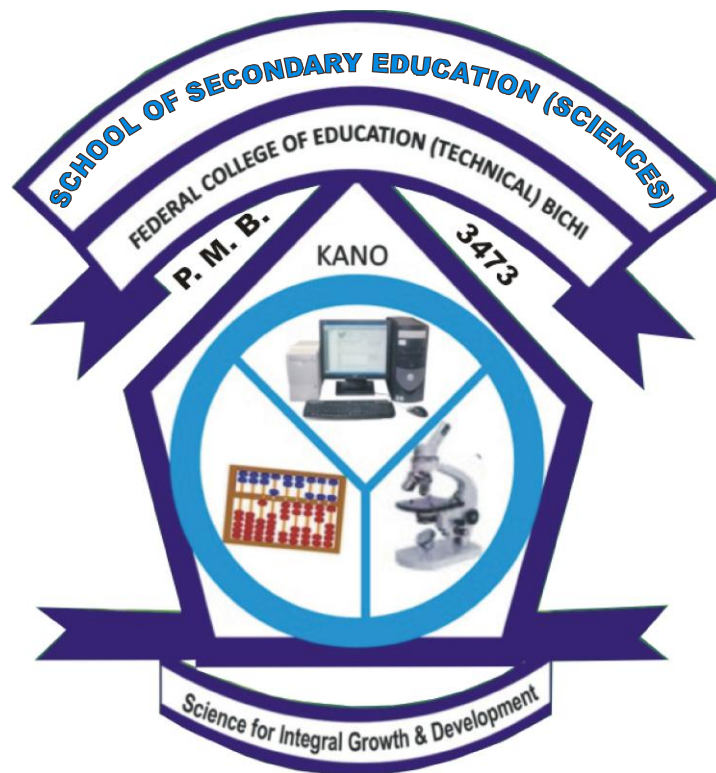


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EDITORIAL

WATARI Multi Disciplinary Journal of Science, Technology and Mathematics Education presents in this edition emerging issues in STEM internship-teaching practice (TP) and students' industrial work experience (SIWES): challenges & prospects. TP and SIWES stand out as critical aspects of teacher preparation. Our esteemed contributors beamed their searchlight on the various problems bedeviling the two exercises in various higher institutions and suggested ways of making them better by using technology especially in the supervision of student teachers involved the two exercises like use of mobile phone for data collection during teaching practice assessment. Also as unemployment is a topical challenge these days, we also present Entrepreneurial Education and SMEs and ways of curbing their emerging challenges. There is a presentation on the application of Polya problem solving in Mathematics. These and many more interesting articles are contained in this edition of WATARI Journal which is graciously sponsored by Tertiary Education Trust Fund (Tetfund). We sincerely welcome your contributions, criticisms and enquiries as usual. WATARI online platform powered by TechnoXSolutions is now fully functional. You visit www.watari.com to submit your paper for online publication at any time. Follow the guidelines below

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**EMERGING ISSUES IN STEM INTERNSHIP-TEACHING PRACTICE (TP)
AND STUDENTS' INDUSTRIAL WORK EXPERIENCE (SIWES):
CHALLENGES & PROSPECTS
OKEGBILE A.S. (PHD)
FEDERAL COLLEGE OF EDUCATION (TECH) BICHI**

INTRODUCTION

One of the characteristics of a standard profession is the inclusion of internship in the curriculum. TP is a step in making teaching the most precious, noble, enviable and standard profession. It is a sheet anchor for teacher education programmes. According to TDP (2019) TP is perhaps the most important component of any pre-service programme. It is the student teacher's first direct experience of classroom teaching and it is one of the most important milestones in their professional development. It is a critical period when trainee teachers put all the learning from their time in College into practice and start to understand what it means to be a teacher.

HISTORICAL PERSPECTIVE

TP is as old as teacher education in Nigeria. With the introduction of Teacher Training College in Abeokuta in 1859 and Nassarawa School in 1909 the apprenticeship system of teacher training emphasized on-the-job training under the watchful eye of the Master Teacher. By 1929 two types of teacher training institutions evolved: The Elementary Training Center (ETC) for lower Primary School Teachers, a two year program course culminated in Grade III Teachers Certificate and Higher Elementary Training College (HETC), a two year program culminated in Grade II teachers certificate (Fafunwa, 2004).

A would be teacher had first of all to serve as a pupil-teacher for 2 years before proceeding to the ETC, then on the successful completion of Grade III course, he had to teach for at least 2 years before proceeding for Grade II course.

The Ashby Commission's recommendation for teachers Grade 1 Colleges was modified to give rise to NCE for the preparation of teachers in the lower forms of Secondary Schools and in the Teacher Training College. Indeed history has its place in human development and **reforms**. The Federal Advanced Teachers Colleges were later established in 1962 (Ibadan moved to Ondo, 1962/1964; Owerri, 1963; Zaria, 1962; and Kano, 1964.) To achieve NCE then, a candidate must pass at a final examination in two science subjects and two arts, education and **practical teaching**.

Federal College of Education (Technical) Bichi (the College where I currently lecture) was established by Decree No. 4 FGN Gazette dated 21/3/1986. The College became fully operational and lectures started on 4/1/1989. The first and second TP of the same set of students took place in April 1990 (at NCE II level) and October 1990 (at NCE III level) respectively. It was a two tier TP system under ABU affiliation.

It is difficult to believe that despite the background history of education, teaching as a profession is still far behind other professions in Nigeria.

On SIWES in the teacher education sector, it is a fact that no society can achieve meaningful progress without encouraging its youths to acquire necessary practical skills. Such skills would enable them to face the challenges of harnessing available resources to meet the needs of their societies and also improve on the means of production. According to Adeluyi (2006) this was what necessitated the concept of

SIWES in 1973. For the students, it was envisaged that SIWES would prepare them to fit into industrial work environment after their career and for the lecturers it was also designed to offer them opportunity to evaluate the relevance of training to the needs of industry. The main aims and objectives are not far-fetched and are comparable to the aims of internship as stated in SIWES booklets.

SIWES commenced in 1974 and in 1979, the Federal Ministry of Education made it compulsory for relevant programmes in Polytechnics and Colleges of Education. In Federal College of Education (Technical) Bichi, the first enrolment of students for SIWES was in 1989 (108 students, in 43 establishments, across 14 states).

Ladies and gentlemen, I was privileged to serve on TP, SIWES committee (combined) and have keenly followed COEASU's positions on TP and Federal Government proposed incentives for teachers. Really, there are emerging issues on TP and SIWES which if well discussed constructively, would provide a road map for improvement. I therefore hope that this conference will do great justice to emerging issues on STEM internship. The subthemes are loaded and have summarized issues of discourse.

I wish to eulogize the Federal Ministry of Education, TETFund, Universal Basic Education Commission, SUBEB, National Commission for Colleges of Education, ITF and supporting donor intervening agencies for great work done on Teaching Practice and SIWES. So far, there are well articulated guidelines and working documents on TP and SIWES. The Agencies have appropriately made the Colleges of Education and the curricula the engine room for TP. Colleges of Education lecturers in particular are TP brain boxes.

The present nature of pre service teacher training especially at the College level is comparatively the best amongst the Teacher Training Institutes and Faculties of Education in Nigeria because of the comprehensiveness of its TP. It is worth noting that TP student teachers need to be prequalified through micro teaching process and courses. Also, there are TP briefings and administrative processes for both staff and students during and after TP. Quite a lot of professional activities were designed and applied including TDP models.

From the theme and the subthemes, I wish to raise six issues and emphasize two as my contribution to the discourse:

- (1) Definition of TP and related terms
- (2) Period of internship. Two tier or one tier system, 1 year, 3months, 6months or 18 months TP duration
- (3) Harmonization of TP and SIWES incentives for Colleges as in the implementation guidelines for NTEP (2009) Pp 7paragraph 4.2(4)
- (4) Reflection of SIWES in the implementation framework of the NCCE Minimum Standard.
- (5) Format of TP tools and kits (toolkit) and their recency Vis a Vis TDP input
- (6) The place of self assessment in TP and SIWES especially on the part of the trainee teachers and reflective teaching.

PROBLEM OF DEFINITION

What do students do on TP ? Ojegin (2009) described **Teaching Practice** as what a qualified, professional teacher does which is comparable to **Legal practice, Medical practice** etc; **Practice teaching** as learning how to teach under the guidance and supervision of a professional teacher; and **practical teaching** as physical demonstration of actual teaching that is rated by master teacher and external examiner. According to Mohanty (2009) Student teaching, practice teaching, In school experience, teaching rounds, internship are similar in definition.

How are students' TP scores or grades captured in the NCE Certificates, Statement of results, Transcripts and Reports?. Any discrepancies ?(YES). In the college mentioned earlier, Class Teaching is reflected in students' statement of results while TP is used in the NCE Certificate designed by NCCE. Hoping that this conference will address such if it is worthy of emphasis.

SELF EVALUATION AND REFLECTIVE TEACHING

How much data does a teacher have about his progress in teaching ? A pilot has the numbers of hours he has flown. He cannot do without his logbook. The Minimum Standards (2020) provides for lecturer's assessment by his college students but no provision for self evaluation. Asiedu-Krofi (1985) observed that to teach oneself on the job is based on the principle that learning is a life-long experience. So to confine teacher education to Training Colleges and a host of skills without teaching oneself through self-evaluation will defeat the purpose of education.

The present nature of the TP process will prepare trainee teachers for the job but after College, one can decide to be the kind of teacher one wants to be. Devoid of personal development and self-evaluation spirit, the present TP efforts will yield dictatorial and prescriptive results which were not purported. In the process, **more** professional freedom on assessment needs to be emphasized for pre service teachers' future independent development. A more problem solving model or innovation is needed.

The Colleges should provide means of self evaluation to the students, show them criteria for success and present models and principles that will guide trainee teachers in search of tentative procedures.

Also, reflective teaching, a fitting approach to teaching which is enhanced by self evaluation is suggested. The main aim of reflective teaching is to support trainee teachers, mentors, and coordinating school no matter how experienced, to reflect upon teaching in a more systematic way (Pollard et al., 2006). Reflective teaching model, will improve upon the limiting effect of traditions in TP, habit, authority, institutional definition and expectation. Reflective teaching involves willingness to engage in constant self-appraisal and development. It involves flexibility, rigorous analysis and social awareness. The approach should be explored for further improvement.

In conclusion COEASU (2014) stated that TP is a major exercise in teacher preparation just as housemanship is to Medical Doctors in training and moot court practice is to law students. The Union therefore demands that government should take full responsibility in financing TP exercise. It is now the right time to call COEASU National Executive to follow up on Government promises to fully finance teaching practice through TETFund and pay student teachers, supervisors and other

participants. The whole world is aware of the promises made. It is when the teachers' incentives promised are fulfilled that pre service and in service teachers will sincerely and proudly thank the Federal Government of Nigeria for a good job well actualized. I thank science teacher educators for upholding the Code of Conduct. I also appreciate everyone present for your interest in teacher education. Thanks to all offline and online listeners/participant. God bless you.

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BIODIESEL FROM BLACK PLUM (*vitex doniana*) SEEDS VIA-BASE CATALYZEDTRANESTRIFICATION REACTION

¹ABDULMUMIN MALAM USMAN,

²ABDULKADIR ABUBAKAR SALMAN,

³HAUWA MOHAMMAD UMAR,

⁴SHUAIBU O. SALIHU

^{1,3,4}DEPARTMENT OF CHEMISTRY,

²DEPARTMENT OF PHYSICS

SCHOOL OF SECONDARY EDUCATION (SCIENCES)

FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

P.M.B 3473 KANO, NIGERIA

ABSTRACT

Due to the increase in the global energy demands, there is an increased in search for alternative sources of fuel. Due to its similarities with petroleum-based diesel, biodiesel arose as a potential replacement for diesel. In this study, biodiesel was produced from the seed oil of black plum (Vitex Doniana) using a two-step catalyzed transesterification reaction. The Physico-chemical analyses carried out on the produced biodiesel gave strong indication that it can serve as an alternative feedstock, having recorded a comparable flash point of 102 °C to American Society of Testing Materials and European Committee for Standardization standards. The percentage yield of oil was (50.1%), acid value of the oil was (4.09), specific gravity was (0.9711 g/cm³) kinematic viscosity was found to be (11.5mm/s) and the p^H was also found to be (8.52). These values indicates that black plum oil will be very useful industrially for the production of biodiesel, though kinematic viscosity measurements showed biodiesel products of relatively high viscosity which has the tendency to leave deposits on combustion. .

1.0 INTRODUCTION

In this modern world, biodiesel is becoming an increasingly important alternative source of energy. The use of biodiesel will reduce the use of fossil fuels thereby minimizing the emission of green house gasses which causes environmental hazard to both living and non living things. Therefore, biodiesel as a substitute for the depleting fossil fuels will also lead to environmental friendly, sustainable and viable source of energy, which will reduce the dependence on the depleting fossil fuels.

The worldwide worry about the protection of environment and the conservation of non-renewable natural resources, has given rise to alternative development of sources of energy as substitute for additional fossil fuels (*Supple et al, 2012*). The major part of all energy consumed worldwide comes from fossil sources (petroleum, coal and natural gas). Thus, looking for alternative sources of new and renewable energy such as biomass, hydro, wind, solar, geothermal, hydrogen and nuclear are of vital importance (*Ezekwe & Ajiwe, 2014*). Alternatively, new and renewable fuel have the potential to solve many of the current social problem and concerns, from air pollution and global warming to other environmental improvements and sustainability issues (*Ezekwe & Ajiwe, 2014*). Vegetable oils have become more attractive

recently because of its environment benefit and the fact that it is made from renewable resource (Ezekwe & Ajiwe, 2014).

As a substitute for the fast depleting fossil fuel (Sambo, 2010), biodiesel which is an alternative for or additive to diesel fuel that is derived from the oils and fats of plants, like sunflower, Conola or Jatropha had come to stay (Meher, L. C. *et al.*, 2009). It should be able to reduce and maintain the price of automobile fuel and drastically minimized the environmental unfriendliness of the hydrocarbons based fuels. The under exploited and unexploited edible and non edible seeds of many plants are good sources of Biodiesel (Meher, L. C. *et al.*, 2009). Our country is endowed with many of such plants. Research is being carried out now to convert also vegetable oils into biodiesel through biotechnological process (Sabrina *et al.*, 2015). With a concentrated and coordinated effort, wide use of biodiesel in our country is going to be a reality in the days to come.

1.1 STATEMENT OF THE RESEARCH PROBLEM

A national energy master plan and renewable energy master plan drafted by energy commission of Nigeria encouraged biodiesel production which covers all aspects of plantation, procurement of seed, extraction of oil, transestrification, blending and trade, as well as research and development. As at 2008, diesel forms about 11% of the energy consumed in the form of hydrocarbon fuels, and its demand was estimated at 1, 517, 496. 64 million litres (NNPC ARB, 2008). Therefore, blending becomes necessary to minimize environmental pollution and also saves the country's exchequer. Nigeria has vast stretches of degraded land, mostly in areas with adverse agro – climatic conditions, where species of Jatropha, sunflower, Soya beans, wild grapes, and so on can be grown easily.

Even 30 million hectares planted for biodiesel production can completely replace the current use of fossil fuels. The production of biodiesel will also boost the rural economy and more enthusiasm in more than one billion lives in the area and generate thousands of jobs for both rural and urban areas (Morrison *et al.* and Boyd, *et al.*, 2008). The use of vegetable oils as an alternative renewable fuel competing with petroleum products was proposed in the beginning of 1980s.

1.2 THE BLOCK PLUM (*vitex doniana*) SEED

The seed used for the production of biodiesel in this study was obtained from its tree, called black plum (English name). While botanical name of this tree is *VITEX DONIANA*, the family name is Verbenaceae. The local name are plana (Amargna), silanni (Ari) and the Hausa people call it "Dinya".

Vitex doniana sweet (black plum) is a widespread deciduous forest tree largely found in coastal woodlands and savannah but also in water areas at lower altitudes and on Zanzibar and Pemba islands. It is found in deciduous woodlands (especially *Brachystegia*), secondary forest, and dry forests. It is not found in montane rainforest and dry forests. It is not found in montane rainforest and the Dodoma thicket belt (Sabrina *et al.*, 2015). The soil requirement it is found on fields, fallow and on alluvial soils. The means of propagation include wildlings, seed, coppice and root suckers. The seed treatments fruit is oblong about 3cm long, turning black when mature (Meher, L. C. *et al.*, 2009)

1.3 Description of biodiesel

Biodiesel is a light to dark yellow liquid, it is practically immiscible with water, it has a high boiling point and low vapor pressure. Typical methyl ester (biodiesel) has a flash point of 150°C (300°F), making it rather non-flammable. Biodiesel has a density of about 0.88 kg/m³ and when not contaminated with starting material can be regarded as non-toxic (Ma *et al.*, 1998) (Adelodun *et al.*, 2016).

1.3.1 Properties Of Biodiesel

Biodiesel and petroleum diesel vastly differ in their chemical composition. These differences give biodiesel different physical and chemical properties. The composition and properties of biodiesel depend on the feed stock used in the manufacturing process (Morrison *et al.* and Boyd, *et al.*, 2008).

1.3.2 Product quality of biodiesel

Biodiesel is a better fuel than petrodiesel and has been known to break down deposit of residue in the fuel lines of vehicle that has previously been run on petrol. Fuel filter may clog with particular test if a gradual transition of pure biodiesel is made, as biodiesel cleans the engine in the process. It is therefore recommended to change the filter within (600 – 800 miles) after first switching to a biodiesel blend (Kessler, M.R. 1985). Prior to use as a commercial fuel the produced biodiesel must be analyzed using sophisticated equipment to ensure it meets any required specifications. Biodiesel's commercial fuel quality is measured by the ASTM standard (i.e. American standard for testing materials). The standard ensures that biodiesel is pure and the following important factors in the fuel production process are satisfied.

- a) Reaction completion
- (b) Removal of alcohol
- c) Removal of glycerine
- (d) Absence of free fatty acids
- e) Low sulphur content (Kessler, M.R. 1985).

As such, biodiesel can be defined as the mono alkyl esters of long chain fatty acids derived from vegetable oil or animal fats, for use in compression ignition engine (Pahl, 2005.)

3.0 MATERIALS AND METHODS

All the chemicals used in this experiment are of high analytical grade.

3.1 Chemicals

N-hexane, sodium hydroxide (NaOH), Methanol, Sulphuric acid (H₂SO₄), Sodium sulphate (crystalline), Potassium hydroxide (KOH), Silica gel, Grease, deionized water.

3.2 Apparatus

Set of Soxhlet apparatus, Condenser, Receiver, Adapter, Thermometer, Round bottom flask, Beakers, Measuring cylinder, Conical flasks, Filter paper, Funnel, Reflux condenser, Thimble, Standard agitator or mixer, Water bath, Heating mantle, Retort stand, Centrifuge, Separating funnel.

3.3 COLLECTION OF VITEX DONIANA SEED

The sample of Black plum (*Vitex Doniana*) fruit were collected from its tree in Bayero University compound and some parts was purchase from Kurmi market in Kano City. The fruits were dried and the dried edible portion was washed and allow it to dry again out of sunlight. The seed was obtained from fruit using two pair of stones to crush the dried fruits and remove the seed (the sample) from its shell. This takes about two to three weeks to obtain the required quantity of the sample. After crushing all the dried fruits, 45g of the sample was now obtained. The sample (seed) obtained was granted using morta and pestle and the grounded sample was weight exactly the quantity required in a thimble, then inserted into the soxhlet extractor which was greases and fitted into a round bottom flask containing n-hexane.



Fig 1: Black plum fruit

black plum seeds

3.4 EXTRACTION OF OIL FROM THE BLACK PLUM SEEDS:

Twenty gram (20g) of the sample was weight and puts into a thimble and covered with a filter paper. The thimble was inserted into the soxhlet extractor which was greased and fitted into a round bottom flask containing 250cm³ of n-hexane. The round bottom flask was placed into a heating mantle and the set – up was clamped to a retort stand. A reflex condenser was then fitted to the top of the soxhlet extraction column and the heating mantle was switched on, the tap connected to the reflux condenser was also turned on when the n-hexane began to boil the vapor passes through the condenser which condenses it to liquid and then drop into the sample until the thimble was filled. As the liquid drops into the sample, it extracts the oil and when the thimble was filled up, the oil extracted together with the n-hexane was emptied into the round bottom flask. This was repeated several times until the oil was extracted completely and this took about 7 hours. There after the whole setup was removed leaving only the round bottom flask on the heating mantle. The content heated at 40°C for 10 minutes with the round bottom flask placed on a water bath and the heating continued until the excess solvent was expelled and only the oil was left. The oil was then placed in a vacuum oven at 40°C for about 30 minutes to further dry it. The volume and the mass of oil extracted were determined. In order to ensure total extraction of the oil, the same procedure was repeated using chloroform and ethyl acetate with the same sample in each case the mass of the oil extracted were determined and recorded (Supple B. *et al.*, 2002). Percentage yield was calculated using:

$$\text{Black plum oil yield (\%)} = \frac{\text{weight of oil}}{\text{Weight of powder}}$$

3.5 CONVERSION OF OIL TO THE BIODIESEL (Transestrification)

A given mass (0.40g) of the NaOH was added to 40cm³ of methanol and stirred until it was completely dissolved. The mass of the oil was placed in a flask and the metabolic NaOH solutions was added to it. The catalyst used here is typically NaOH (i-e caustic soda). It is dissolved in the alcohol using standard agitator or mixer. The alcohol/catalyst mixture is then put into a closed vessel and the oil or fat is added. The system from here on is totally closed to the atmosphere to prevent the loss of alcohol for a recommended time of 1 to 8 hours. The reaction mixture was kept just above the boiling point of alcohol (around 160oF or 71°C) to speed up the reaction. The mixture was stirred for 20 minutes at 25c and then pounded into a separating funnel. After about an hour no separation occurred and the mixture was left to stand in the separating funnel for 24hrs, but there was still no separation then, a solution of 1% sulphuric acid was then added and the mixture was stirred and poured into a separating funnel, after 2 hours it forms three layers of water mixture, soap solution and biodiesel. The water was at the bottom, the middle layer was soap and the top layer is the biodiesel. The soap and water were collected leaving the biodiesel. Once the reaction is complete two major products exist. Glycerin and biodiesel. The glycerin phase is denser than the biodiesel phase and the two were gravity separated with glycerin simply drawn off the bottom of the setting vessel. The equation of the reaction is as shown below:

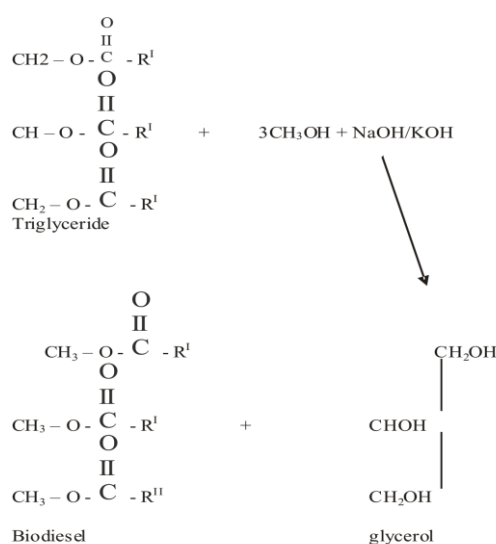


Fig 2: Biodiesel production by transestrification reaction.

Once the glycerin and biodiesel phases have been separated, the excess alcohol in each phase was removed with a flash evaporation process. The glycerin by product contains unused catalyst and soaps that are neutralized with an acid and sent to storage of a crude glycerin. Once separated the biodiesel was purified by washing

gently with warm water to remove residual catalyst or soaps, dried and sent to storage. This is normally the end product process, resulting in a clear amber yellow liquid with a viscosity similar to petrol – diesel (Ezekwe & Ajiwe, 2014). Percentage yield was calculated using the relation:

$$\text{Biodiesel yield \% (v/v)} = \frac{\text{Volume of biodiesel produced}}{\text{Volume of esterified oil}}$$

3.6 PHYSICOCHEMICAL ANALYSIS

The physicochemical analysis was carried out in order to assess the quality of the oil extracted. The reasons is to ascertain the acceptability, stability and other characteristics of the oil extracted in terms of production of high grade biodiesel. The physicochemical parameters analysed include: Percentage yield, acid value, Specific Gravity and pH as shown in table 1.

4.0 RESULTS AND DISCUSSIONS

4.1 RESULTS

Table 1: Physicochemical parameters of black plum oil and its Biodiesel

S/N	PARAMETER	VALUE	
		OIL	BIODIESEL
1	Percentage yield (%)	50	98.1
2	Acid value (mg NaOH/g	4.09	4.09
3	Density (g/cm ³)	0.971	0.72
4	pH value		8.52
5	Colour	Pale yellow	Pale yellow
6	kinematic Viscosity (mm/s) at 25°C	27.2	11.5

Table 2: Comparison of some of the physicochemical parameters With ASTM D6751-07b

S/N	Parameters	Black plum oil biodiesel	Astm D6751-07b
1	Percentage yield	98.1	-
2	Acid value mgNaOH/g	4.09	3.71
3	density(g/cm ³)	0.72	0.87-090
4	Colour	Pale yellow	Pale yellow
5	K. viscosity (mm/s)	11.5	8.5
6	Flash Point (°C)	102	>98

4.2 DISCUSSION

The physicochemical analysis for both the oil and the biodiesel shows that, the parentage yield was found to be 50% and 98.1% for oil and biodiesel respectively. The biodiesel produced from the oil of black plum (*Vitex doniana*) seed was

substantially higher than biodiesel yield from the oils extract from pumpkin and watermelon which gave yield of 58.80% and 40.20% respectively (Ali, 2008), as well as biodiesel extracted from *lannea micro carpa* seeds which gave a yield of 79.80%. Therefore the biodiesel obtained from black plum seed was economically viable in terms of biodiesel yield.

As shown in table 2, the range of the density obtained lies in the range of American Society for Testing Materials (ASTM) which shows that the biodiesel from black plum seed can be used directly in diesel engine without any modification. However, any oil with high specific gravity will create more operational problem to the engine.

The acid value of the oil shown in table 1 shows that the oil is suitable for industrial use and for production of biodiesel. Acid value is the measure of the extend to which the glyceride in the oil have been decomposed by the lipase (Nolte m. et al., 2007).

The viscosity of the oil extracted from the black plum seed was found to be 11.5mm²/s viscosity is a resistance of a liquid to flow or its thickness; it describes a fluids internal resistance to flow and may be thought of as a measure of fluid friction (Sabrina *et al.*, 2015). The higher the viscosity the less readily the liquid flows and it causes injectors not to work properly.

The viscosity of the biodiesel produced from block plum seed was found to be 11.5mm²/s the shows that the viscosity of the biodiesel obtained from black plums seeds was higher than the maximum value of 6.0mm² recommended in USA standard for biodiesel. Hence it will have lesser adverse effect on the injectors of engines (Supple B. *et al.*, 2002).

The pH of the biodiesel was measured using Jenweh Ph meter model 3320. The pH value indicates that base catalyzed transestrification of the oil was used as the method for biodiesel production. If hydrogen ion concentration is greater than the hydroxide concentration, then the pH will be less than 7 which would indicates acid catalyzed transestrification.

5.1 CONCLUSION

Black plum seeds contain audible oil suitable for biodiesel production with high economic yield. Transestrification process is use in the production of biodiesel using alkoxide as the catalyst. Methanol is used to produce the biodiesel in which 12.5% methanol and 0.7% NaOH can be use to produce biodiesel with maximum yield of 98%. The optimum reaction time for maximum biodiesel production with methanol and NaOH was observed at 6 hours.

The results showed successful transesterification of oil from *Vitex doniana* seeds. The seeds which are considered waste have 50.5% oil and can serve as alternative feedstock for biodiesel since the biodiesel conversion percentage is in excess of 98%.

5.2 RECOMMENDATION

From the findings and analysis in this research, the following recommendation have been made:

- i. Nigeria is blessed with a lot of fruits and vegetable which are the sources of biodiesel, industries in the country must realized and to profitably learn from countries with an already developed biodiesel industries.
- ii. The government and other private sectors should use this opportunity to eradicate poverty by encouraging the rural dwellers where there are a lot of black plum trees.
- iii. All the stakeholders should be involved in every step for the development of a successful biodiesel industry.
- iv. Both students and lectures should mobilize the rural communities in realizing the important of those fruits like block plum found at the door step of common man in the production of renewable energy in order to make our environment clean and healthy.

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ASSESSMENT OF MUSCULAR STRENGTH OF THE STUDENTS OF AMINU KANO COLLEGE OF ISLAMIC AND LEGAL STUDIES, KANO STATE

**¹ABDULRAHEEM, SHARIFATU AND ²AJANI, OLAJIDE EZEKIEL
^{1&2} DEPARTMENT OF PHYSICAL AND HEALTH EDUCATION
SCHOOL OF SECONDARY SCIENCE EDUCATION (SCIENCES)
FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI, KANO**

ABSTRACT

This study assessed the muscular strength of students of Aminu Kano College of Islamic and Legal Studies. To achieve the purpose of the study, two research questions and two hypotheses were formulated to guide the study. A descriptive design of survey type was adopted for the study. The population for this study was 12, 072 students and a sample of 380 students of Aminu Kano College of Islamic and Legal Studies Kano were drawn through a multi-staged sampling procedure. Simple frequency counts and percentages were used to organize and describe the demographic characteristics of the respondents. Inferential statistics of chi-square was used to test hypothesis one and independent t-test was used to determine the difference between the male and female students in hypothesis two. The results of the study revealed that students of Aminu Kano College of Islamic and Legal Studies have significant muscular strength ($\chi^2 = 48.6, p < 0.05$). Also, male students of Aminu Kano College of Islamic and Legal Studies do not significantly differ ($t_{cal} = 0.587, p > 0.05$) from their female counterparts in their muscular strength. Based on the findings of this study, it was recommended among others that students of Aminu Kano College of Islamic and Legal Studies should be encouraged as much as possible to further develop their physical fitness through daily physical activities because doing so will develop their physical fitness as well as free them from diseases, such as back pains, leg pains and hypertension.

Key words: Assessment, Muscular Strength, Students, Aminu Kano College of Islamic and Legal Studies.

INTRODUCTION

Physical fitness is the ability of an individual to perform his/her daily duties without undue stress or fatigue and is simply referred to as living actively. Being physically fit will boost an individual's immunity thus preventing infection of certain diseases. Physical fitness helps individuals to live healthy both mentally and physically throughout their lives. In short, they will be able to perform daily chores easily and able to prevent chronic diseases such as heart attack, high blood pressure, cancer, diabetes, and osteoporosis (Omar-Fauzeet, 2010). Physical fitness thus includes adequate degree of good posture, physique, body weight normality, proper functioning of vital organs, muscular strength, muscular endurance, flexibility, body control and most importantly, cardiovascular endurance and mental fitness (Emiola, 1982). How much of each components is required depends on the age and the individual's vocation. Although a person physically fit in all components does not exist. A person should be able to walk, run, carry some fairly heavy objects and be

ready for an emergency. Some of the components can be referred to as motor fitness (agility, balance, coordination, power, speed and reaction time) while others fall into the group of health related (body composition, aerobic capacity, muscular strength, muscular endurance and muscular flexibility) fitness components (Hallal et al., 2012). Physical fitness is a physiological state of well-being that allows one to meet the demands of daily living or that provides the basics for sport performance or both (Emiola, 2007). Physical fitness is the individual's ability to endure exertion and stressful physical activity beyond that required by his/her normal day to day occupation. Physical fitness is a set of attributes that are either health-related, skill-related or both (Barlow, 2004). It is therefore, not only required by males for better performance but also by females for maintenance of a healthy body and healthy mind. Physical fitness is a crucial pillar contributing a lot to the health of an individual. It affects our ability to function and be physically active. The benefits of physical fitness programs include improved capability to perform specific physical tasks, improved ability to mobilize the body efficiently, improved tolerance to fatigue, reduced risk during physical tasks, better psychological preparation and reduced stress and associated health risks (Cooper Institute, 2016). Muscular fitness is the general health, strength and endurance of one's muscles. It is related to other fitness conditions such as muscular strength which describes the amount of resistance that one's muscle can counter and muscular endurance which is the amount of muscular work one can do over time. People work to improve their muscle to achieve a number of goals. Common goals include improving one's appearance, improving one's overall health and reducing stress. There are many possible benefits to improving muscular fitness. One's muscles tend to grow stronger and larger as they gradually become able to lift heavier loads for longer period of time. The association between muscular fitness and quality of life is impressive. The benefits of muscular fitness development include increases in lean body tissue, bone mineral density, connective tissue strength, anaerobic power, low-back health and self-esteem (Sharon & Denise, 2008).

Muscular strength refers to the ability of a muscle or muscle group to exert force against a resistance. It is usually measured as one maximal effort for dynamic resistance exercise. This is often called a one-repetition maximum (1-RMax), whereas for static exercise, it is referred to as a maximal voluntary contraction (MVC) (Sharon & Denise, 2008). There is no doubt that, in varying degrees, strength underlies all motor performances. In an isolated sense, strength may be thought of as the capacity of a muscle or group of muscles to exert maximum pressure, or force, against a given resistance in a limited period of time. A muscular force exerted against an immovable object, with no or very little change in the length of the exercised muscle, is called static or isometric. A muscular force exerted against a movable object, with a change in the length of the exercised muscle, is called dynamic or isotonic. Attempting to push down a wall is an example of static force; lifting a barbell is a dynamic force (Sharon & Denise, 2008). According to William (2004) many people start losing strength as they age or become inactive although the loss is not irreversible. In addition, women lose more strength than men do, especially from the upper body (perhaps because they may be less active when they are younger). Muscular strength allows you to perform many tasks at home and at work and more important it helps to

reduce the stress on joints. Muscular strength is a major determinant of an older person's ability to maintain an active high-quality lifestyle. Nervous system control of a muscle and the condition of the muscle itself combine to produce the muscular control and strength that various activities require. In fact, much of the initial gain from strength training is a fine-tuning of the amount of neural input that is required to contract a muscle. An example is the process by which toddlers learn to stand, through repeated attempts, their movements become smoother and they are able to stand for longer periods. The amount of muscle contraction necessary for the activity has been refined as is the strength in the muscle itself (Emiola, 2007). When there is pain around a joint such as the knee, the nervous system can also inhibit muscle contraction. Many patients have complained about a knee buckling unexpectedly. Usually, secondary to pain after starting a strengthening routine, they have less pain and fewer problems with their knees giving way. Post-surgery joint replacement patients also illustrate the inhibition of muscle contraction because of pain. In many patients, the day after surgery cannot lift their legs off the bed even though they had no problem doing so before the surgery. As the pain around the surgical site decreased and they practice movements, these patients will be able to lift the surgical leg again even though there was no real change in strength. Most strengthening programs produce both neural and muscular changes that improve one's muscular control and strength (American College of Sports Medicine (ACSM), 2005).

Muscular strength in other words, is the ability to exert maximum force, lifting the heaviest weight one time (one rep max). It is possible to have muscular strength in one area, while lacking strength in another area or other areas. Sometimes, all imbalances of strength in muscles can cause physical injury. This is why it is important to train muscles according to opposite muscle groups (quads/hamstrings, biceps/triceps, chest/shoulders, back/abdominal). By doing this, it will help in avoiding injury (Mazzetti et al., 2000).

STATEMENT OF THE PROBLEM

According to Adegun (2005) daily activities become more difficult to perform with prolonged inactive life style over time, this lead to poor habits that can lead to reduced mobility of joints and compromised body posture. Staying active and stretching regularly, help to prevent loss of mobility, which ensures independence with age significantly reducing the chance of experiencing occasional and chronic back pain.

The population of young adults pursuing tertiary education is growing and with this comes the issues that need to be addressed in order to improve their quality of life. The teaching profession is today the major source of producing human resources for the nation and therefore the quality of teachers being produced would definitely affect the type and quality of future generations of human resources. Both male and female youths are pursuing different teacher training specializations in Aminu Kano College of Islamic Legal Studies who are expected to be absorbed into different education sectors of the state, to serve as teachers. As observed by the researchers, it seems that many of these youths are having low levels physiologic attributes of fitness required to carry out their daily activities due to the contemporary orientation of technological

living, or due to inadequate spaces for sports and physical activities within their communities as well as the College.

It has been observed by the researchers that students of the College frequently report back pains at the school clinics and sometimes leg pains, which probably is as a result of inactivity. The end results of inactivity can alter or deter muscular fitness, made up of flexibility, muscular power, strength and muscular endurance which are all performance related components. It is against the stated problems that the study investigated the muscular strength as a components of muscular fitness of students of Aminu Kano College of Islamic and Legal studies. Primarily, the study was guided by the following research questions:

1. Do students of Aminu Kano College of Islamic and Legal Studies possess muscular strength?
2. Do students of Aminu Kano College of Islamic and Legal Studies differ in muscular strength based on gender?

HYPOTHESES

In order to achieve the purpose of the study, the following null hypotheses were formulated and tested at 0.05 level of significance:

- i. Students of Aminu Kano College of Islamic and Legal Studies do not have significant muscular strength.
- ii. There is no significant difference in the muscular strength of male and female students of Aminu Kano College of Islamic and Legal Studies.

PURPOSE OF THE STUDY

The main purpose of the study was to assess the muscular strength for fitness of students of Aminu Kano College of Islamic and Legal Studies, with the view to identify the source and proffer solution to the frequent complaints the students make during their clinic visits, of back pain and leg pains.

METHODOLOGY

Population of the Study

This study adopted descriptive design of survey type. Sunusi (2008), defined a survey as a means for gathering information about the characteristics, actions, or opinions of a large group of people. This design is found suitable for this study, because it assessed the muscular characteristic (muscular strength) of a population of students of Aminu Kano College of Islamic and Legal Studies. The population of this study comprised the entire students of Aminu Kano School of Islamic and Legal Studies, with a population of 12,072, (7,214 males and 4,858, females (Directorate of Academic Planning, Aminu Kano College of Islamic and Legal Studies. 2017/2018 academic session).

Sample and Sampling Techniques: A sample of 380 students of Aminu Kano College of Islamic and Legal Studies Kano State were used for this study. This is in conformity with the suggestion of Research Advisors (2006), that for any population of ten to twenty-four thousand the sample should not be less than three hundred and

seventy (370). A multistage sampling procedure was used by the researchers to select the sample for the study. This is in line with the view of Njodi and Bwala (2010) who stated that multistage involves more than one sampling method. They further stated that in a large and diverse study population, sampling may be done in two or more stages. The following are the stages for sample selection in this study:

Stage 1: Simple random sampling technique was used to select two (2) schools from six (6) schools in Aminu Kano School of Islamic and Legal Studies, Kano State. The procedure is as follows; name of each school was written on a piece of paper, the pieces of paper were folded, mixed and shaken vigorously inside a container. Two research assistants representing the institution picked one folded paper each. The first two schools picked form the sample schools for the study.

Stage 2: Simple random sampling technique was used to select two departments from each of the selected schools. That was School of Science (Computer/Mathematics and Mathematics) School of Languages (Islamic Arabic and Islamic Hausa) respectively.

Stage 3: Proportional sampling technique was used to select 10% of the total population of each selected department

Stage 4: Purposive sampling technique was used to identify participants from each department through those that fill the inform consent form and identify interest in the study from both Schools of Science and School of Languages

Inclusion Criteria Apparently healthy students based on the assessment of laboratory method and physical evaluation

Exclusion Criteria

Hypertensive students with high blood pressure exceeding 140Hg/90mm. Diabetic students with blood sugar level of 126mg/dL(7mmol/L) or above. Those active students who engaged in physical activities (School Athletes) and Physical and Health Education Students

Data Collection Procedure

An introduction letter was written and taken to Provost of Aminu Kano College of Islamic and Legal Studies to seek permission to carry out the study. Through the H.O.D's of the NCE Departments selected, the participants selected for the study were tested on the muscular fitness variables, as well as their demographic characteristics.

Data Collection Instruments

In this study, Hand Grip Dynanometer (X12Va Japan) was used to measure muscular strength of the students (participants). The purpose of this test was to measure the maximum isometric strength of the hand and forearm muscles. Handgrip strength is important for any sport in which the hands are used for catching, throwing or lifting. Also, as a general rule people with strong hands tend to be strong elsewhere, so this

test is often used as a general test of strength. The subject held the dynamometer in the hand to be tested, with the arm at right angles and the elbow by the side of the body. The handle of the dynamometer was adjusted as required, the base should rest on first metacarpal (heel of palm), while the handle rests on middle of four fingers. When ready the subject squeezes the dynamometer with maximum isometric effort, which was maintained for about 5 seconds. No other body movement was allowed. The subject was strongly encouraged to give a maximum effort. The position of the arm and hand can vary in different grip strength protocols. Various positions include the elbow being held at right angles, the arm hanging by the side and the extended arm being swung from above the head during the squeezing motion, the procedure for tests, best of three attempts with 30 seconds rest between. The best result from the several trials for each hand is recorded in Kg/Ibs as each subject's score (Robert,2008).Each student was scored between good or poor in line with the scoring table, according to International Society for the Advancement of Kinanthropometry (ISAK) (2006) fitness score. Simple frequency counts, percentages, mean and standard deviation were used to organize and describe the demographic characteristics of the respondents. Inferential statistics of chi square was used to test hypothesis one to determine the muscular strength of the respondents, while t-test was used on hypothesis two to determine the level of differences between the male and female students on the muscular strength tests at 0.05 level of significance.

Results

Out of three hundred and eighty (380) participants, only three hundred and seventy-five (375) duly completed the tests.

Table 1: Demographic Characteristics of the Respondents

Variables	Classification	Frequency	Percentage (%)
Gender	Male	185	49.2
	Female	190	50.8
Total		375	100.0
Age (Yrs)	18-25	140	37.6
	26-33	189	50.4
	34 & above	46	12.0
Total		375	100.0
Departments	Comp/Maths	79	21.0
	Mathematics	80	21.3
	Islamic/Arabic	124	33.1
	Islamic/Hausa	92	24.6
Total		375	100.0

Table 1 indicated that 140 participants, representing 37.6% were within the age range of 18-25 years; 189 participants, representing 50.4%, were within the age range of 26-33 years with 46 participants, representing 12.3%, were within the age range of 34 years and above. The table also shows that 185 participants, representing 49.2.0%, were males while 190 (50.8%) are females. As shown in the table, the school type indicated 79 participants, representing 21.0%, were from Computer/Mathematics

while 80, representing 21.3% were from Mathematics. Also, 124 participants, representing 33.1%, were from Islamic/Arabic while 92, representing 24.6% were from Islamic/ Hausa departments.

Hypotheses Testing

Hypothesis 1: Students of Aminu Kano College of Islamic and Legal Studies do not possess significant muscular strength

Table 2: Chi-square summary on students' Muscular Strength

Strength	FO	FE	df	χ^2	p
Good	255	187.5	1	48.6	0.001
Poor	120	187.5			
Total	375				

$\chi^2_{tab} = 3.84, df = 1, (p < 0.05),$ Significant

Table 2 shows that 255 (68%) students of Aminu Kano College of Islamic and Legal Studies have significant muscular strength. Chi-Square statistical computation indicated χ^2 value of 48.6 at $df = 1, (p < 0.05)$, the p-value is less than 0.05 level of significance. Hence, the null hypothesis stated is therefore rejected. This implies that students of Aminu Kano College of Islamic and Legal Studies possess significant muscular strength.

Hypothesis 2: There is no significant difference in the muscular strength of male and female students of Aminu Kano College of Islamic and Legal Studies.

Table 3: t-test analysis on Muscular Strength between Gender

Strength	N	\bar{X}	SD	SE	df	t	p
Male	182	5.32	2.10	0.151	373	0.587	0.558
Female	193	5.20	1.99	0.146			
Total	375						

$t_{crit} = 1.96, df = 373, (p > 0.05),$ Not Significant

Table 3 reveals that there is no significant difference in the muscular strength of the male and female students of Aminu Kano College of Islamic and Legal Studies with a t_{cal} of 0.587 and a p-value of 0.558. The p-value is greater than 0.05 level of significance. Therefore, the null hypothesis tested is accepted. This means that male students in Aminu Kano College of Islamic and Legal Studies do not significantly differ from their female counterparts in their muscular strength.

Discussion

This study accessed the muscular strength of students of Aminu Kano College of Islamic and Legal Studies. The finding of hypothesis one of the study revealed that students of Aminu Kano College of Islamic and Legal Studies possess/have significant muscular strength. This finding is in line with the study of Van Mechelen

et al. (2000), who conducted a survey on muscular fitness among young people. Their study revealed that a significant increase in muscular strength resulted in significant benefits for enhancing muscular strength performance, overall performance, competence and technique accessed via a specifically designed strength performance test.

Also, the outcomes of hypothesis two reveals that male students of Aminu Kano College of Islamic and Legal Studies do not significantly differ from their female counterparts in their muscular strength. The current finding is in disagreement with Rossi (2011), who conducted a study on muscular fitness among American Punjabi boys and girls of similar ages. He reported that, Punjabi boys are found to possess higher average strength values at different age levels between 20 to 28 years than the girls. At the age of 20 and 28 years, the Punjabi boys are found to exhibit better upper body strength similar to their American male counterparts. The finding of this study is also in line with Adegboye et al. (2011) who conducted a study on the effect of physical training programme on flexibility of upper body and trunk of male and female in Borne. They reported that male students performed poorly compare to their female counterparts in their strength.

CONCLUSIONS

On the basis of the findings and discussions of the study, the following conclusions are made:

1. Students of Aminu Kano College of Islamic and Legal Studies have/possess muscular strength
2. Male students in Aminu Kano College of Islamic and Legal Studies do not differ from their female counterparts in their muscular strength

RECOMMENDATIONS

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

1. Students of Aminu Kano College of Islamic and Legal Studies should be encouraged as much as possible to further develop their muscular strength through daily participation in physical activities in which the end product is the control of hypo-kinetic diseases as well as control or reduction of knee and low back pain among them.
2. The management of Aminu Kano College of Islamic and Legal Studies in collaboration with the Department of Physical and Health Education should make available a fitness center where students (male and female) and staff can regularly visit to inculcate the habit of participating in physical fitness activities.

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**PROSPECTS AND CHALLENGES OF BIOLOGY EDUCATION IN NIGERIA:
A REVIEW
AISHA GARBA MAGASHI (MRS)
BIOLOGY DEPARTMENT
SCHOOL OF SECONDARY EDUCATION (SCIENCES)
FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI
KANO STATE**

ABSTRACT

Biology as a branch of science plays a vital role in providing knowledge of relevant concepts, scientific skills, environment and natural phenomena. Biology education has been widely acknowledged as a way of promoting economic development, eliminating poverty and introducing social welfare. This paper, analyses some prospects of biology education such as many applications in natural and health care environment, understanding of living system and critical thinking, career working in educational institution or industry among others. It also analyses some challenges facing biology education such as shortages of professionally qualified biology teachers, inadequate fund, lack of teaching and learning facilities, lack of proper curriculum development. Recommendations made include provision of teaching and learning facilities in schools, adequate funding of schools, reform of biology education curriculum. This will help to improve biology education and its contribution in Nigeria.

Key words: Biology Education, Prospects, Challenges.

INTRODUCTION

Science is a dynamic and objective process of seeking knowledge, a way of explaining events and phenomena in nature. It is men, women and children investigating, inquiring and seeking verifiable knowledge of which the search leads to a new discovery (Nwosu, 1991). It is an endless process of observation exploration and acquisition through empirical and conceptual means (Das, 1985). Science is classified into so many branches of which biology is one. Biology is a branch of science which studies life. It is a subject matter of great importance and concern to all. Biology helps to develop attitudes and science process skills such as observing, inferring, classifying, hypothesizing, questioning, measuring, interpreting, communicating, predicting etc. Educating people in biology has been widely acknowledged as a way of promoting economic development, eliminating poverty and introducing social welfare (Nwagbo, 2005). Biology education is the act of teaching and learning in order to inculcate or transfer the knowledge of biology to the students (Okenyi, 2012).

Biology as a branch of science plays a vital role in providing knowledge of relevant concepts, scientific skills, environment and natural phenomena (Nlewem, 2012). It helps to develop science process skills and scientific attitude. Education on the other hand is a designed process for training an individual by which knowledge is acquired (Eya, 2010). Eya opined that it is a vital developmental process which is directly related to the effectiveness of trained manpower. Biology Education is a process of

imparting knowledge, skills and attitudes in biology to learners at any level. It gives the learner a sound academic knowledge, skills and ample opportunity to apply this knowledge. According to Okenyi (2012), Biology Education is an application of principles of education in teaching and learning of biology. It is also the act of teaching and training in order to inculcate or transfer the knowledge of biology to students. Biology education is very important for any growing economy like that of Nigeria. About 70 percent graduates of biology education are self-employed and employers of labour (Okenyi, 2012). Many graduates of biology education also own schools of their own where people work and earn their living while some are into fishery business. Biology education and its contribution to the Nigerian's economy will be highly improved through analyzing the challenges and prospects of biology education in Nigeria. Thus, this paper analyses some prospects and challenges of biology education, in order to improve biology education and its contribution in Nigeria.

OBJECTIVES OF BIOLOGY EDUCATION

The study of biology can have a multitude of aims and objectives largely; it is studied to allow a person to enter a specific field of employment. Other aims for studying biology are intellectual, ethical and pragmatic: to increase knowledge about all types of organisms, to encourage greater benevolence in the relationship between humans and the natural environment and to implement biological skills into various technologies or management techniques (Heather, 2007). The study of biology aims to increase understanding of living systems and to allow one to consider the systems in relationship to the self and other organisms in the natural environment. Biology has many applications, in the natural environment. Studying biology however allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients.

The major objectives of biology education in Nigeria are to (NCCE, 2008)

- a) Provide the youth with sound knowledge of the basic principles and techniques of biology.
- b) Produce knowledgeable, highly motivated, professional and effective teachers of biology who will be able to develop in students an appreciation and understanding of biological processes and principles.
- c) Develop confidence in biology teachers and enhance the ability to adopt to the changing situation in science and the technological oriented society.
- d) View biology as a process of inquiry into the living world.
- e) Analyze the activities of living things in their environment.
- f) Demonstrate practical skills in handling scientific apparatus.
- g) Demonstrate excellence and professional competence in teaching secondary school biology.
- h) Include positive scientific attitudes and value in the society and promote positive disposition towards biology, science and the scientific enterprise.
- i) Apply concepts and methods acquired in new areas of study and in everyday situation.

- j) Achieve the above listed objectives which are aimed at the development of biology education and acquisition of knowledge for an improvement in biology education in Nigeria beyond 2020, there is need to assess the problems and prospects of biology education development in Nigeria.

IMPORTANCE OF BIOLOGY EDUCATION

- a) It helps to promote the individuals' understanding of the man's relationship with environment as well as knowledge of the interrelationship existing between living and non-living things that abound in the environment.
- b) The skills include the ability to observe, communicate, identify problems, ask questions, formulate hypothesis, analyze data, make inferences and predictions.
- c) The carefulness, open-mindedness and acceptance of warranted generalization.
- d) It helps to prepare the individual for vocational selection such as in Pharmacy, Medicine, Teaching, Agriculture, etc.
- e) It helps to increase the individual's interest and aesthetic appreciation of nature.
- f) It helps to stimulate the individual's interest in biologically-based hobbies such as growing flowers, collecting insects, etc thereby encouraging leisure activities for individual enjoyment.
- g) It helps to impart factual knowledge and stimulate scientific reflective thinking so as to produce a better informed individual.
- h) It helps to inculcate in the individual scientific skills and attitudes in his approach to personal and social problems.
- i) Study of the importance of plants in botany makes us understand their role in human survival. They are the resources which provide many of the basic needs like food (for both humans and animals in the form of carbohydrates, proteins and fats), clothing (they are the largest supply of fiber as cotton required to make cloth), shelter (as they provide interior and exterior furniture), medicines (as they are greatest sources of medicine).
- j) Study of animals is vital because it helps in better study on animals useful to humans like those: which provide food (eggs, milk, honey & meat) which contribute in clothing (wool from sheep), which are dangerous when encountered by man etc. some of the animals are useful in making drugs and medicines useful to man. For example many of the anti-bodies are prepared by using animals as reservoirs. We can also understand the role of animals in maintenance and balance of the environment (Mazzarello, 1999).

CHALLENGES OF BIOLOGY EDUCATION

Despite all the things biology can accomplish in the nation's development, there are many challenges militating against it especially in Nigeria. These challenges can be viewed under the following headings (Aina, 2009).

- a) Shortages of Qualified Teachers:** Biology teachers are key factors to be considered when talking about improvement of biology education in any nation. There are shortages of qualified biology teachers in Nigerian schools, most of the so called biology teachers are not professionally trained. They may have the knowledge of the subject but lack the method (Aina, 2009).

- b) **Lack of Proper Curriculum Development:** In biology education improvement in Nigeria, the relevance of biology education curricular cannot be ignored. Biology education has not been given an appropriate place in the Nigerian school curriculum. The, bulk of what is taught in schools is imported from other developed countries (Obiaga, 1997). It is therefore necessary to have a curriculum reform to enhance quality of biology teaching in Nigeria.
- c) **Inadequate Fund:** There is no adequate fund for the provision of conducive and enabling environment to facilitate the effective teaching and learning of biology process as well as research. Tertiary institutions are statutorily expected to be engaged in research to enrich the process of social development and not to be engaged in teaching only (Ebong, 2008).
- d) **Lack of Teaching and Learning Facilities:** Lack of ideal resources for teaching and learning in Nigerian Schools has been a major issue of concern. Majority of schools lack essential resources for teaching science subjects such as biology. Science is an abstract subject and will only be understood through the use of adequate and appropriate materials. In many schools there are no facilities for teachers to demonstrate phenomena, allow students to have the opportunity for finding out things for themselves. In many schools there are no laboratories. This can not give room for effective teaching and learning (Omoifo, 2012).

PROSPECTS OF BIOLOGY EDUCATION

Despite the challenges of biology education in Nigeria, some prospects are reviewed under the following headings (Aina, 2009).

- a) Health Care and Education Biology has many applications, both in the natural environment and the environment of health and education. Studying biology allows health care workers to understand the living systems of the body and to apply the knowledge in direct ways to recover and maintain the physical health of both animal and human patients. Biology education, if improved by the government will hopefully help the biology educators to teach the study of life to future generations.
- b) Understanding living system and Critical Thinking, Biology education will hopefully help to increase understanding of living systems and to allow people to consider the system in relationship to self and other organisms in the natural environment.
- c) Employment of Biology education in Nigeria will prepare the Nigerians for a career working in either an educational institution or an industry in which you can be directly involved in the research and development of drugs, food related items and biotechnology. Through biology education one can also become qualified to work for the government in managing an environmental research of animals, river system or biological waste. If biology education is well improved in Nigeria, people will also be able to learn many of the skills needed to succeed in business like in the fishery business (Augustena, 1998).
- d) Program Goals Biology education may provide a comprehensive education in biology that stress scientific reasoning and problem solving across the spectrum of discipline within biology. It will enrich students with opportunities for

alternative education in the area of biology through undergraduate research, internships and studying abroad.

- e) Learning Aspect Biology education will hopefully help the learner to be able to read, understand, and critically interpret the primary biological literature in his/her area of interest and to apply basic ethical principles to basic and applied biological/biomedical practice and will understand the role of biology/biomedical science and practitioners in society.

CONCLUSION

From the discussion in this paper, biology education is faced with a number of challenges such as shortages of professionally qualified biology teachers, lack of proper curriculum development, lack of teaching and learning facilities, inadequate fund which are militating against its contribution to the nation's development. Despite the challenges, some prospects of biology education include, many application in natural and health care environment, understanding of living system and critical thinking, career working in educational institution or industry.

RECOMMENDATIONS

The following recommendations were preferred:

- 1) Biology teachers should be professionally qualified by upgrading their certificates through in-services training, as such staff training should be improved by government.
- 2) Adequate fund should be provided for the provision of conducive and enabling environment to facilitate effective teaching and learning process as well as research in biology education.
- 3) Biology education curriculum should be reformed to enhance the quality of biology teaching in Nigeria.
- 4) Appointment and admission in to higher institutions of learning in Nigeria should be based on merit in order to produce qualitative biology educators

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ANALYSIS OF FACTORS THAT DETERMINE CAREER CHOICE AMONG FEMALE STUDENTS IN SENIOR SECONDARY SCHOOLS OF KANO METROPOLIS

**¹MADU CLETUS IFEANYI
AND**

²MARTINA UCHENNA, NWUNE

¹DEPARTMENT OF MATHEMATICS

²DEPARTMENT OF INTEGRATED SCIENCE

SCHOOL OF SECONDARY EDUCATION (SCIENCES)

FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

P.M.B. 3473, KANO

ABSTRACT

Career guidance is a planned assistance to students, in developing goals and choices related to their educational and vocational future. It creates understanding of the many problems that confront students in their immediate and long term planning and also helps them to determine means of overcoming them. This survey investigates the factors, like career counseling, family background and environment that influence career aspiration among female students in senior secondary schools within Sabon-Gari, Kano metropolis. Four (4) research questions guided the study. Data were obtained through questionnaire distributed to 100 female students selected randomly from five (5) schools within the study area. It was observed that the greatest influencer of female students' career choices is guidance and counseling services in their schools (56%) while parental influence is second with 37%. Environmental and peer factors is third with 7%. It was also discovered that literate parents tend to impose particular career on their children for various reasons, while less literate parents attach values to other areas of life which invariably prevent their children from aspiring for certain occupation. It is therefore recommended among others that the role of professional counselors in schools should be strengthened. Also parents, through the instrumentality of Parents Teachers' Associations, should be enlightened in order to enable them positively influence their children career choices.

Key words: Career guidance, Career choice, career decisions, occupational stereotype

INTRODUCTION

Career guidance is the process of helping individuals (school/college students or professionals) in making adequate educational and occupational choices and in taking career decisions based on the demand and requirements of the future of work. For most people a quality life is of outermost importance, hence, an appropriate career to them is the only means of getting a quality life and a respectable status in the society (salami & salami, 2013). Education is the process of providing information to an inexperienced person to help him/her develop physically, mentally, socially, emotionally, spiritually, politically and economically (Ocho, 2005). He further stated that education is the process through which individuals are made functional members of their society. Deduced from the above, the researcher implies that to educate

means to train the mind, character and abilities of individuals generally and female child in particular.

It has been established by researchers (Ayo-sobowale, 2006) and (Ofodile, 2009) that enabling female education is crucial for national development, and the role of women cannot be underestimated as against the native traditional philosophy which states that a woman's place is in the kitchen and her primary role centers on her home. The girl child needs to be educated to acquire knowledge and skills needed to advance her social interactions and self-improvement. The girl child education prepares her to face the reality in society and teaches her to be a good wife and mother (Ayo-sobowale 2006). When she is educated, she realizes the full potentials endowed on her and this cannot be actualized without a proper guidance or counseling.

Educational guidance and counseling is aimed at helping the secondary school students to choose further course of study. A number of related subjects must be studied at the secondary school level to provide the basic knowledge on which mastery of a chosen field is built (Edo- Olutu, 2006). Edo- Olutu, (2006) also claimed that students in secondary schools today still gamble with subjects to choose, more so the level of career awareness among these students also determine to a large extent their choice of relevant subjects which will eventually give them a career in future (Okeke, 2003). Career counselors offer a wide range of career related programs to students which is expected to guide them into right vocations so as to make students enjoy their work (Zunker, 2002; Collins 2007). Okon (2005), Kazi and Akhlaq (2017) respectively reported that a number of factors like intellectual ability, individual's environment, skills, interest, professional and educational level of parents, gender, financial prospect, school and counseling, expectations and prestige, country's need, one's culture and socio-economic background has observed effect on students when making career decisions.

Kazi and Akhlaq, (2017) on factors affecting career choice observed that parents had the most significant effect on students when it comes to career selections. Osa-Edoh and Alutu, (2011) in their research, observed that the socio-economic status of parents affects the educational values and career aspirations of students. Students from high socio-economic status were more optimistic, because finance was available for them to continue their studies in any environment they wished to continue while students from low socio-economic status groups opt for career that would be time and financial friendly because of the ignorance of their parents. Okonkwo, (1980) in Nwune, (2006), found sex difference to be a dominant factor in determining career choice among secondary school students in Nigeria. Sosanya (1980) in Nwunne, (2006), also showed that boys were significantly more interested in artistic, literary, clerical activities and music. Kochung and Migunde, (2011) in their research, came up with list of factors and their order of influence on students, gender had the greatest effect. Students in Enugu South and Nigeria are faced with problem of vocational or career choice towards the end of their secondary school education due to poor form of guidance programs being run in secondary schools (Egbo, 2017). Nyamwange, (2016) from her findings concluded that having a prior knowledge about a career is important to developing and nurturing interest in the career.

This study therefore investigates the factors, like career counseling, family background and environment that influences career aspiration among female students in senior secondary schools within Sabon-Gari, Kano metropolis.

STATEMENT OF PROBLEM

Many children born into low-income families have relatively little prospect for maximizing their occupational goals. Some parents with little formal education hold values that tend to prevent their children from aspiring for certain occupations. Occupational stereotype by sex has led to discrimination in the world of work against women. Some religious practices and beliefs often restrict women from expressing their aptitude and inclinations as some are not to be seen in the public or wear certain cloths. The concern of this paper is therefore to analyze these factors with a view to determining the extent to which each of them can be considered to be affecting female students' career choice and consequently proffer the needed solutions to the situation.

Specifically, the study seeks to investigate:

- i. The career aspiration and development of female student.
- ii. How career counseling affect/influence career aspiration and development among female students in secondary school.
- iii. The influence of family background on the vocational aspirations of female students in secondary schools in Kano metropolis.
- iv. The influence of environmental and peer groups on career aspiration among female students in secondary school.

RESEARCH QUESTIONS

1. What is the career aspiration of female student?
2. What is the influence of career counseling on aspiration and development among female secondary school students in Kano metropolis?
3. What is the influence of family background on vocational aspirations of female secondary school students in Kano metropolis?
4. What is the influence of environmental and peer group on career aspiration among female secondary school students in Kano metropolis?

RESEARCH METHODOLOGY

The study adopted a descriptive survey research design. The basis for choosing this research design method was contingent upon the fact that survey research enables the collection of detail and factual information which describes existing phenomena.

The study population comprised of 627 SS1 female secondary school students of 14 co-educational secondary schools in Sabon-gari area Kano metropolis, Kano State. These schools were selected using stratified sampling technique. Five (5) schools were randomly selected out of the 14 co-educational secondary schools in Sabon-gari Kano metropolis. Furthermore, 100 female SS1 secondary school students were selected using balloting. 20 female SS1 students were selected from each of the five (5) co-educational secondary schools in sabon-gari Kano metropolis.

A fourteen (14) Likert scale structured item questionnaire was constructed in order to collect data for the study. This is deemed to be good enough for this study as

recommended in Adeloje, (2005). The items in the questionnaire were designed to allow respondents to indicate their choices by ticking their choice in the options provided and some other questions required them to supply short answers by filling in the blank spaces.

The questionnaire was validated by three experts. One of the validators from test and measurement unit, and the rest from Integrated Science department all from F.C.E(T). Bichi. The instrument was tested to establish the reliability using 20 students who were not used in the main study. The Cronbach Alpha approach was used to establish the reliability coefficient of the instrument. The value obtained was 0.78.

All completed questionnaires were collected from the students and checked to ensure that the instructions given were properly followed. A 100% return of the questionnaires distributed was recorded. Data collected were analyzed using simple percentage. For the purpose of this study, parents with primary and below primary education are considered illiterate while those with above primary education are considered literate.

PRESENTATION OF RESULTS

The following tables show the information as gathered from the respondents.

Table 1: Frequency table of parents' occupation

Parent's occupation	Frequency	Percentage
Trading/Business	59	59%
Civil service	17	17%
Trading and civil service	24	24%

From the table above, parents who are both traders and business men have the frequency of 59, those who are civil servant had 17 while those who either the fathers are traders and mothers civil service or vice versa had 24.

Table 2: Frequency table of parents' educational statuses

Parent Educational Statuses	Frequency	Percentage
Both Literate	65	65%
Both Illiterate	15	15%
Father Literate/Mother Illiterate	9	9%
Father Illiterate/Mother Literate	11	11%

From the table above; parents with primary and below primary education are considered illiterate while those with above primary education are considered literate. Parents who are both literate have frequency of 65, both illiterate had 15, father literate and mother illiterate had 9 while father illiterate and mother literate had 11.

Table 3: Frequency table of student’s subject choice

Students Subject Choice	Frequency	Percentage
Sciences	63	63%
Arts	31	31%
Commercial	6	6%

From the table above, students aspiring for science related career had frequency of 63; arts 31 while commercial had 6.

Table 4: Parents educational statuses and percentage influence on students

Parent’s Educational Statuses	Frequency	Percentage Influence On Career Choice
Both Literate	65	65%
Both Illiterate	15	15%
Father Literate/Mother Illiterate	9	9%
Father Illiterate/Mother Literate	11	11%

From table above, literate parents tend to influence their children’s career choice more than other parents, most students tends to aspire towards their parents career.

Table 5: Frequency table of student’s response to factors influencing career choice and aspiration.

Factor influencing career choice	Y es	N o	% of Yes	% of No
Career counseling helps students to improve in their career choice and aspiration.	100	0	100%	0%
Parents’ educational status/interest affects student’s career choice and aspiration.	66	34	66%	34%
Peer influence and environment factor affects students’ career aspiration and choice.	13	87	13%	87%

From the table above, all the 100 students agreed to the fact that career counseling helps the students to improve in career choice and aspiration, 66 says yes to parents educational level while 13 to peer influence and environment factor.

Table 6: Percentage influence of factor influencing career choice and aspiration.

Factors	Percentage
Career awareness through guidance and counseling	56%
Parental educational level and career	37%
Environment factor	7%

From the table above, need for career awareness through guidance and counseling had the highest influence on the career choice and aspiration of the students followed by parental educational level and career, while environment factor had virtually no effect on the career aspiration and choice.

DISCUSSION

The result obtained from this study attributed career choice decisions to be affected most by career awareness through guidance and counseling which agrees with findings of (Nyamwange, (2016) and Egbo,(2017). Also, parental educational level and career also influence carrier choice among students, this agrees with the work of Kazi and Aklaq (2017) and not on gender or environmental factor which disagrees with Okonkwo(1980) in Nwune (2006), Sosanya(1980)in Nwune (2006), and Kochung and Migunde (2011).

Career aspiration among female students in senior secondary school within sabon gari Kano metropolis is most affected by parental influence and career awareness through guidance and counseling, as most literate parents dictate career choice for their children while less literate parents makes less impact on the career aspiration and choice of their children. From table 6, it is discovered that the influence of career awareness through guidance and counseling had the most effect as majority of the students attested to the fact that they were not fully exposed to career education through guidance and counseling in their schools and the students used for the research believed that career guidance and counseling will help them to improve in their career aspiration and choice. The popular saying that “what a man can do, a woman can do as well better” holds. In Nigeria today, virtually in all occupational sectors, women are found; sports, politics, business, engineering, legal practice, medical and even ministries, women are found.

CONCLUSION

From the result obtained in this study, it was concluded that the major determinates of career aspiration among the female students within the designated environment remains the issue of career awareness through guidance and counseling and parental influences.

RECOMMENDATIONS

In the light of the above findings, it is recommended that,

1. a planned and implementable career programs be introduced in the schools.
2. a trained career teachers (counselor) be employed to assist the students.
3. the role of professional counselors in schools should be strengthened.
4. there is need to educate parents on the possible negative impact of their influence on the future career of their children through PTA meetings.

5. further study to be carried out to determine the problems that militates against the provision of career guidance in secondary schools in Kano state.

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**EFFECTIVE MICRO-TEACHING ACTIVITIES AS STRATEGY TOWARD
ACHIEVING TEACHING PRACTICE EXERCISE IN THE NIGERIA
CERTIFICATE IN EDUCATION**

**AUWAL MOHAMMED BAKO
AND**

**ALIYU MOHAMMED
SCHOOL OF EDUCATION
A.D RUFAL COLLEGE OF EDUCATION, LEGAL AND GENERAL
STUDIES, MISAU, BAUCHI STATE**

ABSTRACT

Microteaching exercise has been in calculated in teacher preparation programme of the Nigerian certificate in education. Passing microteaching theory and practicum is one of conditions for allowing students to go for teaching practice exercise. This paper addresses the need for effective microteaching programme for quality teaching practice exercise in the Nigerian certificate in education programme. The paper highlights the importance of microteaching toward qualitative teaching practice exercise. The paper goes on to explain the concept of teaching practice and microteaching as a medium for effective teaching practice exercise. Finally the paper discusses the justification of microteaching in the teacher preparations programme and made some recommendation for effective microteaching for quality teaching practice exercise in the Nigeria Certificate of Education programme.

KEYWORDS: Microteaching, Teaching practice, strategies.

INTRODUCTION

The mandate of the teacher training programme at the Nigeria Certificate in Education level, which is the recognized minimum teaching qualification in Nigeria, is to produce quality teachers for the basic education sub-sector (FGN 2013) thus, if the NCE is to remain relevant to the sub-sector it is intended to serve, it must do more than it is presently doing. It must prepared teachers with knowledge and skills required to teach effectively at the different level and areas of the basic education programme. The NCE programme being a major sector of teacher education, generally aims at producing teachers with high personnel and professional discipline and integrity, teachers who are dedicated with appropriate knowledge, skills and attitudes that would facilitate easy achievement of the national goals (FGN 2004).

In the education industry, just like other professional fields of study, students usually undergo a form of practical training as an extension or expansion of theoretical aspect of their course, with a view to putting into practice the various components of their courses. One of the most common and essential practical training under the educational sector- is the teaching practice; where all the prospective teachers are usually posted to various educational institutions to teach pupils or students for a specified period of time. According to National Policy on Education (FGN 2004) teaching practice is one of the aspects of training required to become a professional teacher. Many students teachers encounter a lot of problems in handling their pupils/students and also the various class room activities. This is most prominent where the student teachers was not effectively engage in micro-teaching activities to

receive adequate coaching of how to prepare their lesson or how to impart knowledge to their students with much ease, how to plan and use instructional materials etc. according to Abifarin 2012, micro teaching is a scaled down teaching procedure involving teacher-trainee or students-teacher in which teaching is based on a well planned but a brief lesson where few students are involved and a limited time is used for teaching with the sole aim of exposing the student-teacher to the rudiment of the art of teaching. Micro teaching is very essential to the training of students-teachers in teachers-training colleges and universities just as clinical training and most court presentation are essential to the medical students and law student respectively. That is why it forms an essential part of teachers education programme. Micro-teaching microteaching is normally carried out before a student teacher or trainee is allowed to go for teaching practice exercise. This is to enable him/her to have an objective appraisal of himself/herself for the purpose of self improvement, confidence and competence in the art of teaching.

ESSENCE OF MICROTEACHING IN TEACHING PRACTICE

In our traditional mode of teachers training a great dependence is observed on the availability of pupils, classroom and cooperation from the staffs of the practicing Manga (2014) the microteaching approach incorporating stimulating techniques help training institution in overcoming the hardship faced in the task of organizing students teaching. Microteaching help in reducing the complexities of the normal class room teaching as it reduces the size of the class and duration of the lesson and provide proper opportunities for practicing one component of teaching skill at a time by using single concept of the content. Microteaching works as a laboratory exercise to focus training on the acquisition of teaching skills and instructional techniques. Here, a trainee can experiment with several alternatives in a limited time and resources. It is just like learning the art of operating human body part in an educational laboratory by a student doctor before actually operating a patient.

Generally, there are major purposes of microteaching. These are:

1. To enable student-teacher develop teaching skills under controlled conditions without hampering the learning of the pupils.
2. To enable experienced teachers examine, refine and update their teaching techniques.
3. To enable the student-teacher and experienced teachers to be aware and cope adequately with latest technologies, that are flowing from time to time to the field of education as a result of research finding and technological development.
4. Microteaching is a practical teaching experiment of teaching techniques, skills strategist and research finding in the classroom. Therefore, to achieve the above started purpose of microteaching, it will involve adequate planning, teaching, observing and re-planning, re-teaching and re-observing of the student teachers and experienced teachers by the supervisor and colleague of the student-teachers on regular bases Abifarin (2012).

PURPOSE OF TEACHING PRACTICE

Teaching practice is very essential aspect of teachers education programme, even though some teachers and student-teachers do not seem to recognize its importance. They merely regard it as a requirement for the teacher training programme only

without taking in to cognizant all the important values and experiences which teaching practice infuses in to the students-teachers such as developing positive professional attitudes, understanding the skills of teaching etc Gar (2013). He further said many others including scholars and educators realized the significance of the programme which encourages and develop teaching competence among the prospective teachers. It also provides an opportunity for gaining insights in to the full text of teaching.

The purpose of teaching practice was stated by the National Policy on Education (2004:39) as follows:

- i. To produce highly motivated, conscious and efficient class room teachers for all level of our educational system.
- ii. To encourage further the spirit of enquiry and creativity in teachers.
- iii. To help teachers to fit in to the social life of the community and the society at large and enhance their commitment to national goals.
- iv. To provide teachers with the intellectual and professional background adequate for their assignment and make them adaptable to changing situations.

The NPE (2004) further recommend that all teachers in educational institutions shall be professionally trained, and special education programme must be designed for preparation of teachers. These special education programmes includes, the teaching practice activities (skill building for professionalism), practical activities, project writing and so on. All these would help the student teacher to acquire enterpreneural ability.

MICROTEACHING AS MEDIUM FOR EFFECTIVE TEACHING PRACTICE EXERCISE

Microteaching represents an appropriate innovative technique for helping the student teachers being trained in the colleges of education in their acquisition of the desired teaching skills (Mangal, 2014). As a matter of definition microteaching can be define as a sort of specialized training technique that provides appropriate opportunities to the student-teacher for the practice and development of some specific teaching skills by organizing teaching in it micro form (miniature in term of class, size, time duration and content to be covered).

In a microteaching class the student-teacher or teacher-trainee is expected to teach a particular predetermined micro teaching skill for a specific short period of time upon which he/she is assessed and constructively criticized by his/her supervisor and colleagues. At the end of his/her teaching the student-teacher or trainee is offered the opportunity of re-planning and re-teaching the previous lesson taught in order to effect all necessary corrections raised by his/her supervisor and colleagues. And this would build a solid foundation for teaching practice exercise.

Abifarin (2019) identify the followings as the benefit of microteaching exercise to student-teachers on teaching practice.

- i. Microteaching affords the students teachers or trainee the opportunity to acquire needed skills and competencies for practicing as trained teacher.

- ii. The programmed builds up courage and confidence in the student teacher to teach without fear. That is, the problem of psychological fear usually faced by student-teacher in their first encounter in the classroom is eliminated.
- iii. More teaching also affords the student-teacher the opportunity to practicalise all their theoretical experiences gained in the different aspect of education such as sociology of education, psychology of education, theory and practice of education and other aspect of education.
- iv. It equally affords the student –teacher the opportunity of immediate correction of their mistakes while teaching. That is, the student-teacher, the supervisor and colleague correct his/her mistakes detected and observed by them while he/she was teaching from him/her to make immediate and all the necessary correction in order to improve his /her teaching skills and competencies
- v. Micro teaching exposes the student-teacher to effective planning and executing of his/her lesson in accordance with the stated objectives of his lesson.
- vi. It also protects the student from being subjected to poor teaching methods by the student –teacher during teaching practice exercise.
- vii. Micro teaching equally affords the student-teachers the opportunity at self-criticism and self assessment of their teaching through the use of recorded video clips or audio tape recording of their micro teaching session. The student-teachers self evaluation improve and enhance mastery of their learn micro teaching skills.
- viii. The micro teaching exercise offers the student –teachers the opportunity of practicalising their theoretical experiences in sociology of education and psychology of education in handling some social and psychological problems affecting the learner’s in their classrooms with the sole aim of providing lasting solution to them.

JUSTIFICATION FOR MICROTEACHING EXERCISE

When microteaching procedures are adequately followed in MCE programme, it will definitely go a long way in creating the concept of self confidence in student teachers. This follow up is to ensure that the student-teachers need to be knowledgeable in theory and in practice for a successful teaching practice exercise. According to Ukeje (1992:6) “the teacher need greater depth knowledge, increase skills of teaching, right attitude and improved human characteristics and relations”. His education must be intensive and extensive; it must sound and profound. That is, adequate and maximum attention must be paid on the student-teaching during microteaching practicum with maximum supervision and guidance. This is the only way a student-teacher can have full confidence in teaching practice activities. Often, even when necessary instructional materials are available to the student teacher, but because the microteaching skills was not properly acquired, the zeal of instructional delivery diminishes. Therefore, it is necessary to have an effective microteaching theory and practicum to keep the teaching practice exercise meaningful. Finally, therefore basic teaching skill to be learnt by the student teacher and these basic skills techniques and strategies are learnt through effective microteaching theory and practicum in teacher education programmes, Kanno (2004:26) put it “qualitative and quantitative system of teacher education can be attained, if priorities are laid toward the in calculation of basic teaching skills, strategies and techniques”. Teaching practice is central to the

preparation at student-teachers for a qualitative and productive life as teachers. It also prepares them for effective performance of their duties, if they are both academically and professionally competent.

PEDAGOGICAL CONSTRAINT OF MICROTEACHING IN THE NIGERIA CERTIFICATE IN EDUCATION PROGRAMME

It is a known fact that, no system of education can achieve its purpose without all the necessary thing needed for effective curriculum implementation. Most of the college of education still make use of obsolete equipment that are imported in 1980's by the federal government. For instance, Agwubike Akpomedaye and Bestmart-Digbori (2007) observed that some of the introductory technology equipments imported in to the country by the federal government in the 1980's are still packed and preserved in the crates in which they were shipped in to the country due to poor availability of acquired technicians to operate them.

Abifarin (2019) opine that, the following are some of the disadvantage of microteaching these are:

- i. To effectively carryout micro-teaching in schools there is a need to purchase some electronic gadgets such as interactive board, television, video recorder, tape recorder and some other recording gadgets. In addition, there is need to build a microteaching studio and even closed circuit television (CCTV) studio. All these tasks are very expensive to accomplish. This is a serious hindrance to effective execution of microteaching in schools.
- ii. A major problem to the execution of microteaching is the competence of the student-teachers in handling some modern teaching instruction (media which are computer based). For instance, to adequately operate modern multimedia projectors, interactive board, video recorders and players and some other modern teaching machines by the student-teachers a good knowledge of computer literacy is essential. But most of the student-teachers are deficient in this area.
- iii. Microteaching may inject half-baked teachers in to the teaching profession if not properly monitored. This is because, if the student-teachers are not given enough period to undergo microteaching exercise as a result of population of the students involved yearly and limited available time for such exercise, majority of the student-teachers may not be very skillful in the art of teaching. This may pose some other problems to the teaching profession.
- iv. Inability of institutions to build a standard microteaching laboratory is another major problem of microteaching. Ideally, microteaching practical is supposed to be carried out in a microteaching laboratory. An ideal microteaching laboratory is purposely build for microteaching exercise and it is fully equipped with all the necessary gadgets such as closed circuit television system, video camera, playback machine, computer video projector, television monitor and other related modern equipment. But in most teachers training institutions in Nigeria, there are no standard microteaching laboratories. In most of the colleges of education, universities, and polytechnics where educational course are thought, microteaching is

merely carried out in sub-standard laboratories or in most cases, in the normal classrooms. This is not good enough, because of its adverse effect on micro teaching practical sessions in most of the teacher training institutions.

- v. Frequent electricity power failure in another problem affecting micro teaching in most of the teacher training institutions. For instance today, there is epileptic electricity power supply and most of the institutions cannot afford power generating sets and most micro teaching laboratories can only function effectively through regular power supply. This is a situation poses a lot of problem to effective execution of micro teaching practicum in most teacher training institutions in Nigeria.

RECOMMENDATIONS

The achievements of laudable teaching practice exercise envisaged in the NPE, depend on effective implementation of micro teaching programme. To foster national development through preparation of teachers towards producing compliant teaching practice exercise, the following recommendations are made.

- i. Qualified teachers with good teaching skills and knowledge only should be employed in all our institutions of learning to salvage effective micro teaching for well to do teaching practice exercise.
- ii. Government should build standard micro teaching laboratories in the institutions where teacher education programmes are offered.
- iii. Frequent supply of electric power should be ensured in laboratories where micro teaching is carried out.
- iv. A lot of periods on the school time table should be devoted to microteaching. This is because for a meaningful micro teaching exercise, there is need to share the entire number of student teacher to smaller unit of about ten student in a unit. Therefore, to ensure that all the student teacher participate fully and efficiently.
- v. A harmonized pay package and incentives should be designed for all teaching practice students that performed well in micro teaching exercise.

CONCLUSION

It can be concluded that, education is a veritable fort that all worlds can use skillfully to accomplish whatever national development or objectives they wish. Teacher preparation is vital aspect of ensuring professional builders at nation. Therefore all the necessary teaching skill needed to be addressed to student teacher micro teaching theory and practicum. This will ensure an effective and sound micro teaching practice that will produced competent professional teachers.

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**DESIGNIG OF PHARMACEUTICAL STOCK EXPIRING DATE
MONITORING SYSTEM: (A CASE STUDY OF UGOLAB PHARMACY
KANO)**

¹JOHN E. EZE (PH.D)

AND

²IFEOMA L. EZE

¹DEPARTMENT OF MATHEMATICS

²DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF SECONDARY EDUCATION (SCIENCES)

FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI,

KANO STATE

ABSTRACT

The spread of substandard, spurious, falsely labeled, falsified, or counterfeit (SSFFC) medicines has been a global concern. Their prevalence increasingly threatens public health by jeopardizing patient safety, leading to treatment failure, contributing to development of drug resistance, and possibly leading to diminished confidence in health systems. This project illustrates the designing and implementation of a Pharmaceutical Stock Expiring Date Monitoring System with stock alert system. The aim of this project is to improve accuracy and enhance safety and efficiency in the pharmaceutical store. This work designed and modeled an Integrative computerized pharmacy inventory system that would have the capability to improve pharmacy drugs quantity tracking, accurate financial records and account balance and give alert for any expired drugs at a specified period. The specific objective of the system is to provide better security for securing and controlling expiring date of medications in the pharmaceutical company, saves space, reduces pharmacy storage footprint, aids in Joint Commission compliance by providing complete audit trail of all transactions and gradually eradicate sales of expired drugs. In this paper, the structured system analysis, design methodology and Unified Modeling Language(UML) used for the model design was adopted. The interface between the front-end and the back-end is through Structure Query Language (SQL) in SQL express and through an application program interface (API) defined in Visual Basic. Net.It was recommended among others that there must be a continuous power supply which ought to be made accessible during the time of operation of the drug store.

KEY WORDS: Stock, Expiry Date, Monitoring, System Design, interface, Inventory, Data base

INTRODUCTION

Medication is becoming more complex with the introduction of innovative drugs including biological agents. Pharmacy store (Patient store) practices have evolved over time to become fully encompassed in all aspects of pharmacy itself. The spread of substandard, spurious, falsely labeled, falsified, or counterfeit (SSFFC) medicines has been a global concern. Their prevalence increasingly threatens public health by jeopardizing patient safety, leading to treatment failure, contributing to development of drug resistance, and possibly leading to diminished confidence in health systems

(Lonc, et al, 2008). Protecting the public from exposure to SSFFC medicines requires the presence of a robust medicines quality assurance system. Establishing such a system can be challenging in resource-limited countries, as they are more vulnerable to trafficking of poor-quality medicines, which gives rise to potentially devastating effects (Pribluda , Evans , Barillas , Marmion , Lukulay & Chang J, 2014). In addition to good medicines quality assurance systems, transparent access to reliable data on the quality of medicines is needed from country authorities, and most importantly, these data need to be shared with neighboring countries as well as regional and global initiatives to combat the spread of SSFFC medicines (Hajjou , Qin , Bradby , Bempong & Lukulay , 2013).

Pharmaceutical Stock Expiring Date Monitoring System is a monitoring system that is designed to improve accuracy and to enhance safety and efficiency in the pharmaceutical store (Tull, 2018; Bultman & Svarstad 2002). It is a computer based system which helps the Pharmacist to improve inventory management; cost, medical safety etc. The system allows the user to enter a manufacturing and expiry date for a particular product or drug during opening stock and sales transaction. The system will also give report showing the list of products expiry after a specified date before the product eventually expires (Ayad, 2011).. It also involves manual entry upon arrival of new batches of drugs and upon drug movement out of the pharmacy for a certain period. For instance, every month the pharmacist may want to generate report for the movement of drugs in and out of the pharmacy, getting information about the drugs e.g. expiry date, date purchased, number of drug type left, and location of a drug in the pharmacy.

An expiration date is defined based on a drug that is stored under “ideal manufacturer-suggested conditions of temperature, humidity, light exposure, and packaging integrity” (Coffey, 2013). The expiry date specified by the manufacturer of a drug product means that a drug should meet the applicable standard of identity, purity, strength and quality at the time of use, provided it is kept under storage conditions indicated by that manufacturer (Farrugia, 2011). Drug manufacturers are required by the Nigeria Food and Drug Administration to label their products with expiration dates based on real time or estimated testing data (Ihekwereme, Chidebelu & Nwadiiorah, (2017).

Most products are released to pharmacies with expiration dates of 1 to 5 years from their date of manufacture (Lyon et al., 2010). In case of drugs stored in temporary, provisional warehouses as in emergency settings, it is very hard to rely on the quoted expiry date. This initial expiration date may later be extended based on further stability testing (Lyon, Taylor, Porter, Prasanna,& Hussain,2010). In low- or low- and middle-income countries (LICs/LMICs) it should be possible to extend the useful lives of medications that pass tests for efficacy and safety – and help save both money and the environment – via Shelf Life Extension Programmes or SLEPs (Kamba, Balikuna & Kaggwa, 2017). Therefore, the printed expiration date may not necessarily represent the ultimate shelf life.

At present, manual system is being utilized in the pharmacy. It requires the pharmacist to manually monitor each drug that is available in the pharmacy. This usually leads to mistakes as the workload of the pharmacist increases. The community pharmacies and hospital pharmacies have key roles to play in the

pharmaceutical practices. For the community pharmacies in Nigeria, a computerize approach to the sales and dispensation of none expired drugs is not common, due to the fact that laws governing pharmaceutical practices have not fully enforced it. On the part of the hospital pharmacies, there is a more controlled approach to the computerize method of drugs management. There is a need for these computerize method to be fully enforced.

With software such as the Pharmaceutical Stock Expiring Date Monitoring System, which provides a platform has been provided to help with drug management, as well as providing ease to all pharmacy activities such as expiring date tracking. The methodology used in the implementation of the software is the Incremental Model of System Development Life Cycle, which allows room for scalability as time goes on. Records of production and expiring date are subject to tracking from time to time or when there is case of reduction in demands. Errors on report of expired drugs should be precisely cancelled out and signed for. Records of expired drugs should be completely tracked in the dispensary each day, and not afterward. This will facilitate straightforward compilation of drug utilization.

Creating a Pharmaceutical Stock Expiring Date Monitoring System(PSEDMS)would help in Drug's information for all events of the store. It is eminent that the system provides a safe, secure and verified platform for all activities which help to bridge the communication gap and provide accurate drugs data. Therefore, if all recommendations are strictly adhered to, there will be strict monitoring of how and when drugs are restocked and a decrease in the spread of expired drugs.

STATEMENT OF THE PROBLEM

Pharmacy management has kept paper record in filing cabinets. Managing a very large pharmacy with records on papers will be tedious and difficult to keep track of inventories with regards to the drugs in the store, expiry date, quantity of drugs available based on the categories and their functions.

The pharmacist has to order drugs to replenish the already diminishing stock. In addition, ordering of drugs is being carried out manually. Significant amount of time is allocated for writing the order as the pharmacist needs to go through the stock balance and make rough estimate of the amount of order based on Figures.

Drugs are not supposed to be used after they have expired. This project work will prompt the pharmacist about drugs that are close to expiry, preventing those drugs from being sold and also providing solution to the earlier stated problems.

AIM AND OBJECTIVES

The aim of this project is to develop software for the management and monitoring of the stock and stock expiring date for effective management of a pharmaceutical store that will be able to achieve the following objectives:

- a) Ensuring effective policing by providing statistics of the drugs in stock.
- b) Maintaining correct database by providing an option to update the drugs in stock.
- c) Improving the efficiency of the system by ensuring effective monitoring of services and activities.
- d) Get report about the drugs close to be expired,
- e) Get reports about the drugs staying too long in the stock after production

- f) Get reports about the drugs finishing in stock.
- g) To provide optimal drug inventory management by monitoring the drug movement in the pharmacy.
- h) To ensure that there exist levels of restricted access based on functionality and role.
- i) To ensure that the system is user friendly.
- j) To be able to generate report within a specified period of time.

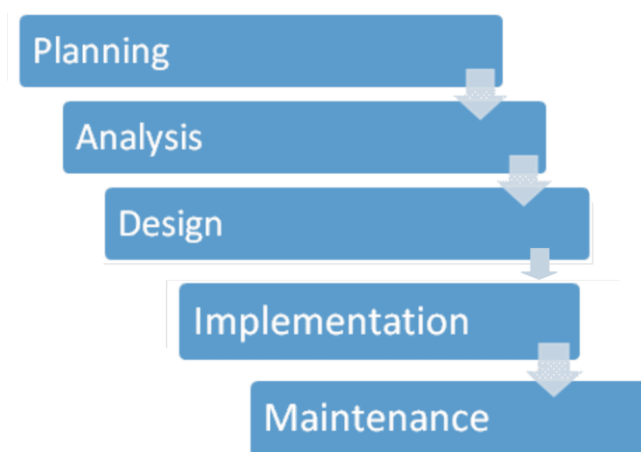
1.4 SCOPE OF THE STUDY

The scope of this project is limited to the activities of UGO LAB Pharmaceutical store which includes taking stock of expired or about-to-expire drugs, inventory management and billing system. The use of a computer based management system for improving the efficiency of a pharmacy is needed and it is an essential part of any modern continuously evolving society.

The system will not be able to handle drug prescription, drug to drug interaction. The system will not be able to handle contraindication and poly-pharmacy in a prescription; this implies that these services will be manually completed by the pharmacist,

SYSTEM DESIGN METHODOLOGY

In this project, Incremental Model of System Development Life Cycle (SDLC) Methodology was used. System Development life cycle (SDLC) is a traditional methodology for developing, maintaining and replacing information system. It is relatively cheap and is used for small projects. This methodology is most suitable for the project due to the project's future requirements which would require changes in the system. This methodology consists of the following phases that describe the procedures for successful system development.



PLANNING

It is the process of identifying problems, opportunities, and objectives. This phase required the analysts to look honestly at what is occurring in a business. Then, together with other organizational members, the analyst pinpoints problems.

Identifying objectives is also an important component of the first phase. The analyst first discovers what the business is trying to do. Then the analyst was able to see whether some aspect of information systems applications can help the business reach its objectives by addressing specific problems or opportunities.

Activities in this phase consist of: interviewing user management, summarizing the knowledge obtained, estimating the scope of the project and documenting the results. The output of this phase is a feasibility report containing a problem definition and summarizing the objectives. Management must then make a decision on whether to proceed with the proposed project.

SYSTEM ANALYSIS

This involves studying the business processes, gathering operational data, understand the information flow, finding out bottlenecks and evolving solutions for overcoming the weaknesses of the system so as to achieve the organizational goals. System Analysis also includes subdividing of complex process involving the entire system, identification of data store and manual processes. The design model adopted in this work is the Structured System Analysis and Design Methodology (SSADM). Unified Modeling Language was used for the model design of this system. The UML is the most widely used graphical representation scheme for modeling object systems. An attractive feature of the UML is its flexibility. UML modelers are free to use various processes in designing systems.. In this paper , three UML diagrams (user case, class and activity diagrams) were used to explain the behaviour of the components of the database system. We employed SQL Express as the database engine because of its extreme power, security, scalability and speed..

SYSTEMDESIGN

The system was modeled using the Universal Modeling Language (UML) as a tool. System design is the most crucial phase in the developments of a system. The logical system design arrived at as a result of systems analysis is converted into physical system design. The major task involved is by producing software which will achieve the best performance at the least cost. The system design involved:

- a) Defining precisely the required system output
- b) Determining the data requirement for producing the output
- c) Determining the medium and format of files and databases
- d) Devising processing methods and use of software to produce output
- e) Determine the methods of data capture and data input
- f) Designing Input forms
- g) Designing Codification Schemes
- h) Detailed manual procedures
- i) Documenting the Design

It was designed in such a way that it will be able to easily navigate through the information entered into the system and track expiry date of an item based on some given criteria and allow other related transaction and computation by employees on the system. In other words, the system was designed to include the activities required to produce useful feature of the system that was developed in a satisfactory system

design analysis process. The system was designed to analyze the implementation of the “Pharmaceutical Stock Expiring Date Monitoring System”.

DATABASE DESIGN

Database used in the System contains a data dictionary of varying data types (Figure 1). The data dictionary was tested to confirm that it has been properly used to implement the system database through the Database Management System (DBMS). The database was also tested to make sure that the system satisfies the ACID properties (Atomicity, Consistency, Isolation, and Durability) of a DBMS. Database testing was conducted on the tables link to various forms of the System with its data dictionary at hand so as to ensure that the insert, delete and update operations are as consistent as possible to avoid the possibility of occurrence of database crash as volume of data generated increases.

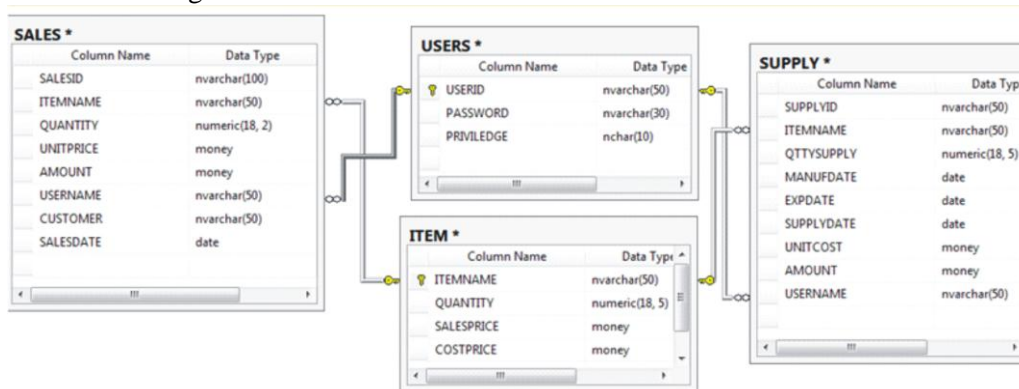


Fig. 1 Data Dictionary

DATABASE TABLES

Table 1: Users Table

This table saves the entire users who can access the software, be it Admin or any other user.

Results:

ITEMNAME	QUANTITY	SALESPRICE	COSTPRICE
BALU	98.00000	50.0000	30.0000
CHEMIRON	0.00000	100.0000	70.0000
PANADOL	200.00000	500.0000	400.0000
PCM	30.00000	50.0000	30.0000

Table 2: Item Table

The Item table saves all items that can be found at the pharmacy.

Table 3: Sales Table

Results:							
SALESID	ITEMNAME	QUANTITY	UNITPRICE	AMOUNT	USERNAME	CUSTOMER	SALESDATE
PANADOL11/3/...	PANADOL	20.00	500.0000	10000.0000	IBUKUN	MOSES	11/3/2017
011/10/2017 3:3...	BALU	2.00	50.00000	100.00000	CLIFF	LAWAL	11/10/2017
011/3/2017 1:36...	PANADOL	10.00	500.0000	5000.0000	CLIFF	LOLO	11/3/2017
111/3/2017 4:00...	PCM	10.00	50.00000	500.00000	CLIFF	TATA	11/3/2017

The sales table saves all sales transactions.

Table 4 : Supply table

Results:								
SUPPLYID	ITEMNAME	QTTYSUPPLY	MANUFDATE	EXPDATE	SUPPLYDATE	UNITCOST	AMOUNT	USERNAME
11/2/2017 5:18:...	PANADOL	50.00000	10/1/2017	12/9/2017	11/2/2017	60.0000	3000.0000	CLIFF
11/2/2017 10:55:...	PANADOL	50.00000	8/29/2017	12/14/2017	11/2/2017	300.0000	15000.0000	CLIFF
11/3/2017 3:56:...	PCM	20.00000	8/1/2017	2/1/2018	11/3/2017	30.0000	600.0000	CLIFF
11/8/2017 5:39:...	BALU	100.00000	10/2/2017	1/1/2018	11/8/2017	30.0000	3000.0000	CLIFF

Once goods (Drugs) are supplied, the details of the goods supply will be saved under this table

SYSTEM IMPLEMENTATION

In computer science, implementation is specifically categorized as the realization of a technical specification or algorithm as a program, software component through computer programming and deployment. The system runs on a number of languages and tools which make it fully responsive and dynamic. These include:

1. VISUAL BASIC: Visual Basic has gone through many phases of development since the days of BASIC that was built for DOS.. The PSEDMS was designed using Visual Basic 2010. All interfaces (GUI) are designed in visual basic(VB) and codes also written in VB 2010 code environment. What the user sees was the Graphical User Interface (GUI) which allows easy access to products and services. The GUI of the system is as a result of all the tools and languages in VB 2010.

2. SQL: Structure Query Language is database management language used to generally manage databases. Most Database Management Software (DBMS) such as Oracle, My SQL, Access, MS-Server, MS SQL Express e.t c use the Structured Query Language.

Microsoft SQL Express was used for creating and managing database in this system. MS-SQL express is a relational database system that is designed to work with multiple systems. This tool is used to manage information in the database of both small and large systems. It is an in-built DBMS in Visual Studio and works on VISUALBASIC 2010..

CODING

The system design needed to be implemented to make it a workable system. This demands the coding of design into computer understandable programming language. This is also called the programming phase in which the programmer converts the

program specifications into computer instructions, which we refer to as programs. It is an important stage where the defined procedures are transformed into control specifications by the help of computer language. As stated earlier in the abstract of this project work, codes are written in high-level language using VisualBasic.net version 2010 as Integrated Development Environment (I.D.E)

TESTING

Before actually implementing the new system into operation, a test run of the system has been done for removing the bugs, if any. It is an important phase of a successful system. After codifying the whole programs of the system, a test plan should be developed and run on a given set of test data. The output of the test run should match the expected results. Testing can be done at two stages namely:-Unit testing and system testing.

1. **Unit Testing:** The system is tested in modules before integration is done. This is important as faults are discovered before the systems complexity increases through system integration.
2. **System Testing:** The system is tested for conformity with requirements after all modules has been put together and the system as a whole is tested to authenticate that general system requirements have been met.

In the development of the System, various criterions were used as testing yardsticks of the system. These yardsticks include Graphic User Interface, usability testing, database and exception handling.

Both the black-box and white-box methods were used in the unit testing.

Program Test

When the program is coded, compiled and brought to working conditions, it was individually tested with the prepared test data. Any undesirable happening has been noted and debugged (error corrections)

Graphical User Interface Testing

The Graphical User Interface (GUI) testing involves testing the system's graphic components to ensure that it covers the entire domain i.e. the complete functionality of the system, with respect to the different modules. For example, in the testing of the System, both Sales and Supply modules were tested to ensure that they all contained fields in their respective tables and directly links to their requirements as designed with user cases in the preceding section. There also comes a stage of sequencing testing with GUI testing. This ensures that domains of requirements have an efficient follow up order, that is, users are less likely going to be confused or going to find it difficult to navigate around the system in search of how to perform some sort of operation. For example, the user can view sales record, change password, check for expired drugs and many more as shown in the figures below.

A. LOGIN FORM

The login form is tested to ensure that only authorized users can access the software. Authorize users are users registered by the admin through the ADD USER FORM.

The users can only login with the user id and password given to them by the admin, after which the password can be changed through the Change Password Form.

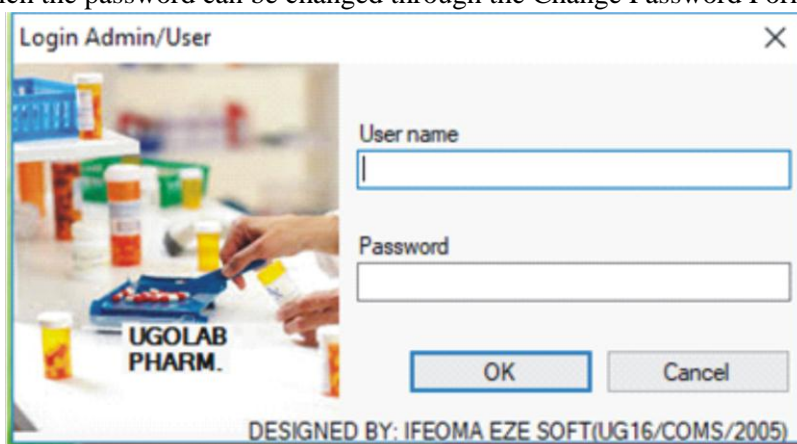


Fig.2. LOGIN FORM

B. MAIN INTERFACE

This serves as the **HOME PAGE** with links to other pages (forms) and also welcome users to the program. It contains five menu on the menu bar.



Fig. 3. MAIN FRAME

C.THE ADD MENU



Fig. 4. ADD MENU

The ADD menu has command to create a new user. When you want to give access to anybody, you add the username and password through ADD USER.

D. ADD USER FORM

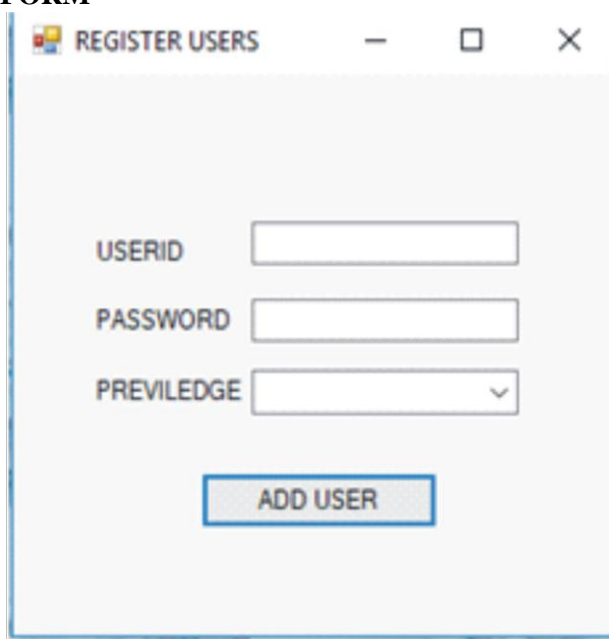


Fig. 5. ADD USER FORM

Use to authorize new access to the software

E.ADD STOCK

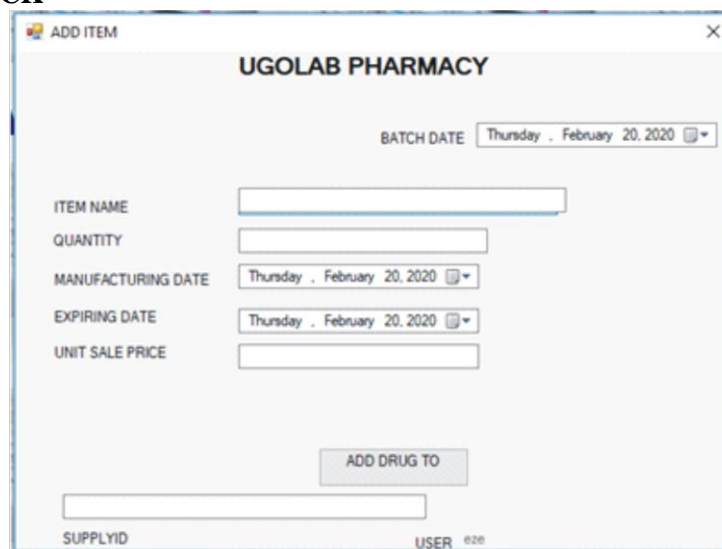
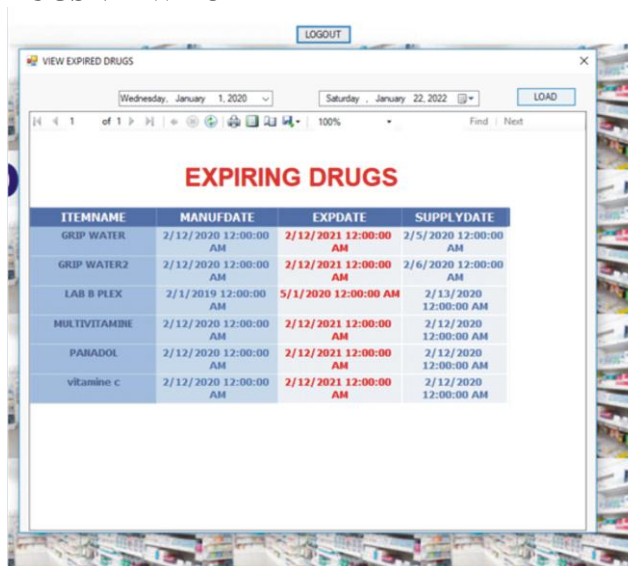


Fig.6. ADD STOCK

The ADD STOCK is used to update drugs in the ware house

F. EXPIRE DRUGS VIEW FORM



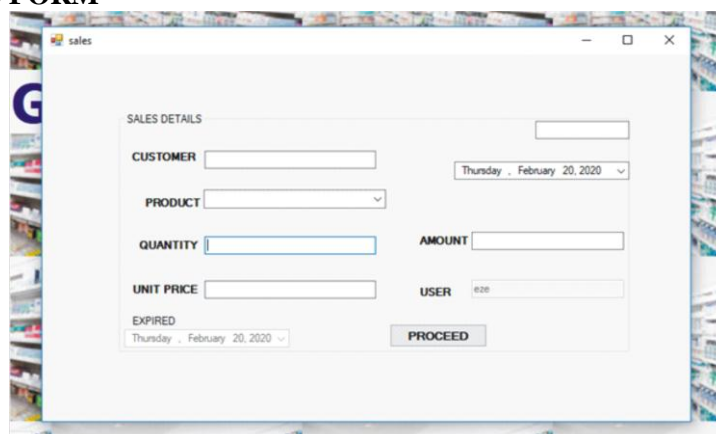
The screenshot shows a web application window titled "VIEW EXPIRED DRUGS". It features a "LOGOUT" button at the top right. Below the title bar, there are date pickers for "Wednesday, January 1, 2020" and "Saturday, January 22, 2022", along with a "LOAD" button. The main content area displays a table titled "EXPIRING DRUGS" with the following data:

ITEMNAME	MANUFDATE	EXPDATE	SUPPLYDATE
GRIP WATER	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM	2/5/2020 12:00:00 AM
GRIP WATER2	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM	2/6/2020 12:00:00 AM
LAB B PLEX	2/1/2019 12:00:00 AM	5/1/2020 12:00:00 AM	2/13/2020 12:00:00 AM
MULTIVITAMINE	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM	2/12/2020 12:00:00 AM
PARADOL	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM	2/12/2020 12:00:00 AM
Vitamine c	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM	2/12/2020 12:00:00 AM

Fig. 7. EXPIRE DRUG VIEW FORM

Expire Drug View shows all drugs and their expiring date. It can also search for drugs that will expire within a specified period. On this form all expired drugs are displayed based on current date or a specified period. The drugs and their expired dates are displayed in a tabular format

G. SALES FORM



The screenshot shows a web application window titled "sales". It contains a "SALES DETAILS" section with the following fields:

- CUSTOMER:
- PRODUCT:
- QUANTITY:
- AMOUNT:
- UNIT PRICE:
- USER:
- EXPIRED:

A "PROCEED" button is located at the bottom right of the form.

Fig.8. SALES FORM

All sales transactions are saved and tables concerned are updated through the sales form.

H. REVERSAL FORM

The screenshot shows a web-based application window titled 'LAB PHARMACY_KANO'. The main menu includes 'EXPIRED ITEM', 'SALES', 'VIEW', and 'REVERSE', with a 'LOGOUT' button in the top right. The 'SUPPLY REVERSER' form is the central focus, containing the following fields and controls:

- SUPPLYID**: A text input field with a 'SEARCH' button to its right.
- ITEM NAME**: A text input field.
- QUANTITY**: A text input field.
- MANUFACTURING DATE**: A date picker set to 'Thursday, February 20, 2020'.
- EXPIRING DATE**: A date picker set to 'Thursday, February 20, 2020'.
- SUPPLY DATE**: A date picker set to 'Thursday, February 20, 2020'.
- UNIT PRICE**: A text input field.
- TOTAL PRICE**: A text input field.
- Buttons**: 'UPDATE' and 'REVERSE' buttons at the bottom.
- User**: 'USER eze' is displayed at the bottom of the form.

Fig. 9 REVERSAL FORM

The reversal form is used to remove or delete unwanted transactions.

I. ITEMS VIEW FORM

The screenshot displays the 'ITEMS VIEW FORM' within a 'LAB PHARMACY_KANO' application. It features a search interface and a data table:

- Search Bar**: 'ENTER DRUG NAME TO SEARCH' with a search button.
- Dropdown Menu**: A list of items including 'MILK SOLUTION', 'PARACETAMOL', 'LAB 8 PLEK', 'CORONINE', 'GRIP WATER', and 'STAIN WATER'.
- Table**: A table with the following structure:

ITEMNAME	MANUFACTURING DATE	EXPIDATE
MILK SOLUTION	2/12/2020 12:00:00 AM	2/12/2021 12:00:00 AM
- Navigation**: 'ADD' and 'EXPIRED' buttons are visible on the left side.

Fig.10. ITEMS VIEW FORM

View item shows all drugs in the store and give status of anyone selected.

MAINTENANCE

It is necessary to eliminate errors in the system during its working life and to tune the system to any variations in its working environments. It has been seen that there are always some errors found in the systems that was noted and corrected. Rooms are created for ITEM update, user removal, sales reversal etc.

It also means the review of the system from time to time. The review of the system is done for knowing the full capabilities of the system and the required changes or the additional requirements.

CONCLUSION

Pharmaceutical Stock Expiring Date Monitoring System is intended to enhance the precision, upgrade security and effectiveness in the pharmaceutical company. It is a computer-network based system which encourages the Pharmacist to enhance stock administration, cost, expiry date detection, and so forth. Pharmaceutical Stock Expiring Date Monitoring System is produced to guarantee the security of data and unwavering quality of Pharmacy records while getting to and giving administrations to the clients. The data accumulated amid the information gathering was legitimately broken down and the outcomes gave the premise to the new system. The system was tried and observed to be utilitarian and the yields created by this system will be empowering. The application will subsequently lessen given out expired or about-to expire drugs.

RECOMMENDATIONS

Based on the conclusion drawn, the following recommendations were made.

- a) There must be a continuous power supply which ought to be made accessible during the time of operation of the drug store..
- b) There has to be fundamental PC information for the clients of the product. The users of the software must have the basic computer knowledge.
- c) It is suggested that the product be enhanced particularly in ranges of alarm and barcode as it will be of awesome effect to the improvement of drug stocks.
- d) A standard server system should be available to store the database while other work stations access it from any desk.
- e) It is also recommended that the software be improved, especially in areas of accounting as it will be of great impact to the development of pharmaceutical companies.

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**ENHANCING THE STANDARD OF EDUCATION THROUGH EFFECTIVE
SUPERVISION OF BASIC EDUCATION SCHOOLS IN NIGERIA
UDUAK SUNDAY ISIM
DEPARTMENT OF FOUNDATION IN EDUCATIONAL
ADMINISTRATION AND PLANNING
SCHOOL OF GENERAL EDUCATION
FCE (T), BICHI KANO STATE.**

ABSTRACT

Since the olden days, education has been described as a means of developing the society. Secondary education has since then, been of immense value to mankind. Many school certificate holders climbed to the peak of their chosen careers with only their school certificates. It prepared the youths fully for future challenges. However, basic education schools have started to decline in quality; it does not have the value it had before. The society now experience many problems arising from dwindling standards. School leavers are unable to defend the certificates they are holding. Hence, this paper examine how supervision could be used to improve the quality of education. It explores the possibility of developing a better education system in Nigeria through functional and effective supervision, of basic education schools in Nigeria.

INTRODUCTION

The Universal Basic Education (UBE) programme was introduced in 1999 by the Federal Government of Nigeria as a reform programme aimed at providing greater access to, and ensuring quality of basic education throughout Nigeria. The federal Government in Nigeria established the UBE commission in 2004 (UBEC) with an act of the National Assembly, known as "the compulsory, free, Universal Basic Education for all children of primary and junior secondary school age in the Federal Republic of Nigeria". It also stipulates penalties for parents who fail to comply with its provisions.

THE SCOPE OF THE UBE PROGRAMME

The UBE programme covers the following areas:

- i- Early childhood care development and education (ECCDE).
- ii- Six years of primary education.
- iii- Three years of junior secondary education [total 9 years].

THE AIMS OF THE UBE PROGRAMME

The following are the main aims of the UBE programme:-

- a) Ensuring an uninterrupted access to 9- year formal education by providing free, compulsory UBE for every child of school age.
- b) Reducing school dropouts and improving relevance, quality and efficiency.
- c) Acquisition of literacy, numeracy, life skills and values for lifelong education and useful living.

SUPERVISION AS A MEANS OF IMPROVING THE QUALITY OF EDUCATION IN BASIC EDUCATION

For the actualization of the objectives set for the establishment of school education system in the country, the Federal Government has authorized the Federal, state and local education authorities to set up inspectorate units to monitor what goes on in the system. These are some activities and services of the school principal, the vice principal, heads of departments, head of schools and class teachers. The supervisory work in school must involve all stakeholders in the school system so as to help to raise the quality of education. Working together in school system so as to help to raise the quality of education working together in schools will assist in developing in the students the right attitude to their studies.

In order to improve the quality of school education, both external and internal supervisors must try to facilitate the implementation of various learning programmes aimed at improving the students' learning situations. Another area worth mentioning is that the school head should try to delegate some supervisory roles to others in the school teachers or group of teachers should be put in charge of time table planning, evaluating students' attitudes and dressing habits, and so on.

SOME PROBLEMS ASSOCIATED WITH SUPERVISION IN BASIC EDUCATION SCHOOLS

Many problems facing schools today are traceable to ineffective supervision. Such problems include, lateness on the part of both the learners and the teachers, failure rate, indiscipline among the teachers and learners, e.t.c. In spite of many efforts made in the past to eradicate the problems of supervision in the country, very little success is achieved. In other words while supervision is recognized as a crucial aspect of organized education, it has received less attention than it deserves. Many have failed to realize that supervision is a cooperative problem solving process, rather than an aversive inspection for staff deficiencies.

Other problems associated with supervision in our secondary schools include, lack of time for instructional supervision, leaving the task of supervision in the hands of inexperienced officers and teachers. Others are lack of instructional materials, inability to improvise materials, financial constraints, poor communication system and lack of co-operation between the school heads and the teachers.

RECOMMENDATIONS FOR IMPROVED SUPERVISION IN SECONDARY EDUCATION

It is very necessary that if high standards and good quality of instructions are to be entrenched into our basic education school system, all the stake holders in this sector would play more active supervisory roles. For instance, the school principal should constantly organize seminars for the teachers. Other supervisors from various ministries of education should exhibit the right type of attitude in their duties.

Furthermore, supervisors and others who perform supervisory functions should devote more time to supervision in our secondary schools.

Also there should be organization and development of more supervision and academic programmes in the school. The more adequate the programmes the more adequate the level of attainment of the instructional goals and quality of education.

Such programmes include introduction of new courses, variations in subject content, use of audio visual devices, computer application, ICT techniques, e.t.c.

There is a dire need for all to pay greater attention to supervisory work and evaluation of instructional programme. There must be cooperative work, exchange of ideas, so as to improve teaching and learning situation.

CONCLUSION

Supervision of educational instructions in basic education schools is very paramount in improving the quality of education in Nigeria. If there is thorough supervision in schools, the academic achievement of students will be very high thereby guaranteeing the quality of education to that of international standard.

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USE OF MOBILE PHONE FOR DATA COLLECTION DURING TEACHING PRACTICE ASSESSMENT: PROSPECTS AND CHALLENGES

¹OLABIMITAN EMMANUEL OLUDARE,

²MUHAMMAD AMINU UMAR

AND

³YONGO JOSEPH TYOLUMUN

^{1, 2, 3}COMPUTER SCIENCE EDUCATION DEPARTMENT

SCHOOL OF SECONDARY EDUCATION (SCIENCES)

FEDERAL COLLEGE OF EDUCATION (TECH.) BICHI, KANO

ABSTRACT

Considering the ubiquitous influence of mobile phones on modern society with continuous improvement in their functionalities, and decrease in related acquisition and operating costs, it is not surprising that mobile phones have been employed in a variety of ways to aid data collection efforts around the world. This paper critically x-rays the use of Mobile Phone for Teaching Practice (TP) Data Collection and assessment, to popularize its application towards resolving ambiguous challenges in TP data analysis. It discusses quantification of effective teaching as mean for evaluating teaching practice exercise, identifies several benefits associated with use of mobile devices for data recording and transmission during Teaching practice exercise. Initial cost of designing and launching of assessment form to the database, technology specification for application software built for such purpose among other challenges were identified. Training and retraining workshop is necessary to help users understand detailed procedure of assessment and method of data transmission were advocated.

Keywords: Teaching Practice, Assessment, Mobile Data collection, NCCE

INTRODUCTION

Every profession has its own practical components; the training of lawyers, doctors, engineers, and other well-known professions make adequate provision for practical work which forms an integral part of the total training of the professions. Teaching practice exercise is the practical aspect of the teacher education programme. A sound professional preparation is necessary for successful teaching profession and teaching practice constitutes an important and indispensable component of the process involved in the adequate preparation of professional teachers.

Teaching practice has been defined by Ndagi (2014) as the exercise which those training for teaching or any education work are engaged for a specified period of time before graduation under a supervisor or supervisor guiding, directing and assessing trainee teacher. The student teacher's expectation include mastering of subject matter before going to classroom and starts to teach. It is a very important scheme which has been in existence since the introduction of education course in Teacher Training Certificates (T. T. C.), Nigeria Certificate in Education (N. C. E.), etc. These programmes make teaching practice compulsory and no candidate is awarded certificate in Education without teaching practice during training. Teaching practices is the most important element in the professional training of teachers across the

world. The importance of teaching practice in teacher education programme cannot be overemphasized. It is the crucial periods of translating the theory into practice. Teaching practice is a period during which a student teacher is assigned to a specific institution; primary or secondary school for a supervised teaching as one of the requirements for graduation and effective teaching experience. Okorie in Agusiobo and Udegbe (2018) defined teaching practice as a period that enables student teachers to learn about the actual work of the teacher in the classroom as well as out-of-class experience.


Teaching practice provides the laboratory where a student practicalizes what he/she had learnt concerning effective teaching. Teaching practice is an important factor in preparing students for future teaching assignments. According to National Teacher Institute (NTI), teaching Practice manual (Patience 2013), the general objectives of teaching practice are to enable the student teachers:

- a) Gain general experience both academic, professional, social and physical related to teaching profession.
- b) Acquire a wealth of practical experience from all staff they are likely to be in contact with through active participation in the school assigned responsibilities.
- c) Have direct contact with such significant issues as the functions and responsibilities of various categories of school, staff academic and non-academic.
- d) Develop competence in proper lesson preparation delivery and assessment.

To achieve the above objectives, the student teacher is usually required to undergo at least twelve weeks teaching practice to enable him/her to acquire the expected skills which will position him/her as a competent professional teacher.

ASSESSMENT OF TEACHING PRACTICE EXERCISE: QUANTIFICATION OF EFFECTIVE TEACHING

Quantification of effective teaching has been made possible by National Commission for Colleges of Education (NCCE). NCCE (2005) in Joy-Telu, H.E. (2016) came up with a unified assessment format for the assessment of teaching practice exercise which is now popular in teacher training institutions in Nigeria. This has helped to erase the erroneous conception that teaching cannot be effectively evaluated because of its multifaceted dimensions (i.e. the occurrence of several activities at the same time in the classroom) as a result the exact weighting to attach to different activities and competences were not uniformed.



STATE EDUCATION PLANNING AND ASSESSMENT BUREAU
P.M.B 3473, KANO

NAME OF STUDENT:.....
 MATRIC NO:..... SUBJECT:.....
 TOPIC:.....
 CLASS TAUGHT:..... TIME:..... DATE:.....
 TEACHING PRACTICE SCHOOL:.....

		MAXIMUM	MARK AWARDED	COMMENTS
1.	PREPARATION (12 MARKS) (a) Statement of objectives: State in behavioural terms (b) Comment: Logical, properly sequenced... (c) Adequacy (as reflecting facts/knowledge, values/attitude & skills) (d) Conformity of topic with scheme of work/weekly Diary	5 2 3 2		
2.	Presentation (52 Marks) (a) Introduction (Relevance) to the topic (b) Development of lesson (c) Mastery of Subject matter (d) Skillful use of chalkboard (e) Time Management skills (f) Questioning skills (g) Competence in use of instructional materials - Relevance (2) Appropriate timing (2) - Adequacy (2) Variety (2) (h) Competence in Enhancing Class Participation (i) Capacity for Effective Conclusion	5 5 10 3 3 5 8 8 5		
3.	SKILLS OF CLASS MANAGEMENT (9 MARKS) (a) Class Control (b) Class arrangement (c) Reaction of pupils reinforcement of pupils' responses	5 2 2		
4.	COMMUNICATION SKILLS (7 MARKS) (a) Clarity of Voice / Audibility (b) Appropriate use of language (Gestures, sketches etc. - As reflective of specialized subject professional skills)	2 5		
5.	EVALUATION SKILLS (10 MARKS) (a) Suitability of assessment (b) Attainment of started objectives	5 5		
6.	TEACHER'S PERSONALITY/PROFESSIONAL ATTITUDE AND VALUES (10 MARKS) (a) Neatness & Appropriate Dressing (b) Readiness Diligence/Adaptability (c) Learner-friendliness (d) Competent	3 2 2 3		
	Total Score	100		

ADDITIONAL COMMENTS:.....

 NAME AND SIGNATURE OF SUPERVISOR DATE

Figure 1: Teaching Practice Assessment Form

Experience has shown that this very crucial aspect of teacher education is being confronted with many challenges which have given various stakeholders a lot of concern. For instance, Idowu (2000) observed that the programme is beset with a multiplicity of problems and difficulties confronting student-teachers, cooperating teachers as well as the co-operating schools and the supervisors. He stressed that most of the problems are not resolved even at the end of the exercise. Some of the problems identified include psychological makeup of the trainees, pedagogical preparations, classroom adaptation, and mode and means of assessment. There seems to be controversy among the stakeholders as to what is to be done to revitalise the scheme for the general good of the beneficiaries of education enterprise. Nevertheless, to carry-out the Teaching Practice assessment using the instrument above, TP supervisor can adopt any of the two forms below.

1. Manual Method which implies recording information on printed copy of assessment instrument above using a pen. It is otherwise called Paper and Pencil data collection
2. Electronic method which implies digital method i.e. use of electronic gadget such as phones, computer etc. example is Mobile data collection

Mobile data collection (MDC) refers to the utilization of existing information technology products such as phones, smart phones, and tablets (hardware), and several different possible programs (software), for data gathering. Mobile data collection (MDC) allows businesses and organizations gathering a lot of quantitative data using mobile devices. MDC eases the collection of data by ensuring that this is directly uploaded to the platform server by the evaluators. Instead of recording information on printed paper using a pen, which is then manually entered into a database for analysis, data is input into a device and exported directly into a centralized database. Therefore, you can reduce the time, resources, and costs used in the task while improving the quality of the information collected.

OPPORTUNITIES ASSOCIATED WITH USE OF MOBILE FOR T.P. DATA COLLECTION AND ASSESSMENT

Here we will look at why choice Mobile data collection is better than traditional mode (Pen and paper data collection) Some of the benefits include:

1. **Reduced cost:** By reducing or eliminating the need for paper and shorten the time needed by field workers to collect data, you can make some cost savings. Additional savings can be made on printing costs, which can be significant based on student size and number of pages of assessment instrument (imagine the cost of a 2- page assessment form that will be required to assess 5,000 Teaching practice students). Subsequently, digital form can be updated or corrected as need arises in the collecting device used, so, the need for reprinting materials no longer applies. It also removes the need for physical forms to be brought to the office. Traditional methods often require “double data entry”, where two separate entries is done on the same data which include; data entry carry-out during the supervision exercise and data entries require during result compilation. Eliminating this redundancy adds up to significant cost reduction.
2. **Increase speed of turnaround time; it is seen as the time required by supervisor to turn in their results for necessary action.** Mobile data collection eliminates or reduces un-necessary waiting time, that is the time taken by supervisors in the same group to bring their result together for final computation. As data is entered directly into an electronic form that can be exported into a statistical package or information management system, access to data even become instantaneous thereby making data ready for whatever action needed to be taken in a significantly reduced amount of time since real-time data is instantly uploaded. From a program perspective, the faster turnaround time is significant as it allows better responsiveness to issues like prompt result computation and data analysis for immediate and future use.
3. **Data quality** Use of Mobile data collection ensure the data quality but reducing or eliminating the possibility of error at the point of collection, and in addition to that also, filter down the data. Furthermore, mobile data collection tools allow for validation of the data being entered during the exercise which reduces the

chance of inputting errors. It also improves the transparency and visibility of the data thereby reducing the risk of data leaks.

4. **Benefit of Customizability and added tools** MDC tools generally offer a wide range of customization possibilities. These include but are not limited to different types of questions (all that can be asked using pen and paper), provision of mathematical operators and functions for performing different mathematical calculations, and the addition of multimedia features such as graphics, audio, and video. Examples of these added features include the ability to use audio, graphics or video to improve data collection and using a camera function to capture a photo of a school, audio or video recording of students on practice which may be used as evidence for good performance or used as reference to motivate other students on the field.
5. **Improved control and flexibility of field work** Since Teaching practice Assessment Instrument is generated from mobile devices, assessment instrument can be updated or corrected without necessarily calling the supervisors from the field to come back for a new or corrected assessment form. It is possible to fix small issues in Instrument design such as typo errors, phrased questions, or filter logic. Also real time backend data check and verification is made possible. This method facilitates more efficient two-way communication between management and people working on the field.
6. **Benefit of Safer storage and backup** Paper can get lost, destroyed, or mishandled in many ways, which can create problems later if the data needs to be re-accessed. Digital mobile data, on the other hand, can be easily and inexpensively stored, copied, backed up, and -if needed- encrypted for secure future access. Take for instance, the data collected through mobile device in Federal College of Education(Tech.) Bichi, during Teaching Practice assessment are uploaded to Kobo database in the cloud.
7. **User friendly method:** MDC guides the supervisors through the instrument by presenting the assessment instrument item by item to ensure that all items were attended to. It helps supervisor to spend less effort in making sure that all items are scored accordingly, and thus eliminating error due to oversight which can occur during traditional Pen and paper method.
8. **Use of MDC makes researcher to have quick access to data for necessary research work** Mobile data collection tools can provide a quick response capability as data can be ready for analysis in real time. Accessing data in a timely manner also allow quick responses to adjust certain activities.

Take for instance FCE(T) BICHIKoboCollect platform contains every filled Teaching practice assessment forms domicile in its central database, accessing such data for necessary research work to determine the weakness and strength of both teachers and students involved in this activities with the possibilities of proffering solution to those issues identified

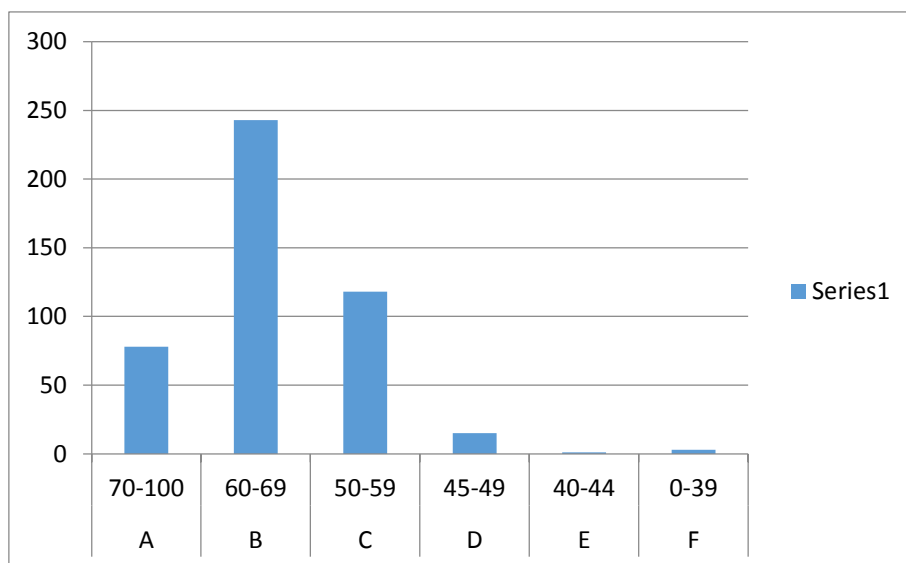


Figure 2.: FCE(T) Bichi 2018 Teaching Practice Performance Chart from Data Retrieved from College Kobo Collect Database

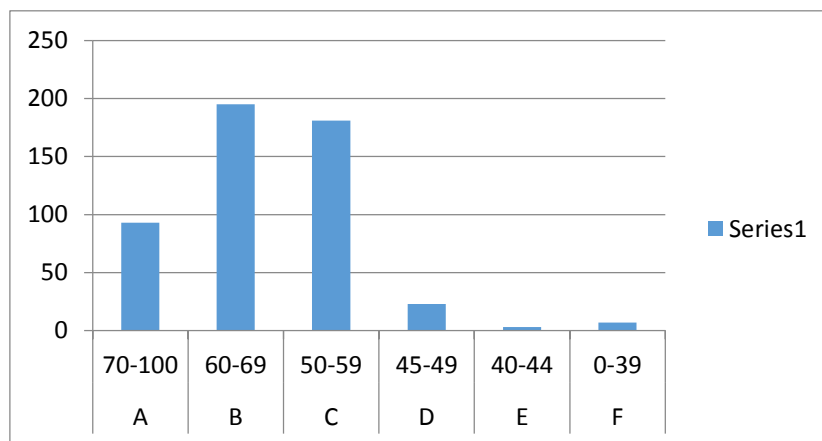


Figure 3: FCE(T) Bichi 2019 Teaching Practice Performance Chart from Data Retrieved from College Kobo Collect Database

The figure below shows the comparison of performance in teaching practice exercise of 2017/2018 and 2018/2019

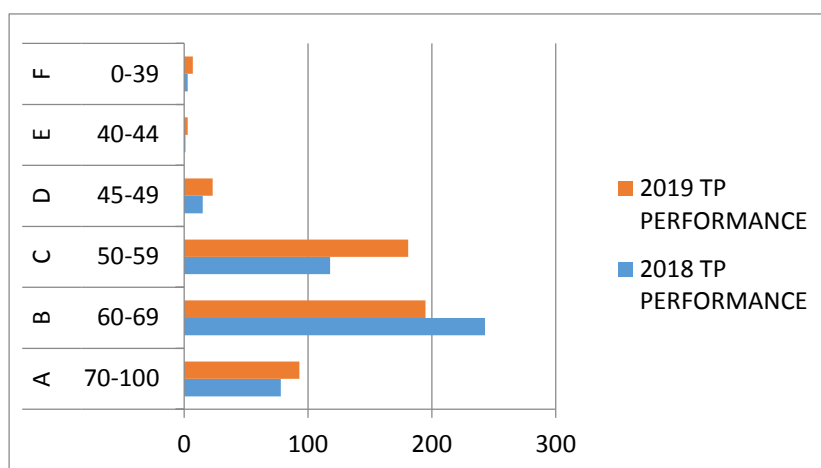


Figure4:Comparison of performance in teaching practice exercise of 2017/2018 and 2018/2019

The table shows the expected performance of TP students of 2018/2019 and the actual score obtained.

Table 1: expected performance of TP students of 2018/2019 and the actual score obtained

S/N	INSTRUMENT CATEGORIES	EXPECTED TOTAL SCORE(502 STUDENTS)	ACTUAL SCORE EARNED	SCORE EARNED %
1	PREPARATION (12)	6024	3877	64.36
2	PRESENTATION (44)	22088	13072	59.18
3	CLASSROOM MANAGEMENT (13)	6526	3874	59.36
4	COMMUNICATION SKILLS (7)	3514	2070	58.91
5	EVALUATION (8)	4016	2265	56.40
6	TEACHER'S PERSONALITY (10)	5020	3649	72.69
7	REFLECTIVE JOURNAL (6)	3012	1744	57.90

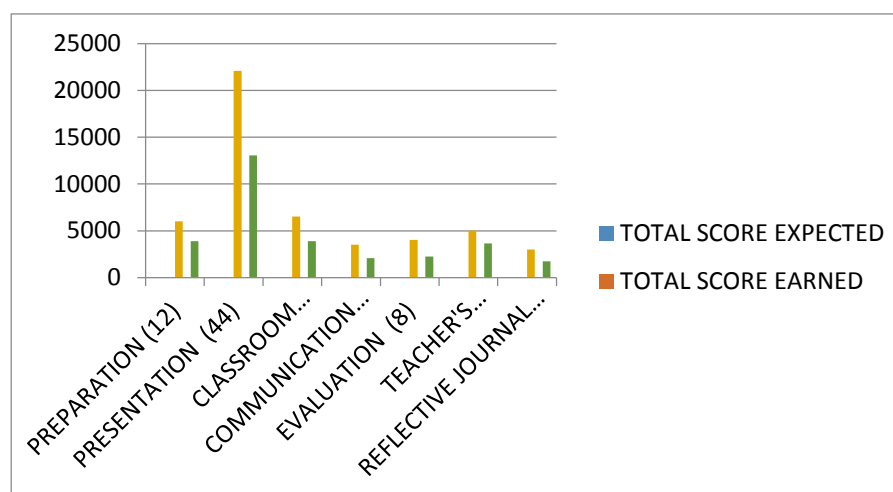


Figure 5: Comparison of expected performance of TP students and the actual score obtained in 2017/2018 and 2018/2019.

9. **Reduced environmental impact** Paper surveys are not environmentally friendly. A simple survey can waste thousands of gallons of fuel, hundreds of thousands of gallons of water, and up to twelve trees.
10. **Data Monitoring:** the utilization of Geographical Point System (GPS) technology of in MDC can record GPS coordinates during data collection which offer the monitoring team an opportunity for remote verification of field data.

To sum it up, Mobile data collection tools offer many exciting and innovative possibilities for improving the quality of Teaching Practice assessment. It enables cheaper and quicker access to a better quality of analyzable data than traditional methods and it allows increased responsiveness to needs arising in the field.

ISSUES AND CHALLENGES ASSOCIATED WITH THE USE OF MOBILE DATA COLLECTION

While data collection via mobile phones may offer advantages when compared with traditional survey and data collection efforts, this is not to imply that such efforts are not without challenges or difficulties. Some common notable issues and challenges include those related to providing examples of concerns that organizations often raise about using MDC, or as reasons not to, as well as effective tips to address them:

1. **Technology specification:** As per what technology should we use? What are the minimally viable specifications required for the devices used in mobile data collection efforts? What software applications are available, and what are their related advantages and disadvantages? Take for instance, the technology specification for Kobo collect for our Teaching practice assessment is Android phone and tablet which implies that any intending Teaching practice supervisor who does not have any of these specified technologies would need to make

provision for a new one for this purpose. This may force people into technology related decision as per the technology for the service of higher order goals versus on-the-ground realities.

2. **Cost:** Start up or initial investment may be too expensive. The costs of designing assessment instruments delivered digitally may be considerably higher when constructing traditional paper-based instrument. In addition, new back-end technology infrastructure may need to be procured and put into place. Where it is not possible for supervisors to utilize their personal phones (whether because such use is not customary or permitted, because existing phones have insufficient functionality or because mechanisms for covering or reimbursing related data transmission costs are not in place), devices may need to be purchased and distributed (and potentially collected once they have served their purpose). Airtime may need to be purchased. (More than a few data collection efforts by mobile phone to ‘benefit charities’ have foundered because sponsoring groups have wrongly assumed that mobile operators would be quick to donate free airtime ‘for a good cause’). Whether or not these costs in aggregate are cheaper than the way things are traditionally done or not – and they often are! – sponsoring groups may have difficulty estimating and budgeting for such costs on the front end, especially the first time they engage in efforts of this sort.
3. **Electronic devices are unreliable:** Devices operate on batteries that run out. If peradventure on way to school or class to carry about assessment exercise, it may fall out of hand to the ground and can break or develop fault, Software may freeze. These are among the common concerns that people may have regarding MDC devices.
4. One of the main limitations of the mobile devices is the difficulty with which text can be typed in, as its keyboards commonly lack 10-finger typing functionality and systems are not amenable to making side notes as most of instrument item may require long comment which may be difficult especially for those who are not use to typing functionality. For these reasons, MDC tools do not currently extend well to qualitative methods, where large amounts of open text need to be gathered. In such projects, the ability to make quick notes with pen and paper still tends to be more efficient and effective.
5. **Training:** It requires Training: Training and explicit instruction may be required, Even though, the tool being used (a mobile phone) is familiar to respondents, in some circumstances additional technology-related training and support may still be required, for example, if an interface is easy to understand, users may not need to spend much time figuring it out. In other words, depending on the nature /procedure of the assessment and the methods of data transmission, additional training may well be required.

CONCLUSION

The experience of many researchers with a large-scale baseline survey indicates that the real-time quality control as well as data collector supervision, enabled by the use of a mobile Phone based survey system makes it a more attractive management option compared to a paper based approach.(Tomlinson, Solomon et al. 2009) This mobile Phone option has the potential to be scaled up in an extensive way for teams

and studies of almost any size. The benefits of mobile technology, combined with the improvement it offers over the manual methods in terms of data loss and uploading difficulties, make mobile phones a feasible method of data collection that needs to be further explored. Rigorous controlled trials comparing data accuracy, readability, reliability, and validity checks comparing paper-based approaches, mobile phones are needed.

RECOMMENDATIONS

- a) Even though the initial investment on equipment seem to be expensive, but the equipment may be reused for multiple rounds of data collection and also reused for many years/sessions for which the teaching practice exercise is required.
- b) On issue of low battery and other concerns can be addressed relatively easily in the preparation phase. If electricity is an issue, choose long-lasting battery hardware, take extra batteries, (like power bank) and plan places where recharging can be done. Devices do break from time to time, so take an extra device with you just in case. If you are operating a phone, buy shock absorbing cases. Software may cause concerns from time to time, but as long as the programming phase of the project is handled correctly, these issues are generally minimal.
- c) Training and retraining workshop should be encourage especially towards the commencement of teaching practice exercise to train new member of staff and refresh the older staff for the task
- d) Since Mobile Data collection gives access to poll of student data, we encourage staff to go into research work to proffer solutions to different problems surrounding teaching practice exercise. Especially on yearly bases the Micro teaching unit are supposed to be getting feedback as regard to the performance of the students, this will guide them to identify and work more on area weakness
- e) We recommend the use of MDC to all Teaching practice supervisor, for it will go a long way to eliminate the waiting time for submission of final result from individual Teaching Practice supervisor. If all supervisors are compelled to use the KoboCollect, all results will be ready right from the day of supervision as soon as the supervisor upload the filled form

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TEACHER EDUCATION REFORMS: PROSPECTS AND CHALLENGES IN NIGERIA EDUCATION PROGRAMME
MICHAEL, ONUH EMMANUEL
DEPARTMENT OF ACCOUNTING EDUCATION
SCHOOL OF SECONDARY EDUCATION (BUSINESS)
FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

ABSTRACT

Although teacher education, both pre and in-service programs are offered in Nigeria by different teacher education institutions (as provided in the National Policy on Education), and varying degree of success have been recorded, various problems still confront the program with far reaching consequences in Nigeria's educational system. This papers emphasis on the need for teacher education, the ideal teacher education, the teacher education and the national development, analyses the historical contexts of the teacher education reforms and development in Nigeria with a special attention on the roles of the Christian Missions, the colonial administration and that of Nigerian government after independence. It examines key recommendations of two (2) commissions (Phelps Stokes and Ashby) and their implications to the reforms and development of teacher education in Nigeria both during colonial era and after independence. The paper further discusses the influence of these and other reforms in shaping teacher education in Nigeria, the challenges still facing it, and finally suggested some recommendations and holistic approach to improve teacher education in Nigeria.

Keywords: Teacher Education, Reforms, Development, Challenges, Prospects, Pre-service and in-Service

INTRODUCTION

Teacher education can be referred to as professional education of teachers towards attainment of attitudes, skill and knowledge considered desirable so as to make them efficient and effective in their work, in accordance with the need of a given society at any point in time. It includes training and /or education occurring before commencement of service (pre – service) and during service (in – service or on-the-job). Every society requires adequate human and material resources to improve its social organization, preserve the culture, enhance economic development and reform the political structures. Education is often seen as pre-requisite for quality manpower development and creation of wealth, a sure path to success in life and service to humanity. Thus, teachers have important role to play to adequately prepare the young for their roles in the society in order to achieve the set national objectives as stipulated in the National Policy on Education (FME, 2013).

Education is inevitable tool for sustainable development and a vehicle for advancing the frontiers of knowledge (Abdul-Kareem, 2001). In this regard, education is severally conceived and inculcated by people of varying backgrounds, ages, needs and aspirations for sustainable development. The potency of education is more evident in its globalization trends imbued with instrumental values of nurturing productive citizens for sustainable development and democracy. Education has been

recognized as a process of imparting knowledge, skills and attitudes of the learners. Teachers' influence is always felt in every aspect of the society. The effectiveness of any educational system depends greatly on the educational system depends greatly on the educational attainment of teachers because on system of education can be qualitatively higher than the quality and commitment of its teachers.

Ukeje, (1996) supported this fact when he stated that education unlock the door to modernization, and added that it is the teachers who hold the key to that door. (Afe, 1992), states that the realization of educational objectives depends on the quality and quantity of the available teaching manpower. This can be influence by the availability of adequate training and retraining programmes for those about to teach and those already teaching respectively. Hence, the efficiency of teacher training should be the main determining factor in the success or failure of education to meet the country's needs. The training is the policies and procedures designed to equip prospective teachers with the knowledge, attitudes and skills they require to perform their tasks effectively in the classroom, school and wider community. Education is the most powerful instrument for social and economic progress. It is the greatest power known to man for his or her own improvements. Teachers are the heart and soul of the educational enterprises, indeed, the life of the school system depends on them.

Teachers belong to the profession which has the only potential of determining the social, economic, political and moral destiny of every Nigerian citizen. This fact underscores the necessity for teacher education to be perceived as a sacred duty that must never be toyed with if teaching must fulfill its divine professional mandate of cultivating generations of highly responsible disciplined and useful Nigerians. Teacher education should also be regarded as the bedrock for national development. Talabi, (1983), Bofarin (1986) and Afel (1995) stated that the major problems facing the nation have been that of getting quality teachers. For teacher quality to rise above educational system, a strong teacher education programme is required. This paper examines teacher education, the ideal teacher education, teacher education and national development, reviews the historical development of teacher education in Nigeria, and further shades light on teacher education reforms as undertaken by Phelp-Stroke and Ashby commissions. Nigeria regional governments, as well as the post-independence efforts. Subsequently, the paper identifies and discusses the current challenges facing the teacher education in the country and proffer suggestions towards improving the system.

AN OVERVIEW OF HISTORY OF TEACHER EDUCATION IN PRE-COLONIAL NIGERIA

The origin and development of formal teacher education in the area that became Nigeria can be traced to the beginning of the western education in the pre-colonial Nigeria. The various church missions such as the Wesleyan Methodist, the Church Missionary Society, the Baptist, the Church of Scotland (Presbyterian) and the Roman Catholic were not the pioneers, but very active in the area between 1842 and 1860. Certainly, they contributed in no small measure to the development of teacher education in pre-colonial Nigeria. According to Ajayi, (1965), the missionary devoted the time and attention initially to the development of elementary (Primary) education in the country, perhaps due to little stipends the mission relied upon from their

overseas headquarters, or as some Africans scholars have argued, to further the imperialist design to limit colonial education to the basics, with the intention to produce educated Africans who (inadvertently) would participate in furthering imperial exploitation only. Discussing the system of education, Adeyika, (1971) opines that the missionaries trained their teachers through the apprenticeship pupil-teacher system. In such a system, the missionary teacher organized the school in his residence premises and some of his pupils lived with him as part of his family. Fajana, (1970) added that at about 14 years, pupils ought to have written and passed the “Standard V Examination”. They were then recruited as a teachers, but further received one hour instruction daily from the head teacher of teaching methodology. The duration of the course was two years, after which they would sit for the pupil-teacher examination. Besides being the foundation of teacher education, the significance of this system was that it enabled the student-teachers to receive further training and education while contributing their quota in the formal education needs of the society through teaching other pupils. From this humble beginning, the system has developed into a more complex one involving college institutions and universities. The first teacher training college, known as the Training Institution was later moved to Lagos 1896 after the missionaries were expelled from Abeokuta due to some disagreement between the missionaries and the local population/authorities most of whom were not very receptive to the new religion and the form of education being introduced by the missionaries. Perhaps, the preponderance of British presence and security assurances in Lagos influenced the decision to relocate to Lagos. Subsequently, it was again located to Oyo where it became known as St. Andrews College, Oyo. Later, in 1896, it was established as a Grade II Teachers College (Now Emmanuel Alayande College of Education, Oyo) it ranks the oldest teachers Training College in Nigerian. In 1897, the Baptist Mission established the Baptist Training College at Ogbomosho, and in 1905, the Wesleyan Methodist Missionary Society founded an institution for the training of catechists and teachers in Ibadan. The later opened with only four pupils, but the numbers of pupils increased to twenty by 1918 when the institution became known as the Wesleyan College, Ibadan.

THE CONCEPT OF TEACHER EDUCATION

Teacher education consist of policies and procedure designed to equip prospective teachers with the knowledge, attitudes, behaviour and skills they required to perform their task effectively in the classroom, school, churches and the local wider society. Ideally, it should be conceived of as an organized seamless continuum. Teacher education is often divided into three (3) stages:

1. Initial teacher training (teacher candidates)
2. Induction (the process of providing training and support during the first few year of teaching or the first year in a particular school).
3. Teacher development or Continuous Professional Development (CPD) (an intensive process for practicing teachers).

THE IDEAL TEACHER EDUCATION

According to Adewuyi & Ogunwuyi (2002), opined that teacher education is the provision of professional education and specialized training within a specified period

for the preparation of individuals who intends to develop and nurture the young ones into responsible and productive citizens. It is performed by the fact that teaching is an all-purpose profession which stimulates the development of mental, physical and emotional power of students. Such education citizens would be sensitive and equipped with peaceful co-existence, environmental management and democratic process.

The heartbeat of manpower development and training for prudent use and sustenance of resources in nation building is teacher education. Teacher education, being inextricably linked with general education and social goals, is constantly caught up in the series of dilemmas derivable from educational expansion, political, technological development and social changes.

The prevailing crisis in Nigerian education and its society as typified by unemployment, poverty, corruption, crime, indiscipline and underutilization of capacitor in all facets of human life and national development, could be ascribed to the neglect of teacher education and pitiable plight of the teachers. All these conflict relationships precipitated poverty-induced hardship across all segments of the Nigerian community. What structurally becomes important in achieving the nation's quest for self-reliant society, imbued with vibrant economy and productive citizenry, is to put in place a comprehensive teacher education programme (Adewuyi, 2012). Ogunwuyi, (2010) contend that education should be globally adopted as an agent of change and stability to promote probity, equity and equality of opportunities and a launching pad for sustainable human development. Herein, teacher education should embrace and radiate the energizing forces of change backed up purposefully by democratic leadership and rational economic policies. This provides the basis for sustainable development and environment which largely facilitate harmonious creation of wealth and well-being of humanity.

The importance of education as a weapon ignorance, conflict, disease and poverty demands coherent information processing systems anchored on manipulative skills which helps to coordinate and transform conceptual ideas, emotion and feeling in life supporting operations beyond the school setting. Herein, a sufficiently educated and enlightened population is a quality assurance for individual and social productivity, responsible leadership and prosperous future. A general desire to be educated in spite of the stagnation of opportunities and incentives as well as disenchantment among the teachers at all levels requires a well conceptualizes humanistic approach to teacher education programme.

A coherent teacher education programme should systematically embrace integrated curriculum innovations which reflect the social, economic and political environment of a modern society to solve societal problems. Oyekan, (2006) states that the purpose of the teacher education is to produce highly qualified professional teachers that can adjust to the changing needs of the students and developmental prospects of the modern society and nation.

A BRIEF ON THE PHELPS-STROKES COMMISSION'S REPORT OF 1925

After the investigations and reviews done by the commission, the report severely criticized the teacher training system of the Christian Missions. According to the reports, the teacher training system was unsatisfactory, the pupil-teachers were over-

worked and under-paid, and the curriculum was poorly conceived. According to Fafunwa, (1974), the supervisory system was inadequate and it seemed that the missions were not adequately prepared for the task of training African teachers. In order to re-orientate and re-organize the teacher education system along the lines suggestion by the report, and the problems of teacher education in the colony, two types of teacher-training institutions were recommended, namely:

- (a.) The Elementary Training College (ETC); for lower primary school teachers, and
- (b.) The Higher Elementary Training College (HETC); for higher primary school teachers

Both the ETC and the HETC programs lasted for two years each and culminated in the award of Grade III and II Teacher's Certificates respectively. Any candidate willing to go for ETC courses leading to the Grade III certificate had to teach again for at least two years before proceeding to the HETC for the two-year Grade II program. This signifies a radical departure from the system adopted by the Christian Missions as it represents a more standard approach towards teacher education, training and development. However the need for further reforms gave rise to the Ashby's Commission.

THE ASHBY COMMISSION AND DEVELOPMENT OF TEACHER EDUCATION IN NIGERIA

In 1959, Nigeria's federal government set up the Sir Eric Ashby Commission to investigate and determine the extent of manpower needs of the country especially within the education sector, with an eye on the future. After its work, the Ashby report prescribed that education was indeed the tool for achieving national economic expansion and the social emancipation of the individual (Urwick & Aliyu, 2003). It recommended the establishment of four Federal Universities in the country, and also the introduction of some education-vital courses in them. Subsequently, five universities (instead of the recommended four) were established, viz: University of Nsukka (1960), Ahmadu Bello University, Zaria (1962), University of Ile-Ife (1962), University of Lagos, Lagos (1962) and University of Ibadan, first established as University College, Ibadan in 1948. A decade later, further demand for manpower compelled the country to establish the University of Benin (1972).

The implementation of the Ashby commission's report not only led to the establishment of university and introduction of course, but also birthed new degrees. In other words, before the Commission's report, Bachelor of Arts in Education {B.A (Ed.)} or Bachelor of Sciences in Education {B.S.c. (Ed.)} or Bachelor of Education (B.Ed.), were not awarded by Nigerian Universities. Graduates of degree awarding institutions earned Bachelor in Arts or Sciences (i.e. B.A., or B.Sc., etc. degrees). Also some of the institutions ran programmes leading to the award of Post-Graduate Diploma in Education (PGDE), sometimes as affiliates of the University of London (Fafunwa, 1974). Reporting on the state of facilities for post-secondary education in Nigeria, the Ashby Commission observed that there was a gravely inadequate supply of trained and educated teachers in Nigerian Secondary Schools, as opposed to the increased in demand for more of this category of education institutions. In view of the need to reconcile this contradiction, particularly as regards teacher education, the Ashby Commission, among others, put forward these relevant recommendations;

- i. The training of more teachers for the nation's post-secondary schools.
- ii. The establishment of more universities
- iii. The introduction of a bachelor's degree in education, {i.e. B.A (Ed.), B.Sc. (Ed.), or B.Ed.}

The Commission further recommended teacher education program at the university level, observing that the new crop of Grade I teachers popularly referred to as well-qualified non-graduate teachers should be further trained at the university levels to man the secondary schools and teacher-training colleges. The commission therefore, recommended the introduction of a Bachelor of Arts/Science degree in Education {B.A (Ed.)/B.S., (Ed)} in all Nigerian universities. The B.A. (Ed.) and B.Sc. (Ed.) according to (Fafunwa, 1974) was lunched at the university of Nigeria, Nsukka in September 1961 with 50 students.

The University of Ibadan followed in 1963, Ahmadu Bello University in 1964, the University of Lagos in 1965 and the University of Ife (Now Obfemi Awolowo University) Ile-Ife, 1967.

From the forgoing, it is evident that the Ashby commission played a part in the development of teacher education in Nigeria. In fact, one major significant event in the development of teacher education in Nigeria was the transformation effect of the recommendations and subsequent implementation of the Ashby Commission's Report.

REGIONALIZATION AND TEACHER EDUCATION IN COLONIAL NIGERIA

The 1964 Richard's constitution divided the country into three regions – East, West and North and each has regional assembly. Politically, the regions were dominated by three political parties; National Convention of Nigerian Citizens (NCNC), in the East, Action Group (AG) in the Western and the Northern People's Congress (NPC) in the North respectively. Subsequently, the 1951 Macpherson constitution further strengthened the regional system and particularly empowered each region to pass laws on selected areas including education. Given this scenario, the regional system in colonial Nigeria set the stage for intensive political rivalry and also in the provision of social services particularly education in the regions. For the colonial Nigeria Western and Eastern regional governments, Western education was a major priority because, while the Western regional government embarks on free universal primary education (UPE) in 1955, the Eastern regional government and Lagos municipal government followed suit in 1957. On the other hand, the northern regional government did not embark on the free UPE until the projects was lunched nationwide in September 1976. This delay in the implementation of free UPE programs in the 1950s gave rise to crash programmes for massive production of trained teachers particularly in the Western region. New teachers training colleges were founded while some of the old ones were expanded to meet increasing demand for teachers. More so, in 1957 the University of Ibadan introduced a one year course for graduates leading to the award of diploma certificate in education, and 1961, the University started a one year associate ship course for selected Grade II teachers who would take over the headship of primary schools after the successful completion of their studies (Fafunwa, 1974), Furthermore, the Ashby commission's

recommendation for teacher's Grade I college was modified by the federal government to give rise to a new program, the successful completion of which earned a giving candidate the Nigeria Certificate in Education (NCE). This program was meant for the training and preparation of teachers for the junior secondary school and the teachers training college in the country. The school were these new program which were popularly called Advanced Teacher's Colleges (ATCs). The ATCs were established in parts of Nigerian in the 1960s for example in Lagos and Zaria in 1962 (but transferred to Ondo State where it became Adeyemi College of Education) others were established at Owerri in 1963, Kano 1964 and Abraka 1968 (Taiwo, 1986 in Jekayinfa, 2000). Admission into these ATCs were opened to candidates who will had either the teacher grade certificate and passed two subjects at the ordinary level of General Certificate of Education (GCE) examination or West African School Certificate (W.A.S.C) examination with credit passes in at least two subjects, all those with GCE in (O' level) with credit passes in five subjects including English Language. Beside admission criteria, NCE graduation requirement was such that a candidate must passed a final examination in two science or two art subjects, education and practical teaching, and must have passed ancillary subjects like General English, Library Work, Health And Physical Education, offered during the program (Taiwo, 1986 in Jekayinfa, 2000).

TEACHER EDUCATION IN POST-INDEPENDENCE NIGERIA

Nigeria got her independence from British imperialist in October 1960. The young nation experienced an unfortunate civil war between 1967 and 1970 which had derived effects on her socio-economic development and consequently her educational system. The experience of the civil war and the aftermath however rekindled the Nigeria faith in education as a major vehicle for national rehabilitation, reconstruction and reconciliation. The National Curriculum Conference (NCC) document of 1969 spelt out the objectives and contents of all levels of education, including teacher education in Nigeria. The NCC provided the basis for the National Policy on Education (NPE) of the (Federal Republic Of Nigeria, 1977) which was later revised in 1981, opening a new chapter in the development of teacher training programs in Nigeria. Because it signified a period when Nigeria indigenou administration undertook educational reforms without any form of missionary or colonial inputs. It introduced the 6-3-3-4 system in which a six – year primary education was followed by a three-year junior secondary school education and a three –year senior secondary education, before successful candidates would advance to (mostly) a four-year tertiary education in prescribed higher institution of learning. (Adeyinka, 1993) observed that with the introduction of the 6-3-3-4 education system, the need for a new orientation for secondary teachers and students arose. This is particularly as it concerned the challenge of new curriculum and acquisition of the basic knowledge. For the teachers, the skill to teach the new curriculum was also deficient requiring some training. To confront these challenges, NPE also provided that all teachers in the nation's educational system and institutions, from pre-primary university, would be professionally trained. The implication of this is more Grade II teachers' colleges and more tertiary institutions of educational training would be established for the training these teachers. In effect, after 1977, the Nigerian government embarked on

the expansion of education facilities and institution with considerable emphasis on tertiary institutions for the training of secondary schools' teachers in order to ensure the teacher education objectives are realized. According to Adeyinka (1988), certain categories of educational institutions that came on board were charged with the responsibility of giving the required professional training for teachers. These are Grade II Teachers Colleges, Advanced Teachers Colleges. Colleges of Education, Institutes of Education, and National Teachers' Institute. The rise of these institutions certainly contributed in confronting the challenges to an appreciable extent. In addition, prior to the emergence of these institutions, the Nigerian Federal Government had, in preparation for the Universal Primary Education (UPE), approved emergency teacher training programmes which began in September, 1974. This was meant to produce estimated 163,000 additional teachers that will feed the rising demand in the education sector within the framework of the UPE scheme (Adeyinka, 1988). To obtain this large number of different categories of school leavers, viz;

- (a) One – year course for holders of West African School Certificate (WASC)
- (b) Two – year course for those who attempted WASC and failed or those with Grade III Teachers Certificate.
- (c) Three – year course for holders of Modern III Certificate or S-75 Certificate (i.e) recognized Secondary Class IV Certificate).
- (d) Five – year course of holders of Primary School Certificate.

Unlike the civilian administration in pre-civil war era which adopted some form of decentralization, Nigeria's military administration in the immediate post-civil war period were favorably disposed to centralized administration. In effect it launched the UPE nationwide in 1976, giving rise to unprecedented growth in school enrollment not only in the primary schools but also at the secondary and tertiary levels. This development, coupled with Nigeria's increasing population, brought more pressure on the demand for more teachers and, correspondingly the demand for teacher education became even enormous. The federal military government took over the financial responsibility for all Grade III Teachers' colleges in the federation as part of the efforts to reposition the UPE program for efficiency. In addition, the government awarded bursaries to all pre-service teachers in the colleges of education and universities in order to support their studies, research and educational development generally. More so, it founded more teacher training institutions with diversified programs and encouraged universities to expand their teacher education programs, in a bid to provide a holistic approach to the challenge posed by deficits in qualified teachers.

TEACHER EDUCATION AND NATIONAL DEVELOPMENT

According to Ukeje, (1988) in Wanekezi, Okoli and Mezieobi, (2011), pointed out that education unlock the door for modernization and sustainable development but that, it is Council Act, began in 2007 with the mandatory registration of all professional and qualified teachers. This action is equally matched with comprehensive training and in-service training through seminars and workshop in the six geopolitical zones of Nigeria. More importantly, the TRCN has begun implementation of the NPE provision that all teachers in educational institutions

including Universities shall be professionally trained(NPE Section 8(b) paragraph 72, 2004). This was in bid to ensure adequate supply of manpower in Nigerian schools in conformity with the goals of teacher education as specified in section 8(b) of (NPE, 2004), paragraph 70 -79, the (NAP, 2006) and the 10 years Strategic Plan, among others. While the goals of strategic plan are design a teacher education framework, based on what teachers should know and do relative to Nigeria's new vision and mission, the (National Policy on Education, 2004 in Makoju, G.A.E. et al 2005 p. 166); highlights the thrust of the ongoing reform noting that it aims to: produced highly motivated, conscientious and efficient classroom teachers for all levels of education system which also;

- a) Encourage further the spirit of enquiry in creativity in teachers;
- b) Help teachers to fit into the social life of the community and the society at large enhance their commitment national goals;
- c) Enhance teachers' commitment to the teaching profession; and
- d) Provide the teachers with intellectual and professional background adequate for their assignment and make them adaptable to changing situations.
- e) It is significant and noteworthy that these approaches that all these immensely towards addressing teacher education challenges through training and retraining, instructional material development and availability, periodic renewal of teacher license capacity building for reformed inspectorate services, support to the TRCN's mandate and enhancement of teachers' status and incentive.

Today, teacher education is much improved than it was before and a few decades after independence. The NPE, released in 1977 and revised in 1981, 1998 and 2004 clearly articulates the importance attached to teacher education and affirms that no education system can rise above the quality of its teachers. The policy makes it mandatory for all teachers in Nigeria to be trained and stipulates NCE as the minimum qualification for the profession. It also provides that teacher education shall continue to take cognizance of changes in methodology and in the curriculum, even as it underscores the need for teachers to be regularly exposed to innovations in their profession. It further recognizes the need for in-service training as an integral part of continuing teacher education. Today, the statutory responsibility for teacher education in Nigeria is vested in Colleges of Education, Institute of Education, Polytechnics, National Teachers Institute (NTI) and Nigeria Universities' Faculties of Education, Nigeria Polytechnics and Colleges of Education award the NCE which is a sub-degree but professional teachers are expected to at least, have diploma obtainable after three years of full-time study. The admission requirement for the NCE programme in Senior Secondary School Certificate (SSSC) or its equivalent with passes in five subjects including English Language and Mathematics, and the curriculum for NCE teachers is designed to produce teachers exposed to a range of courses covering all that is required to make the competent professionals. New courses such Computer Education, Mathematics and General English have been made compulsory for all NCE students.

CHALLENGES FACING TEACHER EDUCATION IN NIGERIA

In spite of the various recommendations and reforms that targeted repositioning teacher education in the country for optimal performance, the challenges facing teacher education in Nigeria are still numerous. While some of these emerged with the changing socio-economic and political condition of the time, others evolved as a result of government neglect of the education sector especially as it concerns keeping pace with emerging realities, such as servicing Nigeria's growing population, education demand and needs with matching supply of education services and facilities. Some of these challenges are specifically examined as follows:

- a) **Poor Policy Implementation:** Poor policy implementation is a challenge to quality delivery of teacher's education. The poor quality delivery is responsible for the abysmal low performance of teachers' graduates from the various institutions of higher learning in Nigeria. Adeyinka, (1994) argued that our policies are written by knowledgeable writers who have foresight and believe strongly in what they write for the future but the problem comes when it comes to translating theory into practice by implementers. However, several factors could be added as inhibitors to smooth implementation of educational policies and thereby resulting to poor quality delivery. Such as government underfunding of education and injudicious utilization of available funds by implementation agencies:
- b) **Poor Conditions of Service and Brain Drain Syndromes:** In Nigeria, Teacher's conditions of services do not hold enough incentives to attract to the teaching profession, and by extension the resultant dwindling enrolment in the teacher education programs, those who remain in the profession maintain relatively low social status with accompanying psychological problems. Consequently, within the remaining pool, some teachers either seek opportunities in other sectors (within the economy) or even migrate to other countries where teachers' conditions of service are much better, in search of greener pastures.
- c) **Quality Assurance and Internal Efficiency Issue:** The academic and emotional qualities of intending candidates for teacher education are critical for quality assurance and internal efficiency in teaching professions. In Nigeria tertiary schools, a trend has emerged where those that have been either denied admission in their first choice areas of study, or are basically unqualified for admission into such popular professional courses such as Medicine, Law, Engineering, Architecture etc. The usual shortage of applicants seeking admission into programs that would prepare them as teachers in universities and colleges is a pointer to why admission and placement in education programs is not as rigorous as it is in other programs earlier named.
- d) **Insufficient Knowledge and Use of Information Communication Technology (ICT):** Another major challenge to teacher education in Nigeria is that of insufficient knowledge and use of ICT in a globalizing world. The knowledge and use of Computer Technology as well as the internet as a necessity for all teachers to guarantee the relevance of the system and its products in the 21st Century. Many schools in Nigeria still operate the traditional education system with little or no adaptation to ICT.
- e) **Non-Professionalization of Teaching:** Some teachers in Nigeria have not measured up to the minimum international standard. This is because a large

number of untrained and half-baked personnel are still retained in the system, leading to a scenario in which career in teaching is not yet professionalize. Many unqualified teachers are still in the employment of some States Teaching Services Boards, while most higher education lecturers are yet to undergo training in education.

THE PROSPECT OF TEACHER EDUCATION

Despite the above challenging confronting teacher education, with task and determination, teacher education can still be salvage from the its apparent impending collapse. The poor quality of teachers produced could result from lack of qualified teachers to teach learners. The poor implementation and interpretation of syllable and lack of dedication to duty can bring about wrong teaching poor quality teachers produced. Taiwo (1980 and Joshua (1997) all agreed that instructional delivery personnel should possess certain minimum levels of competence in their chosen fields guarantee that the graduates of such programme are properly taught and endowed with appropriate skills for the labour market. Adequate funding by the government to teacher training institution will enhance adequate provision of funds for manpower development, good environment, and effective supervision of teacher training programme.

CONCLUSION

In Nigeria, like many other developing countries in the world, teaching is the most vital, crucial strategic profession for national development. This is so because teaching is that important activity which makes possible the acquisition of knowledge and skills that brings about the mark of an educated and useful person in the society. Education remains a single major factor for national development. This paper also reviewed the challenges and prospects of teacher education in Nigeria educational system and their resultant effects on the quality of and quantity of teacher education. To be effective teacher, it requires hard work, intelligence, skills and ability to impart knowledge and ideas that will help in the shaping the behavior or pupils and students toward achieving the goals of teacher education and Nigeria educational system.

RECOMMENDATIONS

- 1. Redefine Teaching as a High Level Profession:** Rethink the content of teacher education to attain teacher quality: the way in which practicing teachers learn depends on many factors – culture and tradition, existing institutions, systemic characteristics, etc. specific needs (education aims processes that are already in-place, developing these skills and to understand the in depth context of the schools in which they teach.
- 2. A More Coherent Educational System should be Designed:** Teacher education as a continuum, the coherence of initial teacher education and professional development has to be improved. In other to be effective as possible, teacher education has to be thought of, and teacher education policy structured as, a continuum of teacher learning (that includes formal and informal preparation activities).

3. Teacher Educators should Explore Alternatives for Teacher Education

Provision: Support for new school-based effective teacher education programs. Emphasis should not be put on the teachers' specific most often but on the creation of a suitable learning environment for students. Schools have to be at the centre of teacher education programmes, and it is needs that have to be taken into account for the design of these programmes.

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EFFECT OF POTASSIUM OIL CONTENT OF SESAME (*Sesamum Indicum* L) VARIETIES IN KANO SUDAN SAVANNA ECOLOGY OF NIGERIA
HALLIRU SANUSI
DEPARTMENT OF AGRICULTURAL SCIENCE EDUCATION,
FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI,
KANO

ABSTRACT

*A field experiment was conducted during the 2018 rainy season at Dawakin Kudu and Teaching and Research Farm of Kano University of Science and Technology, Wudil, Gaya Farm. The study assessed the effect of potassium on oil content of sesame (*Sesamum indicum* L.) varieties in Kano (Sudan Savanna ecology) Nigeria. The treatments comprised of four levels of potassium (0, 50, 100 and 150 kg K ha⁻¹) and two (2) varieties of sesame (Ex-Sudan and E8). These were laid in a Randomized Complete Block Design (RCBD) and replicated four times. Results showed that there were no significant differences in oil content of sesame with an increasing levels of potassium at both sites. The variety E8 had the highest oil content. Also there was no interaction effect between potassium and sesame varieties in this study. This suggests that farmers in the sudan savanna ecology should adopt variety E8 as best variety for desired productivity in oil content in sesame.*

INTRODUCTION

Sesame (*Sesamum indicum* L.) is an important oil seed crop which is cultivated in tropical and sub-tropical countries of Asia and Africa (Akintunde, 2007). The major sesame growing countries are China, India, Tanzania and India (FAO, 2017). Nigeria is the second largest producer of sesame in Africa after Sudan (FAO, 2017). Young sesame leaves are used for soup ingredients in sub-saharan Africa. In India and China, the leaves play a role in treatment of cancer while the seed cake left after oil extraction is an excellent livestock feed, which can also be used as manure, carrier for medicine and perfume (Vossen and Mkamilo, 2007). Its seeds oil content is approximately 50% (Burden, 2005) which is comparable to that of olive tree (*Olea europea*). Magda *et al.*, (2005) stated that increasing soil potassium level significantly increased number of branches/pods/plants, weight of pods and seeds/plants, 100 – seed weight, oil and protein yield of peanut. Report of nutrition studies carried out in the tropics have shown significant yield increase due to fertilizer application. Relatively higher growth rate, yield and oil content of sesame were significantly influenced with the application of potassium in india. The significantly maximum oil content and seed yield were observed with the application of potassium at 50 kg K ha⁻¹ (Ramswaroop *et al.*, 2017). Dasmahapatra *et al.*, (1990) and Mondel *et al.*, (1993) reported similar increases in growth yield and oil content with 50 kg K ha⁻¹.

Alegbejo *et al.* (2012) reported that Sudan and Sahel Savannah ecological regions of the country are important areas of sesame production with distinct wet and dry season. The major producing states in Nigeria are Jigawa, Katsina, Taraba, Adamawa, Kogi, Nasarawa and Benue (Busari *et al.*, 1993, FAO, 2017). The presence of antioxidants (*Sesamum*, *Sesamol* and *sesamol*) make the oil to be one of the most stable vegetable oils in world (Anon; 2008) Potassium is one of the most abundant

cations in plants and is associated with many physiological processes such as photosynthesis, Nitrogen fixation, regulation of the stomata and enzymes activation (Imas, 2013, Ramswaroop *et al.*, 2017). Plants depend upon K to regulate the opening and closing of stomates, which is essential for photosynthesis (Imas, 2013). Sesame seeds (approximately 50 percent oil and 25 percent protein) are used in baking, candy making in cooking and salad oil and margarine. The oil can also be used in manufacture of soaps, paints, perfumes, insecticides and pharmaceuticals. Sesame meal, left after the oil is pressed from the seed, is an excellent high protein (34 - 50 percent) feed for poultry and livestock (Oplinger *et al.*, 2007; Nwalem, 2015).

From the foregoing this crop is of significant economic relevance. Hence, farmers produce them as important cash crops. During cultivation they apply various types of fertilizer to enhance yield. This study meant to assess the impact of potassium rich fertilizer on the oil yield of sesame seeds.

MATERIALS AND METHODS

The experiment was conducted during 2018 rainy season at the Gaya Teaching and Research Farm of the Faculty of Agriculture and Agricultural Technology, Kano University of Science and Technology, Wudil situated at 11°08' North latitude, and 9°10' East and 400 meters elevation above sea level. The mean range annual temperature is between 27°C to 30.6°C and soil type is sandy – loam. The second location was at Dawakin Kudu (11°50'N, 8° 35' E) above sea level. The two sites are located in the Nigeria Sudan Savanna agro ecological zone.

The experiment consisted of four levels of potassium (Muriate of potash sourced from Kano Agricultural Supply Company KASCO at 0, 50, 100 and 150 kg K ha⁻¹) and two varieties of sesame (Ex-Sudan and E8). These were factorially combine and laid out in a Randomized Complete Block Design (RCBD) and replicated four times.

The land was ploughed and harrowed to obtain a fine tilth. Ridges 40cm high and 75 cm inter row were erected. The field was marked out into replications and plots according to the experimental design. The total area for experiment was 22.5m x 15.5m = 348.5m². Gross plot size was 4.5m x 1.5m = 6m² and net plot size was 1.5m x 3m = 4.5m².

Seeds were sown on 2nd July and 6th July, 2018 at Dawakin Kudu and Gaya sites, respectively. Seeds were mixed with sand in the ratio 10g: 1kg and sown on ridges at intra-row spacing of 15cm. A pinch containing sand and seeds was sown per hole. Seedlings were thinned to one plant per stand at three weeks after sowing (WAS).

Potassium at 0, 50, 100 and 150kg ha⁻¹ was applied using side placement method at 3 and 6 WAS. Harvesting was done after the pods were matured. Growth and yield characters were determined. Five gram (5g) of seed sample from each plot were taken and oil content determined using soxhlet fat extraction method with the help of soxhlet apparatus (Malik *et al.*, 2003). The extraction procedure was as follows:

A clean dry receiver flask from the soxhlet assemblies were taken, 250ml of petroleum ether was poured into it. The weighed thimble containing the weighed sample (5g) which was in the extraction compartment were introduced. The height of the thimble was in such a size that the highest point of it remained below the bend of siphon. The apparatus and filled soxhlet with petroleum ether poured in through the condenser at the top by means of a glass funnel were assembled. The apparatus were then placed

on a heating mantle set a control knob of 4. Water was then allowed to circulate in the condenser. Extraction was for 6 hours. After the extraction is over, the thimbles with sample was then removed and transfer into the oven to dry out the solvent and then weighted. The difference between initial weight and the final weight of the samples after extractions was the fat present in the sample. Thus

$$\% \text{ fat} = \frac{\text{Wt of thim} + \text{sam b4 extr} - \text{wt of thim} + \text{sam after extr}}{5\text{g (initial wt of sam)}} \times \frac{100}{1}$$

Key: Wt=weight, thim=thimble, sam=sample, b4=before, extr-extraction

Data collected were subjected to analysis of variance (ANOVA) as described by Snedecor and Cochran (1967) using GenStat (Version). Significantly different treatment means were separated at 5% level of probability using Duncans Multiple Range Test (DMRT).

RESULTS

The effects of potassium on oil content of sesame as influenced by potassium and variety at DKD and GYA during 2018 rainy season was shown in Table 1. There were no significant differences in oil content of sesame with an increasing levels of potassium at both sites. The varieties also did not differ significantly in oil content (Table 1). Further more the interaction of Potassium and variety did not significantly ($P>0.05$) influenced oil content at both locations.

Table: Oil Content (%) of Sesame as Influenced by Potassium and Variety at DKD and GYA During 2018 Rainy Season.

Treatment	DKD	GYA
Potassium (kg/ha)		
0	1.437	0.812
50	1.300	1.075
100	1.412	1.113
150	1.250	1.037
SE _±	0.0896	0.1333
Variety (v)		
Ex – Sudan	1.369	0.919
E8	1.331	1.100
SE _±	0.0633	0.0942
Interaction		
P x V	NS	NS

DISCUSSION

Oil content in sesame is of great importance as it is grown mainly for it. It determines market price for farmers. The oil content of the crop were not significantly influenced with the application of potassium at both locations (Table 1). This is in contrast to findings of Magda and Mirvat (2005) that stated increasing soil potassium level significantly increased seed, oil and protein yields of groundnut. Varieties also did not differ significantly in oil content in both locations.

CONCLUSION

Based on the experimental results, it was concluded that better oil content of sesame crop can be obtained by the application of potassium at 100 kg Kha¹ using variety E8 at both locations.

RECOMMENDATIONS

Based on the result obtained from this study Ex-sudan variety can be recommended for farmers in sudan savanna ecology for desired productivity in oil content in sesame.

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THE USE OF PROCESS SKILLS IN TEACHING BIOLOGY CONCEPTS ON ACADEMIC PERFORMANCE AMONG SENIOR SECONDARY SCHOOLS STUDENTS WITHIN KANO METROPOLITAN
AMINA MUSA AHMAD (PhD)
DEPARTMENT OF BIOLOGY
SCHOOL OF SECONDARY EDUCATION (SCIENCES)
FEDERAL COLLEGE OF EDUCATION, KANO

ABSTRACT

This study investigated the use of process skill strategy on academic performance of Senior Secondary School II Biology Students in Kano metropolitan. One Research question and one null hypothesis guided the study. A Quasi-Experimental Design with pre and posttests, experimental and control groups were adopted. One Hundred and Sixty (160) students were randomly selected from four secondary schools within the research site. An instrument known as Biology Achievement Test (BAT) with reliability coefficient of 0.87 was used for data collection. The experimental group was exposed to teaching of biology concept using a particular process skill teaching method as Practical-oriented Instructional Strategy (PIS), where every lesson is accompanied with practical activities, while the control group was exposed to traditional method of teaching. The data collected were analyzed using mean, standard deviation and t-test statistics at $P \leq 0.05$ levels of significance. The result showed that students exposed to process skill using practical-oriented instructional strategy performed superior than those exposed to traditional lecture method. This finding recommended among other things that teachers should be trained on how to use process skills strategy in teaching biology concepts by engaging them to attained training, seminars, and workshops conferences. There is also need to adopt the method of student centered teaching method as they are exposed to practical activities they equally enquire and find solution to a given problem.

Keywords: Process skill, practical – oriented instruction strategy, Performance

INTRODUCTION

Biology as a science subject involves the use of process skills and different pedagogies to bring about meaningful learning to the students. However, there appears to be a continuous annual meager performance of students in public examinations (Okebukola, 2006). Alarming reports still continue to come out from examination bodies like WAEC and NECO concerning performance in sciences despite various educational improvement efforts. One of such factors is the approach used during deliberation of lesson (Olorukooba and Lawal, 2010). Sambo and Eriba (2012) asserted that there has been consistent decline in the performance of students in public examinations conducted by WAEC and NECO in science across the country over the years. As important as the subject is, students are failing at an alarming rate as shown in the report from WAEC result of 2013-2017 in Table 1.

Table 1: WAEC Result Analysis 2013-2017

Year	No. of students that sat for Exams	No. of students that passed (A1-C6)	% passed	No failed (D7-F9)	% failed
2013	1675224	819390	49	855834	51
2014	1543683	555726	36	987957	64
2015	1692435	529732	31	1162703	69
2016	1593442	544638	34	1048804	66
2017	1544234	597310	39	946924	61
Total	8049018	3046796		5002222	

Source: WAEC Office, Kano (2017)

An analysis of the students' performance above indicated that the total students with D7-F9 over a period of five years are 5,002,222 representing 62%. While those that have passed for the same period of time with grade between A1-C6 were 3,046,790 representing 38%. The low performance could be attributed to the teaching strategy employed. In another report by Ndioho, (2005) opined that the use of traditional lecture method approach by science teachers has a great negative impact on the students performance. For several years reports from expert panels have called for improvements in Science Technology Engineering and Mathematics (STEM) education and the use of process skill. This is one of the reasons why researchers are calling for a paradigm shift from behavioral learning approach such as the conventional teaching method which encourages rote learning to a constructivist approach that will explore all cognitive domains to the students and encourage their activeness so as to make best use of their academic performance.

The use of process skill practical-oriented instructional strategy take in conceptual understanding of subject matter, scientific reasoning skills, laboratory manipulative skills and a better understanding of natural science research. It is of significant for students to gain understanding of, and experience in several aspects of scientific research through the use of practical-oriented instructional strategy in teaching.

Students should be allowed to contribute actively in all concepts taught by the teacher, for this reason, process skill practical-oriented instructional strategy gives opportunity for direct interactions between learners and their instructors, this reason justify the research.

OBJECTIVES OF THE STUDY

The objective of the study is to: Find out the difference in the mean score of SS II Biology Students exposed to process skill practical-oriented instructional strategy and those exposed to traditional lecture teaching method.

RESEARCH QUESTIONS

The following research question guided the study:

- What is the difference in the mean score of SS II Biology students exposed to process skill practical-oriented instructional strategy and those exposed to traditional lecture teaching method?

HYPOTHESES

The following null hypothesis was tested at $P \leq 0.05$ levels of significance.

- There is no significant difference between the mean score of SS II biology students exposed to practical-oriented instructional strategy and those exposed to traditional lecture method.

METHODOLOGY

The experimental research design employed for the study was Quasi-experimental design with pretest (O_1) and posttest (O_2) design, experimental (EG) and control (CG) groups. Integral classes were randomly assigned to experimental and control groups. Both groups were given pretest and posttest treatments.

EG----- O_1 ----- X_1 ----- O_2
 CG----- O_1 ----- X_0 ----- O_2

Fig: 1. Illustration of a Research Design.

Source: Adapted from Mamman (2013)

Key:	EG ----Experimental Group	CG ---- Control Group
	O_1 ----- Pretest	O_2 ----- Posttest
	X_1 -----Treatment	X_0 ----- Untreated

The population of the study comprised of all the SS II Biology students within Kano metropolitan. There were thirty seven Secondary Schools in the Educational Zone with a population of 9,840 students comprising 5,439 males and 4,401 females.

A sample of 160 SS II Biology students was drawn from four randomly selected schools (forty students each per school). This was achieved by subjecting the four sampled schools to pretest using Biology Performance Test (BPT) and the scores were analyzed using Analysis of Variance (ANOVA) and Scheffe's test to ensure their equivalence academically. This number (160 students) is adequately enough to represent the population of the study as stated by Roscoe (1975), that a sample sizes larger than 30 and less than 500 are appropriate for most researches. Two schools were used as experimental and the other two as the control.

RESULTS ANALYSIS

The result obtained was presented below;

Research Question: What is the difference in the mean score of SS II Biology students exposed to process skill practical-oriented instructional strategy and those exposed to traditional lecture teaching method?

Mean and Standard Deviation were used to answer the question analysis was presented in Table 2.

Table 2: Mean and Standard Deviation of Posttest Scores of Exp and Control Groups

S/N	Group	N	Mean	SD	MD
1.	Experimental	82	36.27	6.03	15.37
2.	Control	76	10.97	4.04	

Table 3: t-test Analysis of Students' Performance in Exp. and Control Groups

S/N	Group	N	Mean	SD	DF	t-Val	P-Val
1.	Experimental	72	18.20	4.05	137	8.142	0.000
2.	Control	68	13.75	3.01			

Remark
Significant at $P \leq 0.05$

Table 3 above shows that t-value of 8.142 was obtained and the p-value observed was 0.000 at 128 degree of freedom. The P-value of 0.000 being less than the alpha value of 0.05 indicates that there is a remarkable significant difference in the mean score of experimental group over the control group. Based on the result, the null hypothesis which affirmed that there is no significant difference between the mean score of SS II Biology students exposed to process skill practical-oriented instructional strategy and those exposed to traditional lecture method was rejected.

DISCUSSIONS

The findings of research question discovered that those students exposed to process skill practical-oriented instructional strategy performed better than those exposed to traditional lecture method. The result agree with the work of Usman and Lawal (2017); Abdullahi (2009); Nwakonobi (2008). Ajayi and Osoko (2013) discovered that experimental subjects which were exposed to the practical assisted instructional strategy performed significantly better than their counterparts in the control group who were taught the same concept using the traditional lecture method. Nwakonobi (2008); and Nwagbo (2009) also found that students exposed to practical coupled with theory performed significantly better than those taught using traditional lecture method. Olagunji (2000) also discovered that there was a remarkable difference in the achievement scores of students taught using practical.

CONCLUSION

The result concluded that process skill practical-oriented instructional strategy has significant impact on students' academic performance and achievement.

RECOMMENDATIONS

The following recommendations were drawn from this study;

1. Training, seminars and symposium should be organized to science teachers
2. Curriculum should be geared toward practical activities
3. Practical period at least 2hr per week should be assign to science subject

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ASSESSMENT OF THE IMPACT OF MICROTEACHING ON PRE-SERVICE SCIENCE TEACHERS' PREPARATION FOR TEACHING PRACTICE IN COLLEGES OF EDUCATION IN OYO STATE, NIGERIA

¹SABITU, KAMORU ABIODUN,

²AMOO, JELILI OLALEKAN

AND

³AJOBIEWE, DAMILOLA NNAMAKA

¹DEPARTMENT OF GENERAL STUDIES EDUCATION

SCHOOL OF GENERAL EDUCATION

^{2&3}DEPARTMENT OF COMPUTER SCIENCE

SCHOOL OF SECONDARY EDUCATION (SCIENCE PROGRAMMES)

FEDERAL COLLEGE OF EDUCATION (SPECIAL), OYO

ABSTRACT

The purpose of this study is to assess the impact of microteaching on pre-service science teachers' preparation for teaching practice in selected Colleges of Education in Oyo State Nigeria using Federal College of Education (Special) Oyo, as a case study. The study adopted survey research method. The sample comprised of one hundred and fifty (150) pre-service teachers in second and third year teacher training programme in School of Secondary Education (Science Programmes) through the use of simple random sampling techniques. A self-structured questionnaire was used to collect data from respondents in the study. A test-retest method was used to determine the reliability of the instrument and reliability co-efficient of 0.91 was obtained on the instrument. The data collected were analysed through the use of descriptive statistics. The results of the study showed that 54% of pre-service teachers were adequately exposed to microteaching in the college. The study also revealed that pre-service teachers are averagely prepared for teaching practice in Colleges of Education in Oyo State. It was recommended among others that professionalism should be emphasized in teacher education in order to ensure that prospective teachers are professionally initiated by teachers who themselves are professionals.

Keywords: Microteaching, Pre-Service, Science Teachers, and Teaching Practice

INTRODUCTION

Education is the backbone in the development of a society and teacher has a pivotal role in the education system. The National policy on Education (2004) of the Federal Republic of Nigeria asserted that since no education system may rise above the quality of its teachers, education shall continue to be given major emphasis in the national planning and development. Teaching practice is a major component of a teacher education programme (Adeleke, 2011).

The purpose of teacher education is to produce effective practicing teachers (Kalande, 2006). The question of how trainees can best be prepared to become an effective classroom practitioner has been in the minds of teacher educators worldwide for many years (Gorge, 2000). Review of literature about teacher education and

classroom practice shows that, so far, there is very little known about how teacher education affects practices (Alhassan, 2012).

Microteaching is an effective device for modifying the behaviours of teachers under training as it is a highly individualized type of teacher training techniques. Moreover, it is useful for pre-service and in-service teacher training where teachers can improve their competencies. In the same vein, Syed and Zaid (2005) states that microteaching is a stimulated social skill development process aimed at providing feedback to teachers for modification of their behaviour. He concludes that it is a clinical teaching programme organized for providing teachers with miniature encounters.

Microteaching as an essential part of formal education training for teachers has its objectives which include enabling teacher trainees gain confidence in teaching by mastering a number of skills on a smaller group of students; providing teacher-trainees with an environment for practice-based teaching and through this instil some self-evaluative skills. The objectives of microteaching reveal that it is a field or branch of teacher education essential for teachers in training because through it, they imbibe the qualities of effective teaching, avoid mistakes often made by teachers and equip themselves with adequate mastery skills and techniques of good teaching (Goodlad, 2010).

In micro teaching, teacher candidates find opportunities to develop skills in drawing learners' attention, asking questions, using and managing time effectively and bringing the lesson to a conclusion. Also, through microteaching, the teachers' class management skills improve. They acquire the skills to choose appropriate learner activities, use teaching goals, and overcome difficulties encountered during the process. During learner learning, on the other hand, the teacher candidates improve their skills in giving feedback and measurement and evaluation. Furthermore, by observing the presentation of their friends they find a chance to observe and evaluate different teaching strategies (Abdurrahman, 2010).

Microteaching helps to develop skills to prepare lesson plans, choose teaching goals, speak in front of a group, and to ask questions and use evaluation techniques. Teachers' self confidence grows in a comfortable environment. It provides an opportunity to learn multiple skills that are important for teaching in a short time. It is a useful experience to learn how to realize teaching goals through planning a model lesson. It shows how preparation, organization, and presentation are important in learners' learning. Choosing activities, putting them in a logical order, maintaining improvement make it possible to become a whole with the content. Receiving immediate feedback is a means to determine productivity and using teaching strategies. By asking appropriate questions strong learning environment can be established. Also, it allows for asking questions at various difficulty levels. Also, it makes it possible to create an environment that involves thinking differently and interaction (Gee, 2002).

STATEMENT OF THE PROBLEM

The teacher is assumed to be 'everything' to the learner as well as the character model to the society, as it is commonly expected, his training must be such that not only comprehensive but well articulated. Such training must be based on sound conceptual understanding and reasoning that have been developed within the matrix

of practice and experience. The aim of the microteaching practice research is to prepare pre-service teachers (student teachers) better by themselves in teaching practice lesson. As a result of the process of preparation, pre-service teachers prepare and present the lesson with less anxiety and feeling comfortable are the feelings that are expected to be observed in the class. The main purpose of this study is to examine the impact of micro teaching practices in preparing pre-service science teachers in their teaching practicum and how it has improved their classroom instructional delivery particularly in Oyo State, Nigeria.

RESEARCH QUESTIONS

The following research questions guided there study;

1. What is the level of adequacy of microteaching pre-service teachers are exposed to in the Colleges of Education?
2. To what extent has the microteaching prepared pre-service teachers in the Colleges of Education for teaching practice exercise?
3. To what extent has the microteaching influenced instructional delivery of pre-service teachers in the teaching practice exercise?
4. To what extent has microteaching motivated the pre-service teachers to become professional teachers?
5. How can microteaching be improved to enhance pre-service teacher's preparation?

SIGNIFICANCE OF THE STUDY

Education is the backbone in the development of any society and a teacher has a pivotal role in the education system. This result of this research work will serve as a reliable facts for teacher trainees and lecturers in education to assess the extent to which the curriculum of teacher education as helped in shaping the knowledge of pre-service teachers in terms of instructional strategies and their competences in delivering classrom intructions. It will also stand as a tool for professional bodies like Science Teachers Association of Nigeria (STAN), Nigerian Union of Teachers(NUT) Teachers regulatory agencies like Teachers Registration Council of Nigeria (TRCN) and Misnistry of Education to measure the standard of teachers qualifications in Nigeria.

Furthermore, it will enable researchers to see the level of microteaching programme pre-service teachers (student teachers) are exposed to and if there will be need to improve on the existing methods used in assessing pre-service (student teachers) teachers during microteaching exercise and it will contribute to the existing literatures.

METHODOLOGY

The research is a descriptive survey study in which questionnaire was used to collect data from student teachers (respondents) in Federal College of education (special), Oyo, Oyo State States, Nigeria. Surveys are used extensively to assess attitudes and characteristics of a wide range of subjects. Surveys can be useful when a researcher wants to collect data on phenomena that cannot be directly observed.

The population of the study consists of pre-service teachers in second and third year teacher training programme comprising of teaching practice students offering Mathematics, Biology, Chemistry, Computer Science, Physics and Integrated Science in Federal College of education (special), Oyo, Oyo State States, Nigeria.

The sample consists of one hundred and fifty respondents (student teachers) offering science courses. Fifty participants were selected from School of Secondary Education. The research instrument for this study is questionnaire designed by the researcher. It is titled Questionnaire on Microteaching and Pre-service Teachers' Performance (QMPTP). It has Six (6) sections as follows:-

Section A: deals with bio data of the respondents.

Section B: it deals with the statements student teachers' responded to on the adequacy level of Microteaching

Section C: it deals with the statements student teachers' responded to on influence of Microteaching on teaching practice.

Section D: it deals with the statements student teachers' responded to on the influence of Microteaching and instructional delivery.

Section E: it deals with the statements student teachers' responded to on influence Microteaching on professionalism.

Section F: it deals with the statements student teachers' responded to on the ways of improving Microteaching.

The instrument was validated by two experts in the field of measurement and evaluation from educational psychology, Federal College of Education (Special), Oyo, Oyo State, Nigeria.

The instrument was field tested with ten (20) pre-service teacher from Emmanuel Alayande College of Education, Oyo that did not participate in the real study to determine reliability of the instrument. The respondents and school used for the field test did not participate in the final study. A T-test statistical method was used to determine the reliability of the instrument after the field testing. The reliability coefficient (r) of the instrument is 0.91.

The researcher sought the permission of the Dean of the School and Head of Departments of under study. A total number of one hundred and fifty questionnaires were completed by the respondents and collected by the researchers on the spot the same day they were administered. The statistical techniques used for analysing the questionnaires was descriptive statistics

RESULTS AND DISCUSSION

The data was analysed based on the research questions;

Research Question One: *What is the level of adequacy of microteaching pre-service teachers are exposed to in the Colleges of Education in Oyo State?*

To answer this research question, the data collected in section B of the questionnaire were analysed through mean and percentages as show in table 2

Table 1: Adequacy of Microteaching Courses

S/ N	Statements	Maximum Obtainable mean score	Observed mean score	Level of Adequacy in Percent (%)
1	Have you offered courses in microteaching?	5	4.0	80
2	Are the credit units adequate for your need?	5	2.4	48
3	Are the courses adequately handled by the Tutors?	5	2.6	52
4	Are you involved in the class Projects for microteaching?	5	2.1	42
5	Do the courses enhance your performance during teaching practice exercise?	5	2.5	50
	Overall Level of Adequacy		2.72	54.4

An examination of Table 1 reveals that 54.4% of student-teachers sampled in the study perceived that the Microteaching Courses is adequate for their needs. However, the students were of opinion that the level of adequacy of Credit Units (48%) and handling of Microteaching Courses (42%) was not adequate. It therefore implies that overall level of adequacy of Microteaching student-teachers were exposed to in the Colleges of Education in the Oyo State is just on the average (54.4).

Research Question two: *To what extent has the microteaching prepared pre-service teachers in the Colleges of Education in the Oyo State States for teaching practice exercise?*

To answer the research question, the data collected in Section C of the Questionnaire were analysed through mean and percentage as shown in Table 2.

Table 2: Microteaching and Teaching practice

S/N	Statements	Maximum Obtainable mean score	Observed mean score	Level of preparedness in Percent (%)
6	Prepared me well for teaching practice exercise.	5	2.5	50
7	Strengthen my methodology during teaching practice.	5	3.1	62
8	Given me confidence to teach during teaching practice.	5	2.0	40
9	Empowered me on effective class management.	5	2.5	50
10	Improved my capacity to prepare documents for teaching.	5	2.9	58
	Overall average preparedness		2.6	52

An examination of Table 2 revealed that 52% of student-teachers sampled in the study perceived that the Microteaching Courses prepared sufficiently for their teaching practice exercise. The Table also showed that only 40% of the student-teachers agreed that their exposure to Microteaching course gave them confidence to teach effectively during the teaching practice. On the whole, this result indicates that the Microteaching course student-teachers were exposed to in the selected Colleges of Education in the Oyo State states averagely prepared them for their teaching practice exercise (52%).

Research Question three: *To what extent has the microteaching influenced instructional delivery of pre-service teachers in the teaching practice exercise?*

To answer the research question, the data collected in Section D of the Questionnaire were analysed through mean and percentage as shown in Table 3.

Table 3: Microteaching and Instructional delivery

S/N	Statements	Microteaching	Maximum Obtainable mean score	Observed mean score	Level of influence in Percent (%)
11	Introduce my lesson effectively during teaching practice.		5	2.6	52
12	Present my lessons adequately during teaching practice.		5	2.4	48
13	Evaluate my lessons during teaching practice.		5	2.7	54
14	Summarise my lessons during teaching practice.		5	2.3	46
15	Manage my class for conducive teaching and learning.		5	2.6	52
	Overall average influence			2.52	50.4

An examination of Table 3 revealed that 50.4% of student-teachers sampled were of the opinion that the Microteaching Courses prepared sufficiently for instructional delivery during their teaching practice exercise. The Table also showed that less than 50% (46% and 48%) of the student-teachers agreed that their exposure to Microteaching course empowered them to present lessons appropriately during the teaching practice. On the whole, the result indicates that Microteaching course only prepared student-teachers in the selected Colleges of Education in the Oyo State marginally (50.4%) prepared them to deliver instructions during teaching practice exercise (50.4%).

Research Question Four: *To what extent has microteaching motivated the pre-service teachers to become professional teachers?*

To answer the research question, the data collected in Section E of the Questionnaire were analysed through mean and percentage as shown in Table 4.

TABLE 4: Microteaching and Professionalism.

S/N	Statements	Maximum Obtainable mean	Observed Mean implication	%age Yes
16	Through my exposure to microteaching course; I want to be a committed teacher.	5	2.1	42
17	I want to be a professional teacher.	5	2.5	50

18	I want teacher profession to be my life career.	5	2.3	45
19	I am proud to present myself as a teacher anywhere.	5	2.0	40
20	I want to belong to teachers' professional associations.	5	2.4	48
	Overall average		2.3	45

An examination of Table 4 revealed that only 45% of student-teachers sampled were of the opinion that the Microteaching Courses has motivated them to become professional teachers. This result indicated that Microteaching course had not motivated the majority of pre-service teachers to be committed to teaching as a career.

Research Question Five: *How can microteaching are improved to enhance pre-service teacher's preparation*

To answer this research question, the data collected in section F of the questionnaire were analysed through mean and percentages as show in table 5.

Table 5

S/N	Suggestions	Number of Respondent	Percentage of Respondent	Ranking
21	Tutors should be more devoted handling the Course	60	40.0	1 st
22	Provision of adequate instructional F	30	20.0	2 nd
23	Students should be actively Involved development of Instructional media	25	16.7	3 rd
24	Allocating more time for microteachi Since it is practically oriented	20	13.3	4 th
25	Provision of conducive environment	15	10.0	5 th

Table 5 indicates suggestions of student teachers to the ways of improving Microteaching to enhance pre-service teacher's preparation. The following are the major suggestions to the way of improving the pre-service teacher's preparation in the order of ranking:

- i. Tutors should be more devoted when handling the courses 1st

- ii. Provision of adequate instructional facilities 2nd
- iii. Students should be actively involved in the development of instructional media 3rd
- iv. Allocating more time for microteaching since it is practically oriented 4th
- v. Provision of conducive environment 5th.

DISCUSSION OF FINDINGS

Table 1 above was used to determine the adequacy level of the microteaching pre-service teachers' are exposed to. Table B above indicates the mean level of adequacy of the microteaching pre-service teachers' are exposed to in Oyo State. The mean level is 2.72 and the percentage adequacy level is 54.4 % which indicates that the level of microteaching pre-service teachers' are exposed to is averagely adequate. This finding corroborates with the findings of Ahmad (2013) who observed that the role and importance of microteaching as an integral part of teacher education programme upon which the syllogisms regarding teaching and learning are built. Microteaching is the foundation of good delivery by the pre-service teacher and his/her attitude and general behaviour which is achieved through their active involvement in the exercise.

Table 2 above was used to determine the extent to which microteaching has prepared pre-service teachers' in Colleges of Education for their teaching practice exercise. Table 3 above indicates the mean level of the extent to which microteaching has prepared pre-service teachers' for teaching practice exercise. The mean level is 2.6 and the percentage level of preparedness of is 52%. This indicates that microteaching has averagely prepared pre-service teachers' for teaching practice exercise. This finding corroborates with the findings of Alhassan (2012) who observed that classroom management and poor lesson presentation by teaching practice students is a result of low exposure to microteaching and inadequate environment to rigorously practice teaching during microteaching exercise.

Table 3 above was used to determine the extent to which microteaching has influenced the instructional delivery of pre-service teachers' in Colleges of Education during teaching practice exercise. Table 3 above indicates the mean level of the extent to which microteaching has influenced instructional delivery pre-service teachers' during teaching practice exercise. The mean level is 2.52 and the percentage level is 50.4%. This indicates that microteaching has marginally influenced the instructional delivery of pre-service teachers' during teaching practice exercise. This finding corroborates with the finding of Rosita (2013) who observed that microteaching will equip pre-service teachers with reflective skills for personal growth and also enhance their experience during teaching practice.

Table 4 was used to determine the extent to which microteaching has motivated pre-service teachers' to become professional teachers in Colleges of Education during teaching practice exercise. Table 4 above indicates the mean level of the extent to which microteaching has motivated pre-service teachers' to become professional teachers during teaching practice exercise. The mean level is 2.3 and the percentage level is 45%. This result indicated that Microteaching course had not motivated the majority of pre-service teachers to be committed to teaching as a career. This finding is in line with the research conducted by Abdulwahab (2009) who observed that many

teachers most especially in Nigeria chose teaching profession because they have no other alternatives and has soon as they secure another job they tend to resign from teaching profession despite their professional qualification as teachers. The fact is most of these teachers are not properly oriented during their teacher training programmes and more so in most developing countries today of which Nigeria is part do not take teaching as a serious profession and hence teachers are not well placed in the society. Hence this situation calls for an urgent review of educational policies in Nigeria.

Table 5 was used to determine suggestions to the ways of improving microteaching to enhance pre-service teachers' preparation for teaching practice in Colleges of Education in Oyo State States. The following are the major suggestions stated by the respondents to the ways of improving microteaching to enhance pre-service teacher's preparation for teaching practice in Colleges of Education; Tutors should be more devoted when handling the course, students should be actively Involved in the development of Instructional media, allocating more time for microteaching since it is practically oriented and provision of conducive environment for teaching and learning during the exercise. This finding is in conformity with those of Rosita (2013) which reported that team teacher supervision and team peer supervision were identified by the respondents as being crucial to the effectiveness of microteaching and field experiences. There is a growing appreciation of the practice of team teaching, team teacher supervision and team peer supervision, among teachers, teachers' educators, educational researchers and educational practitioner in general. The importance of such practices lies in their potentialities to offer check and balance in educational decisions or judgment in a manner that is capable of facilitating the attainment of an appreciable level of objectivity, validity and reliability in educational accountability. There is no gainsaying that such practices are capable of enhancing the quality of teacher education in Nigeria and other parts of the world. Furthermore, Adetunji (2010) suggest that to adequately supervise the teaching of a student, emphasis should not be on how far, but how well the supervision is done. In view of this, a reasonable length of time should be spent with the student during microteaching to be able to fallow every facet of the lesson for the purpose of giving adequate guidance. It is suggested that a supervisor should stay with the student for the entire period of the lesson or at least for 30 minutes from the beginning with an additional 10 to 15 minutes to discuss, with the student, his strength and weakness.

SUMMARY OF FINDINGS

This study assessed the impact of microteaching on pre-service teachers' preparation for teaching practice in Colleges of Education in Oyo State of Nigeria.

Relevant literature and researches carried out by some eminent scholars and researchers reviewed on the problems investigated on this study. However, the study adopted descriptive type of research design to describe the phenomenon as it relates to the area of study for generalization. The study generally reveals as summarized below:

- i. The level of adequacy of microteaching prescribes teachers were exposed to in selected Colleges of Education in the Oyo State is 54.4%.

- ii. The extent to which microteaching prepared pre-service teachers for teaching practice in the Oyo State is 52%.
- iii. Exposure of pre-service teachers to Microteaching averagely (50.4%) influenced their instructional delivery during teaching practice exercise.
- iv. Less than 50% of pre-service teachers were motivated by the microteaching course to become professionals.

CONCLUSION

This research has demonstrated that microteaching is an essential programme that should not be made to have an insignificant existence because of the role it plays as the foundation for all forms of success in teaching-learning process. Microteaching appears not to function very well because of mystification that has befallen teacher education institutions as a result of inadequacy of facilities and personnel to ensure adequate assessment and thorough teaching. Moreover microteaching appears not to function well because of non-provision of avenue for discussing cases encountered during microteaching and field experiences. Much should be done to ensure this particularly in areas of facilities, personnel and even methodology. It is believed that this programme remains the pride of the educational status as all professional bodies have one form of professional internship period or the other.

RECOMMENDATIONS

Based on the findings, the following recommendations are made.

- i. The administrators in the Colleges of Educations should ensure that instructional materials (instructional media) such as video recordings and multimedia packages are provided for proper handling of Microteaching courses.
- ii. Teacher training institutions should seek for grants from Tertiary Education Trust fund for the capacity building of their lecturers in handling Microteaching effectively.
- iii. Professional associations such as Science Teachers Association of Nigeria, National Association of Educational Media and Technology, Mathematical Association of Nigeria (MAN) among others should organise seminars and workshops on how to improve the teaching of Microteaching.
- iv. Government at various levels should provide special grants that would motivate student teachers and their supervisors for effective teaching practice exercise.

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**THE EFFECT OF POTASSIUM FERROCYANIDE IN ELECTROLESS
COPPER BATH STABILITY**

¹AMINU TANIMU ADAMU,

²MUKHTAR ABUBAKAR AHMAD

AND

³KHALIFA HARUNA

^{1,2,3}DEPARTMENT OF CHEMISTRY

SCHOOL OF SECONDARY EDUCATION (SCIENCES),

FEDERAL COLLEGE OF EDUCATION (TECHNICAL), BICHI.

P.M.B. FCE (T) BICHI 3473, KANO

ABSTRACT

This research work investigated the effect of potassium ferrocyanide as additive in electroless copper bath. An experimental work was conducted where two electroless copper baths were set up one containing the potassium ferrocyanide, formaldehyde, copper sulphate and other additives at room temperature while in the other bath potassium ferrocyanide was removed. An insulator of polymer material was used and the copper material were successfully coated on surface of the polymer material. The result analysis using SEM and EDS showed that, the deposition of copper materials on the polymer surface was uniform and smooth due to the presence of potassium ferrocyanide which acted as stabilizer in copper electroless bath while in the other set of bath in which the potassium ferrocyanide was removed, the electroless copper plating on the polymer material surfaces were rough, broad and irregular. Generally, potassium ferrocyanide reduces the rate of deposition of copper but at the same time stabilizes the process and made the coating uniform, regular and smooth on the surface of the material. Finally, It recommended that, Potassium ferrocyanide cyanide ($K_4Fe(CN)_6$ complex) should be used in copper plating bath to prevent irregular, rough coating, and it should replace potassium cyanide (KCN) to prevent hazard as potassium cyanide (KCN) alone is poisonous. There should be a collaboration between higher institutions of learning and industries in research projects and SIWESS. However further research should be conducted on other complex compounds of cyanide to investigate their effect in electroless copper bath.

Key words; potassium ferrocyanide, copper and electroless plating

1.0 INTRODUCTION

Electroless plating uses a redox reaction to deposit metal on a substrate without the passage of an electric current. Copper electroless solution contains a metal salt, a reducer, a stabilizer and a buffer system. A redox reaction occurs between metallic ions (Cu^{2+}) and a strong reducer without the aid of an external electric potential (Jiang, B. Q., Xiao, L., Hu, S. F., Peng, J., Zhang, H. and Wang, M. W. 2009). Metal forms around the catalyst in the polymer and grows in the polymer nearby surface as well as on the surface via an autocatalytic electroless reaction. Almost all the metals of the Group IB and VIII of the periodic table (Au, Pt, Ni, Cu, Co, Fe, etc.) can be plated

and exhibit autocatalytic behavior(Nicolas-Debarnot, D., Pascu, M., Vasile, C. and Poncin-Epaillard, F.2006).

Successful electroless plating cannot be guaranteed by simply adding a solution of the reducing agent such as Formaldehyde (HCHO) to one containing metal ions (copper CuSO_4). In actuality, local changes in pH can lead to precipitation of the metal in bulk solution. To overcome this difficulty, complex compounds are added to the plating bath to maintain the metal ion in solution. The complex compound depresses the free metal ion concentration to a value determined by the dissociation constant of the metal complex. In addition to preventing precipitation within the solution, the complex compound also allows the bath to be operated at higher pH values. Ions will be available for deposition. For instance, Ethylene diamine tetraacetic acid (EDTA), which has a high stability constant, requires very careful control if plating is to occur. Oxidation of the reducing agents employed in electroless copper plating invariably involves the formation of either hydrogen (H^+) or hydroxyl (OH^-) ions. Consequently, the pH of the plating solution changes during plating and thus affects the rate of deposition and the properties of the deposit. Therefore, buffers are added to stabilize the pH of the solution. These include carboxylic acids in acid media (which also act as complexants) and organic amines in alkaline solutions (Eom, K., Cho, K. And Kwon, H. 2008).

Electroless plating formulations are inherently unstable and the presence of active nuclei such as dust or metallic particles can lead, over time, to homogeneous decomposition of the plating bath. The presence of the complexant in the correct concentration does not prevent this from occurring. To circumvent this problem, stabilizers such as 2-mercaptobenzothiazole are added to the bath in small concentrations. The stabilizers competitively adsorb on the active nuclei and shield them from the reducing agent in the plating solution. However, the stabilizers are used in excess, metal deposition may be completely prevented, even on the substrate itself. The plating rate is sometimes inordinately lowered by the addition of complexants to the bath. Additives that increase the rate to an acceptable level without causing bath instability are termed exaltants or accelerators. These are generally anions, such as CN^- , which are thought to function by making the anodic oxidation process easier (Meek, R. L. 1975). In summary, typical electroless plating formulations contain (a) a source of metal ions, (b) a reducing agent, (c) a complexant, (d) a buffer, (e) exaltants and (f) stabilizers.

1.1 THE BACKGROUND OF THE RESEARCH:

Electroless copper deposition technology has advanced rapidly in recent years including widespread application in areas such as through-hole plating in printed circuit boards, decorative plating of household utensils and in the automotive industry, electromagnetic interference shielding of electronic components, conductive traces in electronic interconnection devices and integrated circuit manufacturing. In an attempt to bring more innovations and advances in electroless copper plating, this research come up to investigate and address one fundamental aspect in electroless copper plating bath which is the stability of the process that always affect the

smoothness of coating on the surface of the material to be coated.

1.2 THE RESEARCH PROBLEMS:

It is generally believed that, Electroless copper plating bath produces poisonous gases during the process and in most cases the surfaces of coated materials appear to be irregular and rough with high deposition in one area while low deposition in another area on the surface of the material coated as a result of the instability of the bath. In view of the above this research aimed to address the stated problems by replacing potassium cyanide (KCN) which is poisonous and accelerator with potassium ferrocyanide complex $[K_4Fe(CN)_6]$ as additive in the electroless copper bath which is not poisonous acting as stabilizer and accelerator so as to prevent the release of poisonous gases to the environment and stabilizes the bath to achieve regular and smooth deposition on the surface of the coated materials.

1.3 SIGNIFICANT OF THE RESEARCH:

This research will be benefited to the industries using electroless copper bath to reduce the release of exodus and in the production of quality materials with smooth surfaces. The research will be benefited to the society by removing poisonous gases from the electroless copper bath which is release to the environment. it will also benefit the chemical and technical students to understand safer and effective electroless copper plating process. it will generally address the problems of instability in copper electroless bath by introducing the potassium ferrocyanide and solve the problem of using potassium cyanide (KCN) which is poisonous and releasing poisonous gases during electroless copper plating.

1.4 THE ROLE OF POTASSIUM FERROCYANIDE

It is generally believed that, Potassium ferrocyanide act as stabilizer in copper electroless bath and as such has a levelling effect in deposition of copper on to surface of the material.

The plating rate of an electroless copper bath at room temperature decreases in the presence of even minute amounts of potassium ferrocyanide although according to some authors the cyanide complexes of iron also act as accelerators in electroless copper bath.

2.0 EXPERIMENTAL

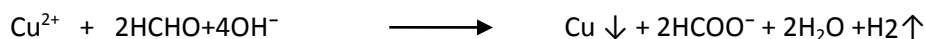
2.1 CHEMICAL/REAGENTS

All the chemicals used are pure and high standard in quality of Analargrades.

TABLE 1: Chemical used for the Experiments

S/N	CHEMICALS/REAGENTS		CONCENTRATIONS
1.	CuSO ₄	Copper (II)sulphate	0.04 mol/L and 16g/L
2.	HCHO	Formaldehyde	0.20 mol/L and 5mL/L
3.	NaKC ₄ H ₄ O ₆	Sodium potassium tartrate	30 g/L
4.	Na ₂ EDTA	Salt of ethylenediamine-tetraaceticAcid	0.12 mol/L and 20g/L
5.	K ₄ Fe(CN) ₆	Potassium ferrous cyanide	25 mg/L
6.	Na ₂ SO ₄	Sodium sulphate	0.14 mol/L
7.	HCOONa	Sodium formate	0.30 mol/L
8.	KCN	Potassium cyanide	4.6x10 ⁻⁴ mol/L
9.	CH ₃ CH ₂ OH	Ethanol	70 ml
10.	NaOH	Sodium hydroxide	2.5 mol/L
11.	HCl	Hydrochloric acid	8 mol/L
12.	PdCl ₂	Palladium chloride	4.5x10 mol/L
13.	SnCl ₂	Tin chloride	0.2 mol/L
14.	H ₂ SO ₄	Tetraoxosulphate (vi)Acid	0.8 mol/L
15.	CH ₃ COOH	Acetic acid	2.5 mol/L

The laboratory work was carried out by setting two set of copper electroless bath in which one potassium ferrocyanide was added while in the other bath potassium ferrocyanide were not added. In both set of baths polymer material was placed for one hour. The polymer material was removed after immersed in to the electroless copper plating bath for one hour and allowed to dried. The most important reaction, occurring in the electroless copper plating when formaldehyde was used as reducing agent, is as follows:



2.2 TABLE 2. The Electroless Copper Plating Bath Solutions without Potassium Ferrocyanide

S/N	CHEMICALS		CONCENTRATIONS
1.	CuSO ₄	Copper (II)sulphate	0.04 mol/L
2.	HCHO	Formaldehyde	0.20 mol/L

S/N	CHEMICALS		CONCENTRATIONS
3.	Na ₂ SO ₄	Sodium sulphate	0.14 mol/L
4.	HCOONa	Sodium formate	0.30 mol/L
5.	KCN	Potassium cyanide	4.6x10 ⁻⁴ mol/L
6.	Na ₂ EDTA	Salt of ethylenediamine-tetraaceticAcid	0.12 mol/L

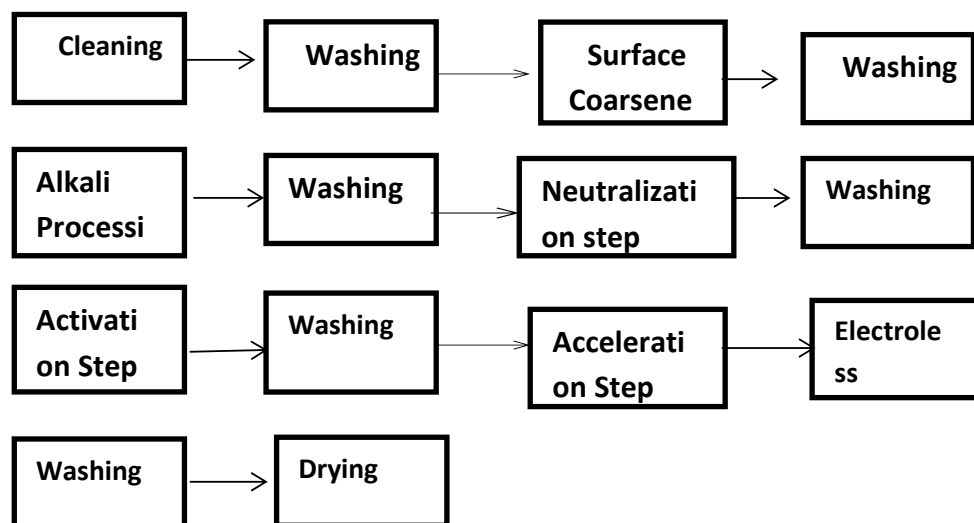
2.3 TABLE 3. The Electroless Copper Plating Bath Solutions containing Potassium Ferrocyanide K₄Fe(CN)₆

S/N	CHEMICALS		CONCENTRATIONS
1.	CuSO ₄	Copper (II)sulphate	16 g/L
2.	HCHO	Formaldehyde	5mL/L
3.	NaKC ₄ H ₄ O ₆	Sodium potassium tartrate	30 g/L
4.	Na ₂ EDTA	Salt of ethylenediamine-tetraaceticAcid	20 g/L
5.	K ₄ Fe(CN) ₆	Potassium ferrous cyanide	25 g/L

2.4 PROCEDURE

The research was designed to use two different methods for electroless copper plating. One set of electroless copper bath containing potassium ferrocyanide K₄Fe(CN)₆ while in another different set of electroless copper bath the potassium ferrocyanide K₄Fe(CN)₆ is not added but Potassium cyanide (KCN) were used.

The method for electroless copper plating was carried out in multi-step processes in each set of bath for the two methods above which includes



Before the electroless copper plating took place the polymer material has to be treated to make the surface ready for the coating.

The first step was cleaning of the polymer material where ethanol was used the washed with distilled water. The surface of the polymer material was made to be rough by heating under reflux in acetic acid for two hours which is then removed and washed by distilled water. The polymer material was also treated with sodium hydroxide where it placed in container containing sodium hydroxide solution for five minutes then removed and washed with water. It followed by the neutralization step where the polymer material was placed in hydrochloric acid solution for ten minutes the removed and washed with distilled water. The polymer material was also activated for coating by the use of palladium chloride and tin chloride which serves as binding agent between the copper and the surface of the polymer material. The polymer material was washed and place in the electroless copper bath solution containing Copper (II) sulphate, Formaldehyde, Sodium sulphate, Sodium formate, salt of ethylene diamine-tetraacetic Acid and potassium cyanide. After one hour the polymer material was removed, washed with distilled water and dried.

The above process was repeated with different set of electroless copper bath containing potassium ferrocyanide Instead of potassium cyanide. Both polymer materials used for the two set of baths were taken to the analysis after the experiment.

3.0 RESULTS AND DISCUSSION

The polymer materials that were plated in the two set of baths were characterized using SEM and EDS,

the properties of the material were investigated as follows

3.1 FRESH POLYMER MATERIAL BEFORE COATING (SAMPLE A)

The SEM image analysis of the polymer morphology in **Fig.1** below indicates that, the surface is smooth and clear. According to the image, the surface is fresh and clear

because it is untreated.

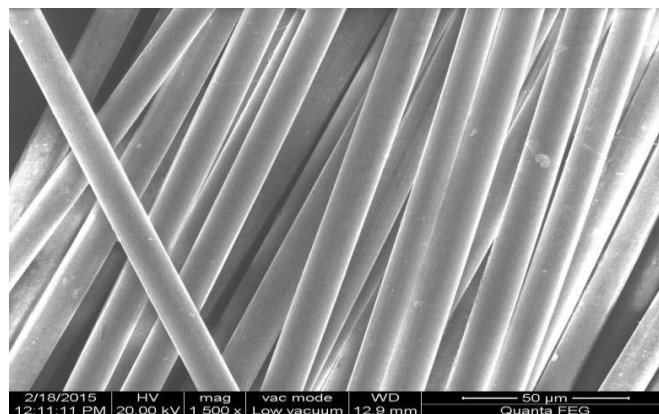


Fig.1 The SEM image for fresh polymer before coating

3.2 POLYMER MATERIAL AFTER COATING (SAMPLE B) IN THE BATH WITHOUT $K_4Fe(CN)_6$

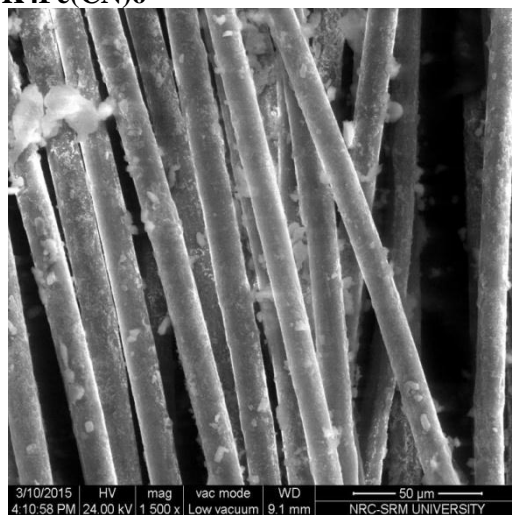


Fig.2 The SEM image for polymer after coating/plating

The image obtained and presented for polymer after the coating in **Fig. 2** indicates a high deposition of copper material around the surface of the polymer. The copper is scattered and deposited on the surfaces in which the deposition is highly dense and rough around the surface.

3.3 POLYMER MATERIAL AFTER COATING (SAMPLE C) IN THE BATH CONTAINING POTASSIUM FERROCYANIDE $K_4Fe(CN)_6$

The SEM image obtained of the polymer material after the coating in **Fig.3** below indicates smooth and regular deposition of copper throughout the surface of the polymer material. The copper is scattered at regular and same level while the

deposition of copper on the surfaces is smoothly achieved.

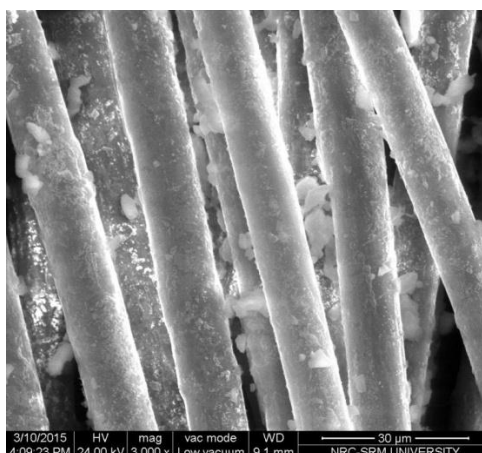


Fig.3The SEM image obtained for polymer fiber after courting. (in the bath that, contains potassium ferrocyanide)

3.4 THE EDS RESULT FOR POLYMER MATERIAL BEFORE COATING (SAMPLE A)

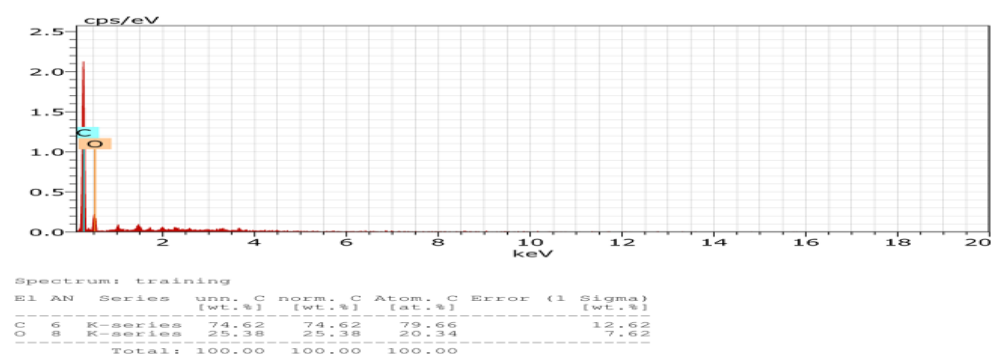


Fig. 4

According to the (EDS) result above in **Fig.4** obtained from fresh polymer shown that, only carbon peak and oxygen are present which are the main elements constituting the polymer fiber material, Oxygen at 25.38 % and Carbon at 74.62 % making 100%.

3.5 THE EDS RESULT FOR POLYMER MATERIAL AFTER COATING (SAMPLE B) IN A BATH WITHOUT POTASSIUM FERROCYANIDE(FIG.5)

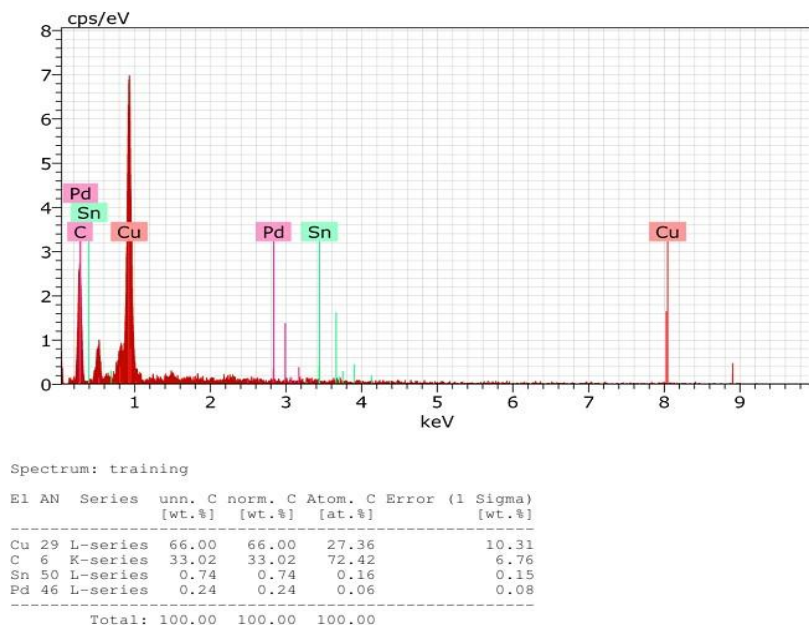
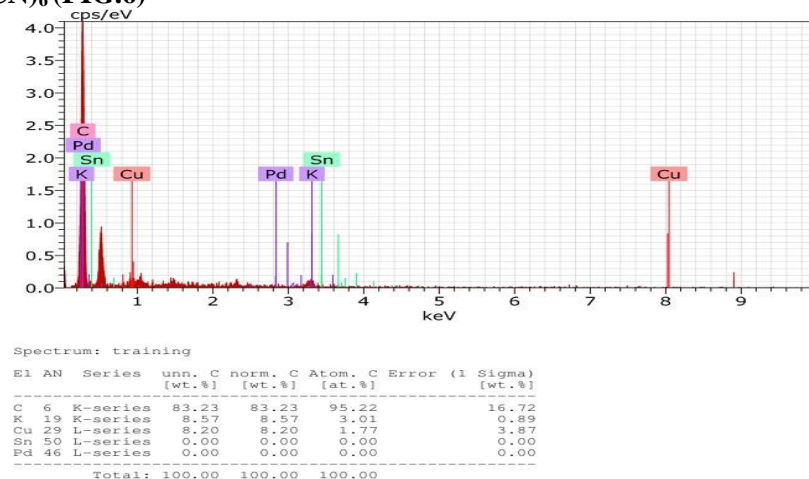


Fig. 5

The EDS result in Fig.5 above shown the presence of the copper with high percentage of 66% which confirms high deposition of copper on to the surface of the polymer material. However, this is due the irregular and dense deposition in some areas on the surfaces of polymer.

3.6 THE EDS RESULT OF POLYMER MATERIAL AFTER COATING (SAMPLE C) IN A BATH CONTAINING POTASSIUM FERROCYANIDE $K_4Fe(CN)_6$ (FIG.6)



The percentage of copper which is just 8.20% in EDS result (Fig.6) above made it clear that, the deposition of copper on to the surface of the polymer material in the presence of potassium ferrocyanide in the bath was less in amount compared with other result of sample (B). this is simply because the deposition on the sample (C) is moderate and the electroless copper bath is stabilized addition of potassium ferrocyanide.

4.0 CONCLUSIONS

The result analysis using SEM and EDS shown that, the deposition of copper materials on the polymer surface was uniform and smooth due to the presence of potassium ferrocyanide which acted as stabilizer in copper electroless bath while in the absence of potassium ferrocyanide, the electroless copper plating on the polymer material surfaces were rough, broad and irregular with higher dense deposition of copper around the surfaces. Generally, potassium ferrocyanide reduces the rate of deposition of copper but at the same time stabilizes the process and made the coating uniform, regular and smooth on the surface of the material. However, the result in the other media (electroless copper bath without Potassium Ferrocyanide) the coating appeared to be irregular, broad and there is high deposition of the copper metal on some areas on polymer surface. In summery potassium ferrocyanide $K_4Fe(CN)_6$ is not poisonous and acted as accelerator and stabilizer in the electroless copper bath because it is a complex compound containing cyanide as well as iron while potassium cyanide (KCN) is poisonous and acted only as accelerator in which the process lack control due the instability of the bath which resulted an irregular deposition of copper on the polymer surface and at the same time made the electroless copper bath solution poisonous.

5.0 RECOMMENDATIONS:

- 1- Potassium Ferrocyanide $K_4Fe(CN)_6$ should be used in electroless copper plating bath to prevent irregular and rough coating instability in the system.
- 2- Potassium Ferrocyanide $K_4Fe(CN)_6$ should be used in electroless copper bath instead of Potassium Cyanide KCN which is poisonous in nature.
- 3- Further research should be conducted on other complex compounds of cyanide to investigate their effect in electroless copper bath.
- 4- There should be a collaboration between higher institution of learning and industries in research projects and SIWESS.

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**CHALLENGES OF PRE-SERVICE SCIENCE TEACHERS DURING
TEACHING PRACTICE: BASIS FOR TEACHING PRACTICE
ENHANCEMENT**

¹MUSA MOHAMMED AND ²MAHADI G. DOKA

**^{1&2}DEPARTMENT OF CHEMISTRY,
FEDERAL COLLEGE OF EDUCATION (TECH.), BICHI
KANO NIGERIA**

ABSTRACT

The study assessed the challenges of pre-service science teachers during teaching practice course. Lesson observation was conducted on the pre-service science teachers while teaching Basic science subject at Basic education levels. The study employed descriptive survey design and the result revealed 68.70%, 43.80% and 58.30% of the pre-service teachers have challenges in some teaching skills such as class control, use of activities to facilitate learning and time management respectively. However, 71.90% occasionally showed fairness and inclusiveness in their interactions. The study attributed the challenges to the inability of the pre-service science teachers in relating theory lessons learnt to real classroom teaching and inadequate assistance from mentors in the classroom environment. Some suggestions such as pre-teaching workshop and more synergy between Colleges and mentors' school should be encouraged for better enhancement of teaching practice.

Keywords: Teaching practice, pre-service science teachers, teacher education, teaching skills.

INTRODUCTION

Science education is an essential training for attitudes, skills and knowledge for individual and societal development. In Nigeria, Colleges of education are among the teacher education institutions saddled with training of teachers. The mandate of the teacher training programme at the NCE level, which is the recognized minimum teaching qualification in Nigeria, is to produce quality teachers for the Basic Education level.

Teacher quality concerns the inputs that teachers bring to school including aptitude, professional preparation and prior professional work experiences (Tok, 2010). Teaching quality refers to what teachers do to promote students learning inside the classroom. It includes creating a positive learning environment, selecting appropriate instructional goals, and assessments, using the curriculum effectively, and employing varied instructional behaviors that help all students learn at higher levels.

The quality of teachers depends on the knowledge and skills acquired during the teacher education programmes. Nurcan & Mustafa (2015) emphasized that what student (pre-service teacher) learn in schools is directly connected to what and how teachers teach, which in turn depends on the knowledge and skills gained during teacher education programmes, and one of such essential programmes is teaching practice.

Teaching practice is an indispensable component of teacher education programmes, in which final year students of Colleges of education observe mentor teachers in real

classroom. This is where student teachers experience actual teaching and culminate experience, which allow them to link theoretical knowledge and practical skills or the art of teaching (Gonca & Burcak, 2016; Tok, 2010). It helps pre-service teacher to integrate into teaching theoretical knowledge and skills gained during the teacher education course. Evidence in the literature (Nurcan & Mustafa, 2015) have shown that success of teachers does not only depends on theoretical knowledge, but also on practical experiences. This informed the focus on classroom practice where practical experiences take place, to study the challenges of pre-service science teachers in real classroom environment during teaching practice.

OBJECTIVE OF THE STUDY

The main objective of the study is to investigate empirically the challenges pre-service science teachers are facing in classroom interactions during teaching practice in some selected junior secondary schools in Bichi Local Government Area of Kano State, Nigeria.

RESEARCH QUESTION

Specifically the following research question was raised to guide the study; “What challenges are pre-service science teachers facing in the classroom interactions during teaching practice?”

RESEARCH DESIGN

The study employed a descriptive survey research design which dealt with the personal characteristics and qualities related to teaching skills. The research instruments are modified lesson observation questionnaire and preservice science teacher’s lesson plans. The lesson observation instrument was developed by NCCE/TDP (2016) for assessing student teachers qualities/skills in teaching. The instrument consist of teaching qualities/behaviors determined by four points scale ranging from frequently observed (i. e. Behavior observed more than four times) = **1**, occasionally observed (i. e. Behavior observed three or four times) = **2**, rarely observed (Behavior observed once or twice) = **3** and **4** = Behavior not observed. The instrument was validated by two experts’ contributions. The study also used the pre-service teachers’ lesson plans as a source of data. The data were analyzed using frequency counts percentage.

RESEARCH POPULATION

The population of the study was all the 320 pre-service science teachers of the school of secondary education (science), Federal college of education (Technical), Bichi who participated in teaching practice during the 2019/2020 academic year. The random sampling was used in selection of thirty two (32) pre-service science teachers posted to some junior secondary schools in Bichi local Government Area as the participants. The participants taught Basic science at their schools of teaching practice training. During the training, the participants (lesson observation) and their lesson plans were observed by the supervisors and one of the researchers.

DATA ANALYSIS AND RESULTS

The results of the lesson observation conducted are presented in Table 1 below under five categories of teaching behaviors/skills namely; Lesson planning, presentation and pedagogy, classroom management, relationship with learners and evaluation.

Table 1: Result (number and %)

S/N		1	2	3	4
	Lesson planning	Frequently observed	Occasionally observed	Rarely observed	Not observed
1	Teacher has prepared a lesson plan	3(9.40)	20(62.50)	6(18.70)	3(9.40)
2	Lesson objectives clearly and fully stated	3(9.40)	6(18.70)	4(12.5)	19(59.40)
3	Clear steps for lesson presentations	2(6.30)	5(15.60)	3(9.40)	22(68.70)
S/N	Presentation and Pedagogy	1	2	3	4
1	Teacher introduces and give a quick overview of the topic	6(18.70)	16(50.00)	10(31.30)	0.00
2	Teacher makes reference to the prepared lesson plan	4(12.50)	5(15.60)	9(28.10)	14(43.80)
3	Teacher uses variety instructional materials	19(62.50)	9(28.10)	3(9.40)	0.00
4	Teacher uses activities to facilitate learning	4(12.50)	6(18.70)	14(43.80)	8(18.70)
5	Teacher uses variety of instructional strategies	13(40.60)	12(37.50)	5(15.60)	2(6.30)
6	Teacher manage time well	9(28.10)	5(15.6)	0.00	18(58.30)
7	Teacher encourage pupils questions/participations	19(59.40)	10(31.30)	3(9.40)	0.00
8	Teacher talking to whole class	22(68.70)	6(18.70)	4(12.50)	0.00
9	Mastery of subject/topic content	10(31.30)	4(12.50)	18(56.30)	0.00
10	skillful use of teaching Board	20(62.50)	12(37.50)	0.00	0.00
S/N	Classroom management	1	2	3	4
1	interruption to lesson	0.00	22(68.70)	3(9.40)	7(21.90)

2	Reinforcement for learners	26(81.10)	6(18.70)	0.00	0.00
3	use of cane/physical forces/threats	0.00	0.00	2(6.30)	30(93.70)
S/N	Relationship with learners	1	2	3	4
1	use of learners name	20(62.50)	12(37.50)	0.00	0.00
2	Fairness and inclusiveness in the interactions	9(28.10)	23(71.90)	0.00	0.00
3	Responds to individual learner	22(68.70)	10(31.30)	0.00	0.00
4	Role model behaviors in dressing and attitudes	17(53.10)	13(40.60)	2(6.30)	0.00
S/N	Evaluation	1	2	3	4
1	Teacher walks round the class checking understanding	9(28.10)	23(71.90)	0.00	0.00
2	Teacher uses variety of assessment techniques	3(9.40)	7(21.90)	22(68.70)	0.00
3	Teacher encourage learners to ask questions	2(6.30)	11(34.40)	19(59.40)	0.00
4	Teacher checks the achievement of lesson objectives	13(40.60)	19(59.4)	0.00	0.00
5	Teacher gives relevant task and assignment	10(31.3)	22(68.70)	0.00	0.00

DISCUSSION OF FINDINGS

Lesson planning: The results under lesson planning, showed higher percentage (62.50%) of the participants have good record of lesson plans, but the statement of lesson objectives and the steps for the lesson presentation of 59.40% and 68.70% of the pre-service teachers need improvement respectively. It was also observed from the lesson plans that, five to seventh weeks in to the teaching practice 59.40% of the pre-service teachers' lesson plans showed no comments or corrections made by either school mentors or college supervisors. This indicated the level of the treatments received by some preservice teachers during teaching practice. Thus, may be one of the reasons for the flaws found in the pre-service teachers lesson planning.

Planning a lesson is what a teacher should do even before getting to the classroom. It guides what to teach, how to teach and how to evaluate the lesson. It helps to enable the student teacher, the supervisor and the mentor teacher to assess whether the student teacher have realized their objectives. It also gives inexperienced student

teacher a feeling of self-confidence (Olaitan & Aguisobo, 1981). In this study, the cause of the observed challenge in planning may be related to the insufficient support received from the mentors and supervisors. Study by Gokce & Demirhen (2005) reported school mentors and College supervisors' inadequate support in developing lesson plans. Many educators concord on lack of time as their reasons for not attending pre-service teachers (Nurcan & Mustafa, 2015). Study by Tok (2010), reported that student teachers did not talk with their mentors about their lesson plans before their teaching.

Lesson presentation and pedagogy: The observations under the lesson presentation and pedagogical skills revealed the percentages (59.40, 68.70, 62.50 and 62.50 %) of the pre-service teachers frequently encouraged pupils' participations, talked to whole class, and skillfully used teaching board and instructional materials respectively. However, 43.80% of the teachers observed, rarely use activities to facilitate learning and also effective time management was not observed by the majority (58.30%) of the pre-service teachers. This indicated a challenge, which may be attributed to the pre-service teachers weaknesses in effective lesson planning observed. According to Tok (2010) making plans help student teachers to use time effectively. The study, observed the inefficiency of the pre-service teachers in time management from the lists of activities and tasks to accomplish, but time doesn't allow them to achieve.

Also the rarely observed use of activities to facilitate learning, entails a challenge in qualities required for teaching science; encouraging activities teaching and learning instruction is the recommended skills in science instruction needed for a paradigm shift from the traditional method of instruction to the learner centeredness. Teaching using activities approach motivates pupils to learn and remember what is learnt when there is a recall. In agreement, Okeke, (2007) reported, that students achieve better in science when taught through activity based approaches. However, it requires appropriate space and physical resources for the exploration to take place and since most of the schools don't have such facilities, this makes teaching complicated and difficult. Probably the reasons for the rarely observed used of activities in the study.

Classroom control or management: In classroom control, the observation showed high percentage (68.70%) of the teachers have problems in classroom control due to the occasionally observed disruptive behaviors that occurred in their classes. The study attributed the occasionally disturbances observed to the inadequate experience of the pre-service teachers and the overcrowded nature of the classes. This goes with Morses's study (1994) that congested classroom increases the probability of disciplinary problems and leads teachers to follow a traditional methods of instructions.

However, despite the distractions in the classes, the study does not observe the use of cane, physical forces or threatening behaviors (100%) in controlling the challenges. This is encouraging due to the side effects of the use of cane or force on students, especially physical punishment, which prevents the emergence of various creativity, innovative thinking and achievements of learning (Mohammed, 2011). The imposition of punishment has presented a very little impact, and when the punishment is absent, the punished student returns to his first behavior, perhaps in stubbornness or

in reaction act of his punishment. In fact, the consequences of punishment by teachers in front of children always leave bad memories.

The ability of a teacher to organize classroom and manage the behavior of their students is critical to achieving positive educational outcomes (Tok, 2010). The study also attributed the effects to the inadequate preparations of lesson planning and professional development of the pre-service teachers. Planning helps teachers in time and class control effectively. Olaitan & Agusioba (1981) emphasized that planning produces a smoothly running of classroom with few discipline problems and fewer interruptions.

Relationship with learners: it can be observed from Table 1 that, 62.50% of the pre-service teachers addressed their learners by names, 68.70% respond to individual learners frequently and 71.90% of their interactions were occasionally fairness and inclusiveness. This indicates supportive interaction and interestingly demonstrated some qualities of a role model teacher, which is not surprising from a student of teacher education programme. The behaviors agrees with the belief, that bias leads to lack of objectivity and fairness and Unbiased behaviors leads to friendship, love, trust and increases students' interactions with teachers and with each other. This agrees with Wayman (2002) who stated that, students' alienation from school is a major cause of dropping out and poor teacher – students' relationships.

Evaluation: Another challenging area observed was evaluation. Though 71.90% of the pre-service teachers were frequently observed checking understanding by walking round the classroom. However, 68.70% and 59.40% rarely uses variety of assessment techniques and checking achievements of lesson objectives respectively. This was also observed in the pre-service teachers' lesson notebooks, where class activities/works, assignments or home works were rarely indicated. Teacher educators insists that their preparation programmes teach classroom evaluation skills, but the indication is that such skills are not taught thoroughly or with adequate supervision in real classroom (Nurcan & Mustafa, 2015). Many teacher educators reported inadequate training of the pre-service teachers and little assistance from mentors and supervisors in establishing productive classroom environment (Baker, 2005). Thus, classroom practice where practical experiences takes place should not be underrated. Hence, all stake holders in education should consider ways of addressing teaching practice challenges for better enhancement.

CONCLUSION

Pre-service science teachers were observed (Lesson observation) during teaching practice course and the main areas of challenges identified include lesson planning, use of activities to facilitate learning, time management, classroom control and uses of variety of assessment techniques in lesson evaluation. Many of these challenges can be related to the pre-service science teachers' inability in relating theory lessons learnt to real classroom teaching and the inadequate assistance from mentors or supervisors in the classroom environment. Therefore, there is no doubt that experience in teaching is considered the most important element for a teachers, besides other elements such as preparation and use of teaching materials.

RECOMMENDATIONS

To enhance pre-service science teachers competencies in teaching the following suggestions are proffered for consideration;

1. More cooperation/ synergy between Colleges and mentors' school should be made to discuss thoroughly on the selection of mentors with teaching experience and who can provide the best mentoring to the pre-service teachers.
2. College/teaching practice coordinator should take into consideration the importance of teaching practice by providing all that is required for effective supervision on time and appropriate sanction should apply to supervision defaulters.
3. College/teaching practice coordinator together with the internship supervisors should take into consideration the observations/suggestions of cooperating teacher (mentor) in handling the next batches of the pre-service teachers in teaching practice.
4. Workshops should be conducted for pre-service teachers before teaching practice period to discuss some important criteria in teaching skills. This will increase performance and reduce pre-service teachers' anxiety in teaching.
5. It's vital for teacher education programmes to make connections between theoretical and methodological issues.
6. Study should be conducted on the student teachers' challenges in other schools and colleges, and involving other variables.

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MENTOR AND TRAINEE ISSUES IN TEACHING PRACTICE

¹ABDULMUMIN MALAM USMAN,

²HADIZA MUHAMMAD IBRAHIM,

³SHAIBU O. SALIHU

&

⁴OTARU FATIMA OYISA

^{1,2,3,&4}DEPARTMENT OF CHEMISTRY

FEDERAL COLLEGE OF EDUCATION (TECH) BICHI

ABSTRACT

In this paper, a criteria was adopted to report on the findings of the study conducted with teacher trainees from the Kano metropolitan, Kano state in North Western region of Nigeria. The challenges and prospects of teaching practice programmes was reviewed. A case study method in the form of qualitative descriptive research was used for the methodology and design of the research. A sample of 2 out of every 5 teacher trainees who had spent a minimum of 2 years from different tertiary institutions was randomly selected. The data analysis was based on research questions and guided by the theoretical framework of the study. The findings reveal that teaching practice for the 21st century is plagued by challenges that affect the success of the programmes. Some of the challenges identified are that teacher trainees use wrong criteria to select practice schools, teacher trainees are not adequately prepared for teaching practice, mentors are not sufficiently involved in teaching practice because they lack knowledge of mentorship, and the assessment and awarding of teaching practice marks are subjective.

INTRODUCTION

The fact that teaching practice is an exercise that is carried out by most colleges faculties of education in Nigeria and the rest of the world and is considered a necessary and valuable activity for the qualifications of an envisaged teacher, means that it needs to be conducted effectively. Over the past decade, considerable attention has been focused on exploring meaningful ways to prepare pre-service students for the teaching profession. With increased demands being placed on teachers to meet the needs of diverse students and to design classrooms and use methods of teaching that are learner-centred, the work of teaching has become more complex. Hence universities and colleges of education are exploring new approaches to teacher education. As most of the influential pedagogies in teacher education are those relating to supervised field experience, there is a need to study new models or improve existing models on how to assist pre-service teachers in the transition from the role of students to the role of beginning teachers.

STATEMENT OF THE PROBLEM

The challenge of education has never been as great as it is today. These challenge include the requirements for capable graduate teachers, the educational policies of government and changes in socio-cultural values. All contributed to the demands placed on teachers for the benefit of Nigerian society (Hinchcliffe 2001). Teacher education studies, however, attest to a disparity between the theory of pre-service

teacher programmes and the practice in the workplace (Cochran-Smith 1999; Cochran-Smith et al. 2011). Consequently, one of the main criticisms levelled at teaching practice is its purported inadequacy in enabling students to bridge the theory-practice gap (Kalantis et al. 2003). As the role of teachers has grown to include consultation, collaborative planning and other kinds of joint work (Hargreaves 2000, 2012), there is a need for effective teacher education and relative teaching practice capable of bridging the gap between theory and practice.

LITERATURE REVIEW

Teaching practice in the 21st century is considered to be one of the most influential aspects of pre-service teacher education (Haigh 2001). McGee and Fraser (2001) emphasise that it is in teaching practice that student teachers are baptized with the experience to gain knowledge of how teachers go about the many and complex task involved in actual classroom practice. In as much as teaching practice is important in preparing pre-service teachers, it is not an easy path to take. Broadbent (1998) sees teaching practice as the most challenging experience for student teachers in the teacher education programme. In view of this challenging and problematic nature of teaching practice, it has in recent years initiated a significant increase in research studies on how the existing gap between theory and practice can be breached and on how the practice can best be undertaken. This is done in order for the practical context of teaching practice to be better established as it is believed to be the avenue that provides teachers with the ability to create successful teaching-learning didactical relationships in their classrooms (Tambo 2005). The need for teaching practice prompted to indicate that teaching practice provides the much-needed avenue and time frame for student teachers to actually apply their interactional classroom skills in an attempt to change their behaviour or teach something new (Bruner 1996). According to Ezewu et al. (1994), the term “teaching practice” has been accepted almost universally and uncritically by all concerned with the preparation of teachers and its use has embraced all the learning experiences of student teachers in schools.. Samuel (2010) expands on the lineage, and refers to teaching practice as far back as the first model of teacher education, the master-apprenticeship model, in which the novice teacher learns best through behavioural modelling, through imitating the expert teacher. The recent and universally accepted terminology of teaching practice forms part of the dominant model of teacher training in South Africa established prior to the demise of apartheid, namely the applied science model which states that the novice teacher must first learn the theoretical basis of the discipline and then seek the context within which he or she will enact and apply the theory in practice (Samuel 2010). This model is also dominant in many other professions. According to Lewin and Stuart (2003), the model presumes that knowledge of the discipline base will provide the foundation for practice. According to Cohen et al. (2001), since the establishment of training colleges in the middle and late 19th century, teaching practice in one form or another has remained an unchallenged, essential element in the preparation of generations of teachers. Unchallenged, that is until quite recently, the concept of teaching practice has been subjected to close scrutiny and found to be somewhat anachronistic and ambiguous. In the ambiguity of teaching practice, it has three major connotations. The first is the practice of teaching skills and assuming the

role of a teacher. This embraces the whole range of experiences that students go through in school and the practical aspects of the course as distinct from theoretical studies which we presumably have in mind when we first speak about a student's teaching practice mark. The second is when we describe a student as being on teaching practice. And the third is when we encourage the need to integrate theory and practice in the education of teachers.

RESEARCH QUESTIONS

This paper was written under the guides of the following research questions: 1. What are the challenges in the management of teaching practice in the North Western region of Nigeria? 2. What are the strategies to curb the challenges inherent to the exercise?

RESEARCH DESIGN

This study was based on a descriptive qualitative research approach. Qualitative research was viewed as a preferred approach to this study as it provided the researchers and the study with an opportunity to understand the social phenomenon of the participants' perspectives on the issues in the teaching practice. A sample of 20 student teachers was selected randomly from 200 student teachers who have spent a minimum of 2 years at the teachers training institution.

METHODS

Fifteen (15) mentors to the 20 student teachers were purposefully selected based on the criteria of being mentors to student teachers for at least two years. The participating schools of the respective mentors to the student teachers automatically became part of the study. Five (5) supervisors from the teachers training institution were selected based on them being assessors to the randomly selected 20 student teachers. Two broad processes of data collection were used. The first was the collection of theoretical data which was done through a literature study. The second was the collection of the empirical data in which the researcher used document analysis and in-depth individual interviews were conducted with mentors and college assessors and with student teachers on the challenges they experienced as they undertook their roles in teaching practice. The focus was on the split of the challenges into two parts: those challenges in the organization of the practice and those in relation to the participants in the practice. Observations were made about live classroom situations of student teachers to evaluate the nature and extent of mentor assistance and the relationship with student teachers. Documents such as student teachers' portfolios, assessment forms, permission letters and practicing schools' reports on teaching practice were reviewed for information relating to the challenges of teaching practice.

DATA ANALYSIS

The procedure began with the naming and categorization of phenomena through close examination of data. As such, the movement from one stage of analysis to another was a gradual and critical process as the bulk of the analysis took the form of written language.

ETHICAL CONSIDERATIONS

The researchers had a moral and professional obligation to be ethical and objective, even when research subjects were unaware of or unconcerned about ethics (Neuman 2003). Adhering to this, the researchers ensured that those being interviewed were absolutely clear about their right to an explanation of aims, procedures, purposes, and consequences of the research, publication possibilities and the right to refuse to take part or withdraw at any stage. The participants were given the confidence to make the decision of acting voluntarily and making their decisions based on the fullest possible information (Briggs & Coleman 2007). The researchers protected participants from harm and violation of privacy, while at the same time maintaining the integrity of the research and its ethical standards. Participants were informed that they may withdraw their participation at any time without any penalty to them.

RESULTS AND DISCUSSION

Challenges in the Management of Teaching Practice in the North- Western part of Nigeria

PREPARING FOR TEACHING PRACTICE:

One of the most crucial factors in the teaching practice situation for the student teacher is lesson preparation. That is finding as many possible strategies for formulating aims and objectives purposefully, selecting appropriate content, deciding on the best method of presentation, and writing actual lesson notes. This stage is considered crucial but can be much easier if a student teacher has studied his teaching concepts effectively. Farrant (1990) observed and recognized teaching practice and confirmed that all practice teaching, as far as student teachers are concerned, is in a sense experimental and as such requires thorough lesson preparation beforehand if it is not to be a waste of time. And this preparation starts off with observation.

In the case of teacher education in the North-Western part of Nigeria, most of the participants indicated to have had theoretical lessons at the colleges in modules that oriented them regarding professional studies toward becoming teachers before going out on teaching practice. This indicates that preparation is done before teaching practice.

A participant indicated thus, “We were taught in modules in the colleges on teaching strategies, portfolios, and how to design a lesson plan before we went out on teaching practice.” Another participant indicated that “after being taught in the colleges on the theory of how to teach, my first outing for teaching practice was for close to a month in which I only did observations and then teach in my practicing school.” Supporting this view, Jenkins et al. (2005) confirm that preliminary observation is essential for effective planning of teaching practice as this affords the student teacher a quick means to get acquainted with his or her task and then to know how to tackle it continuously. Despite the indication of a variety of strategies used to prepare student teachers for teaching practice, some of the participants still felt that the preparation was not enough for the experience in the field. A participant expressed dissatisfaction with the preparation of teaching practice. Thus “we were actually taught in the colleges before going out on teaching practice, but what I saw out there was completely different from what we were taught; the theory does not match the

practice; I was embarrassed. I think we are not properly oriented as to the expectations in the practicing schools. Worse still, I did not even have time for preliminary visits and observations.” Supporting this contention, many of the participants responded thus, “Yeah!! He is right.” To make this opinion clear, another participant indicated thus, “I was asked to start teaching on the second day I stepped my foot in the practicing school without having enough background information on what was going on in the school.” To emphasize the need and importance of observation in preparing for teaching practice, Houston (2007) mentioned that a student teacher can learn a great deal from such expert knowledge and personal experience while on observation. Smith, (2002) confirms that observation provides students with ingredients for the preparation of lesson plans and lesson notes. Participants’ responses reveal without a doubt that the preparation of student teachers for teaching practice has its challenges. These challenges are seen to originate from the different stages of the process, i.e. from the colleges to the practicing schools. The content of the modules in the theoretical preparation is lacking as regards teaching practice as a core topic. General orientation to teaching practice which is different from the theoretical preparation is inadequate. The next stage of the process which is at the practicing schools is also challenged. Staff at practicing schools lack orientation in the activities and procedures to be undertaken by student teachers while on teaching practice. This is why student teachers are allowed to teach immediately they arrive there without having experienced observation. An analysis of records of lessons taught confirms that student teachers start teaching upon arrival at practicing schools.

MENTORS’ INVOLVEMENT AND PARTICIPATION IN TEACHING PRACTICE

Mentors, also commonly called cooperating teachers, are generally considered to be the holders of more knowledge and are supposed to share that with student teachers. But this does not mean that they too can’t learn about certain aspects from student teachers. Of course real teachers are lifelong learners. That is why mentors are supposed to create a rapport with students that will ease a two-way helping communication. Haigh (2001) says that “mentors are expected to promote the confident practice of student teachers and acknowledge themselves as learners”. McGee and Fraser (2001) in their working with teachers in practice assert that “mentor teachers are responsible for the instructional programme and also for guiding the activities of the student teachers”. Therefore to function as a mentor, one must be qualified and experienced in the teaching field. Although some participants affirm that mentor teachers are effective in the undertaking of their roles of guiding, directing and providing professional and emotional support to student teachers during teaching practice, the findings further reveal complaints that mentors are ignoring and abandoning student teachers to themselves while on teaching practice, thus increasing their workload (Fletcher & Barrett, 2004). A review of leave application documents by educators during an academic year of practicing schools reveals that most teachers (mentors) applied for and were issued leave while student teachers were at their schools (Gravett & Geyser 2009). This indicates that student teachers are seen as relieving some of the workload at no extra cost. This finding is further confirmed by

interviews with supervisors who indicate to have hardly met mentors of students when they visited the schools to assess students. Notwithstanding, the paper further reveals that mentors are stereotyped and subjective in allowing student teachers to try new teaching strategies in their classrooms, especially those that they are not knowledgeable about. It is for this same reason that some mentors indicate that student teachers are contributing to the drop in performance in their schools (Dolan, 2012). A participant indicated that “my mentor was very supportive; he always motivated and guided my practice. He was very consistent during my lessons and he gave me proper orientation throughout my practice.” Another participant indicated that “my mentor did not do anything to help me; he was hardly around while I presented my lessons. He abandoned the class and his entire workload to me when I arrived. It was the principal who from time to time assisted me.” The view of this participant was further confirmed when the researcher assessed the portfolios of most of the student teachers which contained assessment forms to be completed by mentors. This revealed that most portfolio files had forms not completed by mentors. Another participant respondent portrayed some mentors as not qualified for the role. “My mentor did not seem to know what she was doing; she instead helped to frustrate and confuse me; she even embarrassed me in front of the learners when I tried out something she was not familiar with in the learning area; we never had any constructive discussions after my lessons; all she did was criticise everything without orientating me as to how to do it properly.” Hsu (2005) mentions that weak mentors deny student teachers the opportunities to learn potentially powerful lessons. Combined efforts of key mentors, a supportive environment, a reflective mentoring process, and peer support contribute to the overall success of student teachers.

ROLES OF INQUEST FOR SUPERVISORS DURING TEACHING PRACTICE

Supervision is inevitable in any teaching practice exercise. It is where correction and motivation are given to student teachers which in turn cause the lesson to be a success. Student teachers build a firm and better base for their teaching experience from the feedback of supervision. Wenger (1998) and Korthagen, (2004) mentions that it is through the supervisory process that student teachers begin to construct their personal knowledge and theories about teaching practice. Undoubtedly, supervisors are also responsible for organising critique sessions at the end of the day showing the students’ weak points and suggesting changes that will work. Supervision was viewed by Cohen et al.(2002) as a key part of the work of associate teachers engaged with student teachers by virtue of their expertise and experience to help them develop new professional knowledge and skills as well as to improve and change practice. This paper reveals that supervisors are not consistent in their duties as supervisors. Participants’ responses reveal that lecturer supervisors from the colleges do not pay regular visits to practicing schools. Student teachers indicated to never have been visited by any supervisor not even once, and yet their visits and roles contribute heavily to the success of the practice. A review of the assessment forms in the portfolio files of student teachers further confirms this opinion as most of the participants’ files had lecturer assessment forms which are not completed. A participant was recalled to have indicated that “I was never supervised or assessed by

any lecturer from the college; well, for the person who was supposed to assess me from the college, he called that he is coming and wanted to know where my school is situated and when I told him, he said it's too far and that was the end of the story." This response revealed that the distance to the practicing school may have an impact on the teaching practice.

LOCATIONS OF PRACTICING SCHOOLS

Most student teachers affirmed that they are undertaking their practice in remote areas which are a far distance from the college. The impact of the location of these schools on teaching practice is that those student teachers who complained about never being assessed by lecturers are those practising from distant schools. Apart from lecturers not assessing student teachers in distant schools, other potential dangers in these schools include a lack of human resources to train these student teachers as expected by the programme. Some of these schools are understaffed and lack adequate infrastructure. With all these disadvantages in some of these schools, what would prompt student teachers to want to practise in these schools? Probably because the criteria those student teachers choose in selecting schools to undertake teaching practice are poor.

CRITERIA FOR SELECTING PRACTICING SCHOOLS

The findings of this paper indicate that most student teachers select practicing schools based on familiarity with the area and staff of the school and that this familiarity is a criterion for selecting practicing schools. And this is not because they think the schools are well resourced and equipped to render the best of the practice. Others select practicing schools based on job opportunities; that is the hope of working in the schools upon completion of their studies. A background check on the student teachers and their respective practicing schools reveals that most student teachers undertake teaching practice in their home areas, and for those who live on campus residences and are from other provinces of the country they select schools that are close to the college. A participant responded with, "This is where I grew up and I am familiar with the teachers in this school because this is where I schooled; I want that and if I can be recruited after teaching practice, let it be here; also, I don't need transport to school because it is close to where I live." These criteria indicate a complete lack of consideration for training college's proximity to the college (which is why some don't make it) and the need for good mentors to see that the objective of the practice is achieved. It also fosters a lack of objectivity in mark allocation as mentors and student teachers are bonded in an unfamiliar relationship to the practice. Rather, practicing schools should be selected based on the required qualities to enhance the practice.

CONCLUSION

Effective teaching practice is in constant practice. It is therefore the foundation of teaching. Hence a teacher who had practiced teaching skills while on practice is likely to teach better. Teaching practice is real professionalism in the training of teachers. It is the avenue to what is referred to as active learners' participation in problem-solving in outcomes-based education. Learners encounter live experiences in teaching. In

Nigeria, no student gains his or her certificate as a teacher without successfully going through the process of teaching practice. Teaching practice at the colleges and Universities in Nigeria is carefully and well designed to meet the goals of teaching nationwide. Despite the good structuring of this practice, it is being ruptured by some challenges which are hidden and need to be unveiled. Much has been done within the schools and faculties to curb most of these challenges affecting teaching practice as in the building of a good relationship between universities and practicing schools. But much still has to be done in relation to the findings of this study and in line with the recommendations proposed. Otherwise, there is most likely the possibility of a collapse in effective teaching practice in the future.

RECOMMENDATION

Approaches to coordinating, managing and redesigning teaching practice should be enforced and revised to take account of the challenges that student teachers, mentors and practicing schools face as they undertake teaching practice.

Selecting Practicing Schools

Practicing schools should be selected taking into consideration the availability of well trained and disciplined staff and students who will mentor learners according to the expected outcomes of teaching practice. Once a practicing school is well disciplined and has well-trained staff and resources, most of the other aspects of the practice will fall into place. The choice of a poor or perhaps trapped school for teaching practice risks exposing student teachers to numerous challenges ranging from poor mentoring to a lack of cooperation and support. It is therefore recommended that the criteria for selecting practicing schools be the responsibility of the college and not student teachers.

Provision of Training to Mentors

Mentors of student teachers during teaching practice should receive training in their mentorship responsibilities. Not only should mentors be trained, but all those involved in the management of teaching practice should be trained as regards to their responsibilities. Student teachers should be further oriented as to the expectations of teaching practice before they set out on teaching practice.

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**MODELLING OF SOIL RESISTIVITY, DRILL DEPTH AND OVERBURDEN THICKNESS IN PREDICTION AND VALIDATION OF SINKING PRODUCTIVE BOREHOLE
DR. AMOO, P. AKINSANYA
DEPARTMENT OF PHYSICS
EMMANUEL ALAYANDE COLLEGE OF EDUCATION, OYO**

ABSTRACT

Portable water scarcity has constituted a big challenge in Ogbomoso city as a result of increase in population of inhabitants and abandonment of public water supply on the part of government. In view of this, general public have resolved to find alternative means of drilling boreholes to cater for their needs. This study developed models taking into consideration factors that are vital in prospecting for underground water such as borehole depth, overburden thickness and soil resistivity among others. Existing data from 104 boreholes were gathered and the aforementioned three parameters from existing wells were modeled to estimate depth and lithological thickness once resistivity is known. The two equations (models) can be used especially to estimate borehole depth and validate it, in and around the study area of Ogbomoso. Statistical was used in the analysis of data pooled from all the wells visited and the result obtained showed that both borehole depths and soil resistivity are moderately correlated with correlation coefficient of 0.31. In the study area, two models were developed, same was tested and it was established to be okay though with minimal error, it is recommended that the models should be used after survey work has been carried out and correlate model results with that of geophysical survey carried out by the geologist.

INTRODUCTION

Huge population spike, industrialization and urbanization in several towns and cities round the world have caused greater demand for clean and safe water for domestic or residential use (Halie & Semir, 2016). Apart from the fact that living things rely on water for survival, it is considered to be food as well as an essential part of life as human beings can survive without food but not without water for some time. Portable water is indispensable in that it is also needed for other purposes such as in agricultural practices, recreational activities, industrial uses and many more. Essentially, water from various existing dams (water works) is abundantly available but it has become moribund over the years for obvious reason which is largely due to government attitudes towards its treatment and incessant power failure which hinders treated pipe-borne water to be pumped by making it available to the entire populace. As a result of its vital needs and essentiality, groundwater is sourced to provide an alternative excellent water quality free of impurities, water-borne diseases, contaminants and poisonous dissolved salts which could pose danger to human well-beings. Groundwater can be simply described as hidden water that is stored below the ground, the presence of a number of dissolved salts makes it to be conductive and it is somewhat comparable to water on the surface such as in pools, rivers, streams and even lakes which moves downward the soil under the influence of force of gravity though not freely as obstacles and barriers are encountered in the processes.

Groundwater finds its way through the gaps between the soils and through cracks in the solid rocks just like rain water flows on a slope containing grass weaving its way through the stems to reach the drain at the bottom end of the field. The puzzle and precariousness about where it takes its source, its movements and where it goes was wrongly interpreted and as a result, this give room for various fabulous and misrepresentations by the public. Groundwater can be found almost everywhere beneath the ground and in rocks below but it is not from the solid rock mass. In true sense of it, groundwater takes its source or arises from surface water which percolates downward into the soil vertically until it can no longer go deeper add it is added to already existing water in the cracks/ joints/ fissure of rock, in this way water start accumulating to a new level termed as 'water table' the level below which all available and interlinked spaces in the soil or rock becomes saturated. Water table is not flat but in slanting form down the valley side and slopes towards the river as it is continually drained by the river. Groundwater may be from well, spring and borehole which is naturally replenished by surface water especially during rainfall, from streams and rivers especially when water from these sources are discharged into water table. It is a long term reservoir of natural water having cycle of residency duration of between days to millennia as against short-term reservoir of water in the atmosphere and that of fresh surface water.

Borehole is considered in this study. It is a specialized well dug narrowly in the ground using drilling machine in other to gain access to the deep seated groundwater. Generally speaking, boring into the ground is not done only to get water but it is also applied in oil and gas exploration, sourcing for geothermal energy, well monitoring for groundwater levels and its quality, survey of subsurface conditions, shallow drainage construction, artificial recharge, waste disposal etc. Boreholes are usually narrow about 150mm (6 inches) in diameter, modern machines that are used in drilling are coupled with compressor to drive a rotating hammer which breaks up the rock into pieces. Exhaust air from the hammer tool blows the broken rock chips and water up to the ground surface. The location of a borehole is predetermined taking into consideration the purpose to which it is meant for considering its quality and long term supply etc which are important factors to be consider when we need borehole for drinking water, irrigation and other purposes. In sinking a borehole, expertise knowledge is needed for hydro-geological assessment to forecast the quantity of water available considering the topography, local vegetation, rock fracturing, local geology, groundwater chemistry, permeability of local aquifers from already existing ones and the point in order to meet up with pumping rate and to decide where to drill, though the location is at times limited by property ownership, which may hinder access to yield point or restriction to the usage of borehole equipment. It is very important practice that a copy of feasibility report should be given to the owner and also keeps a copy with the local authority saddled with the affairs for referral at any point in time when maintenance work is necessary (Douglas, 2013). At the end of drilling, casing is done to support the sides of the bored hole to prevent soft clay, soil, lose gravel and pebbles in transition zone from collapsing into the hole. When it is completed, surge or jet water in form of air in and out is carried out for the purpose of cleaning the bored-hole of mud, sand, pebbles and sediments. Thereafter, an efficient pump of corresponding capacity is installed so as to avoid restricted flow or seizure or

low pumping rate. The pump is connected through electric cables to the source of electrical energy, the pump comprises of motor at the bottom above the water intake compartment. As the motor drives the shaft, it in turns rotates a series of propellers in the pump bowls such that water is now pushed up the pipe to the surface. Aquifer test is also carried out to determine the capacity and efficiency of the borehole by pumping at a constant rate and later increased stepwise from say hours to days. Importantly, borehole should be far from potential sources of contaminants of any form for instances; fuel, chemical storage, streams, sewer, leach field and septic tanks in order to ensure good quality of water and the safety of users.

The target depth known as aquifer can be described as a layer of relatively porous substrate which contains and transmit water or as geological deposit of soil or rock which is permeable to water supply. In such places, voids are usually created by borehole drilling at the regions of saturated pores or cracks of rocks below the water table which allows water to flow into it through the action of gravity until the hole is filled up to the same level as that of water table beneath the ground. It consists of multiple layers but alluvial aquifer or confined layer is the target for commercial quantity of water. It characteristics ranges with the geology, substrate structure and even topography of different locations, however productive aquifers are found in the sedimentary geological formations.

Electrical resistivity investigations were conducted from two bored holes from where it was seen that the soil was stratified, near surface sandy-loam in between 30-70cm, silty loam is found in about 90cm depth and large fraction of sand/stone was found, soil stratification differs in boreholes (Bruce, 2005). Wisam and Hussein (2012) also reported that soil resistivity is an effective tool in delineations of soil layer, it decreases with depth especially in clayey layers due to its water contents. It was discovered that soil resistivity decreases with soil hardness and increase in moisture, the correlation of soil resist data with other geotechnical properties revealed that resist is proportional to sand and dry silts, but indirectly proportional to clay. There are a number of ways by which groundwater could be accessed but four major methods are surface, subsurface, areal and esoteric methods. These methods are sub-divided into various units for instance geophysical survey is one of such under surface method of exploring for groundwater. This is found useful due for two important reasons in that it reveals mapping and serves the purpose of water quality evaluations. It incorporates Vertical Electrical Sounding (VES) and Horizontal Profiling HP activities, it yields both information on existing subsurface thickness in line with water yielding capacities and desire depth with which the drilling needs to go. Al-garni, 2009; Jansen (2011) and Halie & Semir (2016), conducted separate surveys on types of aquifer, depth to aquiferous zones and geoelectric layers. Oladunjoye, Adabanija & Oni (2013) used very low frequency Electromagnetic (VLF-EM) and electrical Resistivity methods to unravel availability of localized groundwater in Ogbomoso to address the ever growing demand for groundwater, different yields were obtained from 3-layers earth models, a strong relationship was noted between geoelectrical successions and lithologic profiles, but no correlation was noticed between layers thickness of resistivity and the lithological profile. Bayowa, Ogungbesan & Mudashir (2019) investigated geophysical Earth fill of Oba dam embankment in Ogbomoso using electrical resistivity approach, the VES revealed that the embankment was

under-laid with four geoelectric layers of different resistivity values, no evidence of structural weakness was seen and so it was concluded that the earth fill work on the embankment integrity was good.

The study area of Ogbomoso metropolis is made up of two local government areas namely; Ogbomoso south and Ogbomoso north is experiencing growth in population and since public supply is not in place, moreover surface water is polluted and not safe, hence the challenges posed by water scarcity have led to absolute dependence on groundwater for domestic and other uses. In 1964, Oba dam was constructed to provide about 4.0million liters per day of pipe borne-water for the inhabitants in Ogbomoso and the surrounding towns and villages, (WCOSO, 1997). In view of the aforementioned, this work tried to look at the way by which an alternative means could be put in place to estimate and validate borehole depth and overburden thickness by developing a model by which borehole location could be determined to access groundwater once soil resistivity of the location is predetermined.

MATERIALS AND METHODS

In this study, data from preliminary electrical resistivity surveys carried out in the study area within and around Ogbomoso were gathered during visitations to every 104 wells from where a comparison of soil resistivity, aquifer depth and overburden thickness were analyzed to see how well the data varies and align with one another. Models were developed from data obtained which could be used to predict and revalidate borehole depth and to estimate overburden thickness. soil resistivity serves three purposes, first in surveying sub-surface geological formation of an area to locate ore, bedrock, depth and other geological investigations. Secondly to investigate the impact or the degree of corrosion in underground pipelines, a decrease level in resistivity suggests increase corrosiveness and it also helps in ground activity design for electricity or thunder protector. Soil resistivity values varies across the globe and its localize value depends on the land terrain, soil layers, type of earth, moisture content, topography, soil temperature, chemical composition, concentration of dissolved salt, presence of metals and other buried metals like pipes, tanks, slabs, cable ducts, rail tracks, concrete pipes etc.

Surface investigations is usually carried out by measuring electrical characteristics of the earth because it is conductive and so electrodes are driven into it to measure voltage and current otherwise called resistivity. Wiener Array and the Schlumberger methods are specifically employed, apparent resistivity are actually measured from the field work because the current path may travel through non uniform geologic materials and thus the measurement represents combination of various materials through which current and voltage traverses. Software is then used in the interpretation of the data to determine the various parameters such as drilling point, borehole depth and overburden thickness and other information needed to give reliable guidance on the site in sinking of borehole. Lithology varies from place to in the study area, some areas revealed a complete buried bedrock by the overburden while some is underlain by three geologic layers. Some include the top soil, lateritic clay/partially weathered bedrock, and partially fractured basement. Major aquifer units within the study area consist of the partially weathered and fractured zones of the bedrock which are buried at varying significant depths. Consequent upon geo-

electric parameters delineated at those investigated points within the study area, the VES point suggested divers depths which the well could be drilled to have an optimum drill depth ranging from 43 to 125m as in table 1. Some of the yields support domestic use and others are in the category of commercial or industrial benefit. Drilling risk factor was reported to be average, using air drilling method with caution.

DESCRIPTION OF THE STUDY AREA

Ogbomoso metropolis comprising two local government areas of Ogbomoso south and Ogbomoso north was considered in this study because of water scarcity from public source which have led to absolute dependence on groundwater for domestic use. Ogbomoso is in Oyo state in the southwestern part of Nigeria on the route A1, according to Encarta Premium facts and figures, it is categorized as one of the Yoruba city with an estimated population 861,300 in the year 2007. Inhabitants are principally farmer, trader, businessmen, craftsmen, civil servants and earn their living through other occupations. Weather features is chiefly tropical with two noticeable rain/wet and dry seasons, under normal condition, it usually rain in the month of may/april through October and dry season usually set in November and ends at the end of march year in year out. Round the year, the temperature is high with an annual mean of about 27⁰C, the relative humidity is between 60 – 80% and the vegetation is savannah with several baobab trees (Bayowa, Ogungbesan & Mudashir, 2019). The latitudes and longitude of the study area are 4° 10'E – 4° 20'E and 8° 00'N – 8° 15'N respectively. It stands within Precambrian complex of southwestern Nigeria of migmatite-gneiss, banded-gneiss, poorly roblastic biotite gneiss, granite and quartzite (Aina, Olorunfemi & Ojo, 1995). It is on plateau of Yoruba land of elevation of 1200feet (366m). Terrain is gentle undulating with subdendritic drainage pattern, geological basement stands within the southwestern basement complex, rocks are of ancient gneiss-migmatite and meta-sedimentary series (Afolabi et al, 2013). It consists of medium grained textures to coarsed of no well defined foliation pattern, in form of biotite, hornblende, quartz, plagioclase, microcline and rarely pyroxene. Weathered profiles over the basement rocks is comparatively shallow and corroborated by shallow hand-dug wells of less than 5m resting on basement rocks in the study area. Groundwater flow is majorly southward direction and westwards (Rahaman, 1988).

TABLE OF RESULTS

In those reports, both horizontal resistivity profiling and that of Vertical Electrical Sounding measured from the sites were subjected to two-phase interpretation process of curve-matching and iterating inversion (layered earth modeling) methods, Futhermore, the apparent resistivity measured were plotted against the electrode spacing to obtain curves at different locations. Measured values of resistivity, overburden thickness and borehole depths from 104 sites visited within the study area were reported in table 1. These pooled results were used to develop two models through which prediction and/or validation of borehole depth could be made.

Table 1: Resistivity, Overburden thickness and borehole depth from the study area.

S/N	Resistivity (Ω m)	Lithology Thickness (m)	Borehole Depth (m)
1.	1200.7	95.0	70.0
2.	83150	98.0	50.0
3.	1437.9	35.0	70.0
4.	1214.3	90.0	60.0
5.	12312.4	86.0	70.0
6.	621.8	94.0	80.0
7.	46958.1	98.0	100.0
8.	2062.8	48.0	47.0
9.	2628.7	14.0	60.0
10.	763.6	90.0	60.0
11.	322.1	77.0	50.0
12.	2149.6	87.0	47.0
13.	601.2	97.0	60.0
14.	272.8	97.0	60.0
15.	13944.2	81.0	60.0
16.	7642.4	89.0	50.0
17.	886.0	94.0	60.0
18.	563.8	85.0	60.0
19.	6892.6	99.0	50.0
20.	4705.2	96.0	70.0
21.	556.3	86.0	70.0
22.	1947.5	82.0	50.0
23.	398.6	82.0	60.0
24.	691.9	94.0	60.0
25.	460.5	47.0	80.0
26.	4001.4	84.0	70.0
27.	11925.4	81.0	60.0
28.	4496.2	28.0	80.0
29.	2663.9	71.0	70.0
30.	196.6	74.0	43.0
31.	3120.7	80.0	70.0
32.	1355.3	81.0	70.0
33.	1359.2	94.0	80.0
34.	2699.7	79.0	45.0
35.	2443.7	80.0	50.0
36.	9591.9	80.0	70.0
37.	4496.2	68.0	45.0
38.	6336.7	42.0	60.0
39.	8642.9	94.0	60.0
40.	9181.0	98.0	65.0
41.	14634.0	72.0	80.0

S/N	Resistivity (Ω m)	Lithology Thickness (m)	Borehole Depth (m)
42.	975.4	76.0	50.0
43.	28394.3	80.0	68.0
44.	14117.2	66.0	100.0
45.	1050.3	77.0	58.0
46.	3179.7	22.0	80.0
47.	538.5	81.0	58.0
48.	330.2	85.0	60.0
49.	1599.8	80.0	60.0
50.	4382.8	79.0	60.0
51.	440.1	81.0	48.0
52.	623.2	85.0	60.0
53.	175.1	91.0	50.0
54.	8384.0	93.0	70.0
55.	401.7	51.0	48.0
56.	3561.8	38.0	50.0
57.	608.1	79.0	70.0
58.	7416.0	77.0	80.0
59.	25913.8	62.0	100.0
60.	49398.6	55.0	70.0
61.	5282.8	108.0	70.0
62.	4853.4	84.0	60.0
63.	2518.0	87.0	50.0
64.	1743.4	77.0	58.0
65.	10591.7	98.0	55.0
66.	8695.1	80.0	48.0
67.	3094.2	86.0	60.0
68.	69.0	94.0	50.0
69.	19916.1	110.0	60.0
70.	1403.6	58.0	50.0
71.	514.9	80.0	70.0
72.	469.7	76.0	48.0
73.	6392.6	81.0	48.0
74.	2093.6	96.0	60.0
75.	758.2	76.0	48.0
76.	1486.7	90.0	50.0
77.	432.8	96.0	48.0
78.	8439.9	76.0	50.0
79.	39.1	94.0	50.0
80.	4339.5	88.0	60.0
81.	9352.1	85.0	50.0
82.	1541.3	66.0	53.0
83.	4327.2	88.0	60.0

S/N	Resistivity (Ω m)	Lithology Thickness (m)	Borehole Depth (m)
84.	4148.6	80.0	80.0
85.	753.8	91.0	70.0
86.	448.5	68.0	50.0
87.	351.6	74.0	48.0
88.	187.5	92.0	48.0
89.	12492.1	90.0	48.0
90.	8689.3	94.0	50.0
91.	6477.9	92.0	48.0
92.	10521.0	114.0	125.0
93.	4853.4	84.0	60.0
94.	601.2	95.0	60.0
95.	53095.8	58.0	100.0
96.	3369.3	92.0	48.0
97.	3850.4	94.0	60.0
98.	29665.7	71.0	60.0
99.	254.5	94.0	50.0
100.	1459.4	95.0	60.0
101.	1284.9	88.0	50.0
102.	10750.8	95.0	68.0
103.	7871.2	87.0	60.0
104.	565.1	83.0	48.0

RESULTS AND DISCUSSION

From the various reports at different borehole sites, the electrical resistivity survey showed that most of the locations within the study area revealed three main geologic layers of top soil, laterite layer/partially weathered bedrock and partially fractured bedrock with the varying resistivity, thickness and depths.

As desired in this study, three essential factors viz; resistivity of the location, overburden thickness and the depth where to which optimum yield could be gotten as reported in table 1 were correlated in this study. Results of these factors from the boreholes visited were analysed using statistical tools in generating or developing models which could serve as a predictor for locating a borehole. The main idea is that, once the resistivity of the location is measured, borehole depth can be easily calculated in the study area. General equation of a straight line is:

$$Y = mx + c$$

Where:

Y is the dependent variable

m is the gradient or slope

x is the independent variable and

c is the intercept on y-axis

In this study, the desired depth of the well is represented by D and it is taken to be the dependent variable from where its value can be estimated once the resistivity is known. Resistivity (ρ) here stand for independent variable. From the data obtained, values of the slope and the intercept are given as follows: Slope was calculated to be 0.0004 and intercept equals 58.74.

Hence the model which connects both the depth (D) and resistivity (ρ) is:

$$D = 0.0004\rho + 58.74 \quad (1)$$

Essentially, the two data sets obtained in terms of the depths and resistivity were correlated and the evaluated correlation coefficient of 0.311 was gotten, hence this show that both sets of data have moderately positive relationship. Furthermore, another model was obtained connecting overburden thickness (T) and resistivity (ρ). The equation which connects the two variables is given to be:

$$T = 6.15^{-6}\rho + 80.82 \quad (2)$$

A negligible correlation exists between two data sets of overburden thickness and the resistivity of the study area. These two equations can be employed in the study area in extrapolating desired depth to which a well should be sank in order to have a good yield of groundwater from the well. This will go a long way in making a comparisons with the calculated value from the Weiner Array cum Schlumberger measurements especially the first equation, it was tested and found to be having high feliability factor than that of secondequation. It is so and evident even from correlation coefficient which was found to be moderately related positively.

CONCLUSION

Various reports considered from 104 wells within the study area revealed various geologic layers. Distinct saturated layer (aquifers) were delineated on each site with divers values of VES 1 and 2 impressing various saturation points in line with the measured resistivities. Different geoelectric parameters delineated at the investigated points within the study area suggested points at which drilling could get to obtain optimum yields. Fractures were suspected at varying depthsbeyond or within the basement, thus enhancing the possibility of encountering productive reservoirs, depending on interconnectivity of fractures. Measured resistivities ranges from 39.1 to 83150.0 Ω m, while the lowest and highest value of overburden thickness is 14m and 111m respectively. The borehole depth was reported to be within 43 and 125meters.

Two models were obtained obtained, the first relates depth with resistivity $D = 0.0004\rho + 58.74$ and the second show the dependency of overburden thickness on the relativity $T = 6.15^{-6}\rho + 80.82$. The two models was tested and was found to be useful as predictor and in validating of survey work carried out previously to drill the well.

RECOMMENDATION

It is hereby recommended that the models should be used in determining and validating borehole depth and overburden thickness particularly in the study area.

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TEACHING PRACTICE SUPERVISION IN COLLEGES OF EDUCATION IN NIGERIA: CHALLENGES, AND THE WAY FORWARD

AMINU ABDU

DEPARTMENT OF GEOGRAPHY

JIGAWA STATE COLLEGE OF EDUCATION, GUMEL.

ABSTRACT

Teaching practice (TP) is an important stage in student-teacher training. It is a process of producing a prospective teacher. One of the processes in preparing student-teachers to become master teachers is teaching practice supervision. However, at this time, there are some challenging issues with TP supervision, and as a result, the aim and objectives have not been met. Thus, this paper examines the objectives of teaching practice and TP supervision, as well as some of the contemporary challenging issues such as covid-19, the increase in student teachers' population, supervisors' attitudes, inconsistent supervisory visits, and time allocation for teaching practice programs, among others. Recommendations were made on how to ensure effective TP supervision. These include: The National Commission for Colleges of Education (NCCE) should review the existing curriculum for our colleges of education on teaching practice and supervision for the achievement of Nigeria's sustainable development goals in teaching and learning. E-learning resources for developing and maintaining teaching and learning programs should be considered considering the present situation of the covid-19 pandemic.

Keywords: Teaching practice, TP supervision, covid-19, E-learning and Student-teacher.

INTRODUCTION

Teaching Practice, as a program, has been accepted as an integral part of the preparation of student-teachers in all colleges of education in Nigeria (Evans et al., 2017). It is through this exercise that teaching skills are acquired and developed both by practice and by reflection on pedagogy and theories of education. The college of education provides student-teachers with the necessary initiation into the teaching profession where consistent and continuous practice and the acquisition of experience are necessary for their improvement in the field and sustainable national development. The teaching practice provides the relationship between the intuition supervisor, teacher, and student-teacher interface to determine the quality of experience the student teacher will acquire (Aglazor, 2017).

Student-teacher supervision and assessment is a vital part of teaching practice exercise. The supervision is done through a coordinated partnership between school personnel and college lecturers. Supervision and assessment are indispensable tools in assuring quality in teacher training (Rosemary et al., 2013).

Teaching Practice Supervision is exclusively an activity for professional teachers. The required qualification for supervision shall be a first degree plus a teaching qualification not less than NCE or its equivalent (Babatunde, 2016). Each college should set up an internal/independent monitoring team for teaching practice to be chaired by the provost (National Commission for Colleges of Education [NCCE],

2012). A student-teacher shall not be graded unless supervised and assessed by at least four (4) different assessors over a minimum of ten supervisions.

However, teaching practice supervision has been facing serious challenges in Nigeria. For example, it seems that student-teachers are not supervised frequently and timorously and can easily affect the overall quality of teaching practice supervision and assessment (Ayodele & Oyewole, 2012). Student-teachers are unable to apply their theoretical knowledge in the classroom. This is where the supervisor's abilities and experience as a successful facilitator and mentor come into play. Nevertheless, the supervisors' role is no longer there. Supervisors of teaching practices programs are thus expected to be equipped with adequate skills that will allow them to function optimally and prepare them to provide qualitative supervision in any teaching practice program to maintain a high quality of education for Nigeria's future development. Therefore, this paper reviews the concept of teaching practice and teaching practice supervision, challenges of teaching practice supervision, and solution for achieving sustainable development goals in Nigeria.

CONCEPTS OF TEACHING PRACTICE (TP)

First and foremost, you need to understand the concept of teaching practice, the aim, and the objectives of teaching practice. Many educators interpret the word teaching practice in various ways. However, a few of these meanings are noteworthy. There are the following:

According to Oyekan (2000), Student Teaching Practice is an exercise that involves professional preparation for interested persons aspiring to become teachers with a good focus on sustainable human development. Teaching practice is considered as practice teaching, field studies, infield experience, and internship (Tanaja, 2000). Nakpodia (2011), states that teaching practice incorporates all the experiences in and out of the classroom which student teachers gather as they embrace real teaching in real classrooms. Teaching practice is a form of work-integrated learning that is described as a period when students are working in the relevant industry to receive specific in-service training to apply theory in Practice (Nnenna & Olanrewaju, 2015). According to the National Commission for colleges of education (NCCE), (2012), Teaching Practice is an important aspect of the teacher education program aimed at allowing student-teachers to put into practice their theoretical knowledge in a real school life situation. It allows teacher educators and educational administrators to assess the effectiveness of the teacher education program.

Considering these different concepts of teaching practice, teaching practice is therefore a period of exercise, in which student teachers get a golden opportunity to apply the theoretical aspect of teaching to practice for sustainable human development.

OBJECTIVES OF TEACHING PRACTICE

Teaching practice is of great importance in teacher education. It is a component of training leading to the award of the Nigeria Certificate in Education (NCE) in Nigeria. According to the National Commission for Colleges of Education (NCCE, 2012), the following are the main objectives of teaching practice for preparing students for teacher training:

1. To expose student-teachers to real-life classroom experiences under the supervision of professional teachers.
2. To familiarize student-teachers with the school environment as their future workplace.
3. To provide the environment for student-teacher to translate educational theories and principles into practice.
4. To provide student-teachers with a chance for further acquisition of professional skills, competencies, personal characteristics, and experience for full-time teaching after graduation.
5. To help student-teachers develop a positive attitude towards the teaching profession.
6. To enable student-teachers to discover their strengths and weaknesses in classroom teaching and provide opportunities to enable them to address their weaknesses and enrich their strengths.
7. To serve as a means of assessing the professional competence of student-teachers by the teacher-training intuitions.

CONCEPT OF TEACHING PRACTICE SUPERVISION

Teaching practice is a critical stage in the training of prospective teachers as it is a process of producing a master teacher. Nevertheless, its aim and objective cannot be attained without evaluation. This evaluation is referring to as teaching practice supervision.

Contemporary writers have slightly different perceptions of the concepts of teaching practice supervision. Most of them, however, appear to agree that TP supervision is an organized, democratic process involving the supervisor and student-teacher for the achievement of desired objectives; see TP supervision as a process of stimulating growth and a means of assisting teachers in helping themselves, and some describe TP supervision as a constant and continuous process of personal guidance based on frequent visits. Hence, TP supervision is a modern idea that should assist student teachers in improving instruction in the classroom (Ayodele & Oyewole, 2012).

Supervision of Teaching Practice involves meaning assessment for the award of marks and giving feedback to student-teachers to guide their future performance and professional development as teachers.

Specialists in the students' areas of specialization are the most qualified to supervise the students in their subject areas. Where this is not possible, teachers in related areas may be used to supervise them.

CHALLENGES OF TEACHING PRACTICE SUPERVISION IN COLLEGES OF EDUCATION

COVID-19 pandemic has resulted in the total closure of schools in about 192 countries all over the world, including Nigeria, with 91.4% of the total number of enrolled learners in these countries temporarily forced out of school (United Nations Educational, Scientific and Cultural Organisation [UNESCO], 2020). According to the report of UNESCO (2020), over 1.6 billion students worldwide are currently being forced to stay home from school due to the Coronavirus, as physical and social distancing is being imposed around the world, both locally and regionally, to contain

and curtail the spread of the pandemic. shows that the lockdown of schools is more prominent in some continents such as Africa, South America, and some parts of Europe. A United Nations International Children's Emergency Fund (UNICEF) report states that 10.5 million Nigerian children aged 5-14 years are not in school, only 61% of 6 to 11-year-olds regularly attend primary (Oluka et al, 2020). The lockdown of schools has set back to TP supervision which is a trait to education sustainable development goal. In addition to the lockdown, the following are impediments to TP supervision

1. **Increase in Student-Teachers Population:** In recent times, the population of student teachers in our colleges of education has increased so much without any corresponding increase on the part of supervisors. Waite (1994) opined that the supervision may also be inadequate if there are many students in training and a shortage of tutors in the training colleges. This makes it more difficult to effectively supervise a student's teaching as efforts are made to supervise a reasonably high number of students within a very limited time. This has led to ineffective supervision and evaluation and consequently has resulted in producing half-baked teachers whose competencies in the teaching profession are doubtful.
2. **Time Allocation for Teaching Practice Programme:** The time allocation for teaching practice is usually too short. According to Afeesakanni (2017), a period of six weeks is allocated for the first teaching practice at the 200 level, followed by another six weeks for the second teaching practice at the 300 level in university while colleges of education are only one semester. This period is not enough for the supervisors to effectively supervise all students and, at the same time, prevent students from getting used to the profession (Ayodele & Oyewole, 2012). Although in the United States, according to the Victorian Institute of Teaching, the minimum practicum (supervised teaching practice) requirements for an approved program made all four-year undergraduate programs to include at least 80 days of supervised teaching practice, which is equivalent to twelve weeks of Teaching Practice Supervision in Nigeria but broken into two periods – (200 Level and 300 Level). Also, in the United States, one-year postgraduate teacher education programs must include at least 45 days of supervised teaching practice (Victorian Institute of Teaching, 2010), while in Nigeria, it is only six weeks (40 days). According to Awoniyi (1979), "an enthusiastic student – teacher once lamented that he had hardly begun to enjoy teaching, acquiring skills, and gaining confidence when his practice had finished," insufficient time has caused many supervisors to do the work in haste, resulting in very shoddy supervision of teaching practice in Nigeria.
3. **Attitude of Supervisors:** Most supervisors exhibit a poor attitude towards supervision and evaluation of students' teachers. They neither give proper guidance to the students they come to supervise nor practically assess students' presentations from the beginning of the lesson to the end. They hastily read through trainee teachers' lesson plans, award marks without indicating detailed shortcomings in the lesson plan.

In a bid for supervisors to finish supervision on time and save cost, they often tell students to skip some stages of the lesson, move to the evaluation stage and summarize the lesson, thereby compromising supervision. Another emerging problem is that the supervisor's comments only the use of skills. e.g., Chalkboard writing, introducing lessons, class discipline, and media use. Less emphasis is given on gradual development of student teachers, new approaches adopted and stimulus variation, whether they are being used effectively or not (Rosemary et al., 2013) Invariably, some student teachers imitate their teachers' teaching style and, consequently, they come out of the mold without originality in their teaching style.

- 4. Inadequate Orientation for Supervisors:** The orientation for supervisors of Teaching Practice is inadequate (Kanu & Anikweze, 2020) as this program is not organized from time to time. The new college lecturers at times commit several mistakes in the field because of a lack of experience and orientation before the commencement of the exercise. For instance, in the University of Botswana, one of the guidelines for lecturers supervising teaching practice is that all staff members in the department must attend the orientation workshops of their student teachers so that they are aware of all that is required of the student teachers once they are in the field (Ayodele and Oyewole, 2012). Supervisors of teaching practice programs in Nigerian universities are not required to attend student teacher orientation. At times, no special orientation is organized for these supervisors before going to the field. This problem needs urgent attention and immediate action in Nigerian universities for the sustainable development of teaching practice programs.
- 5. Lack of commitment on the part of Supervisors:** Based on our experience, it has been observed that some supervisors of teaching practice programs are not committed to the exercise (Ayodele and Oyewole, 2012). Many have been found to assess only the lesson plans of the student teachers, look at their institutional materials and evaluate them without following them to the class to teach. Some do not go to the various schools where the student teachers are placed but gather them together in a school that is convenient for them to locate for the teaching practice. This makes the student teachers teaching to be mechanical as they are not used to the school environment and the students they teach in the class during the process of supervision. Hence, this makes the performance of student teachers in teaching practice superficial at times since the conduct of the exercise is closely linked with examinations.
- 6. Inconsistent Supervisory Visit:** According to the Nigeria Certificate in Education, the minimum standard for general education courses, Teaching Practice should last for a full semester and should run from the start of NCE III first semester to the end. Before calculating a student's TP score, a minimum of ten supervision should be performed on that student during Teaching Practice (NCCE, 2012). However, most student teachers are supervised, and they are only visited three times during the exercise (Vintenaba & Alhassan, 2021). This may

not be sufficient to determine the performance of student teachers in the teaching practice program.

CONCLUSION

The role of teaching practice supervision in preparing student teacher training cannot be overemphasized. However, it has been facing serious challenges in Nigeria. COVID-19 pandemic, increase in student-teacher population, short time allocation for teaching practice program, supervisor attitude, inadequate orientation for supervisors, lack of commitment on the part of supervisors, and inconsistent supervisory visit are some of the issues highlighted in the literature. Based on the issues raised, NCCE should review the current curriculum for our colleges of education on teaching practice and the supervisor the sustainable development goals in teaching and learning are achieved in Nigeria. To fit the current situation of the covid-19 pandemic, e-learning tools for creating and sustaining teaching and learning activities should be considered. Last but not the least, colleges of education, governments, and non-governmental organizations should collaborate to ensure effective teaching and learning in Nigeria.

RECOMMENDATION

1. There is a need for the adoption of digital learning tools in teaching practice supervision.
2. Student-teacher and TP supervisor/tutor ratio should be considered for effective supervision and evaluation.
3. Time Allocated for Teaching Practice Programme in the college of education should be reviewed by NCCE. Considering the importance of teaching practice in student-teacher training, ample time is needed. Thus, one year or two semesters would be appropriate as suggested by Ayodele and Oyewole, (2012) to develop the professional competencies of prospective teachers. This will provide the supervisors the opportunity of having more time to stay with individual student-teacher in the classroom.
4. Supervisors must exhibit a good attitude to supervision and evaluation of students' teachers.
5. Satisfactory orientation to Supervisors should be given from colleges, governments, and non-governmental originations to achieve sustainable development goals in education.
6. Experience and committed supervisors should be used as teaching practice supervisors in the exercise.

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**APPLICABILITY OF POLYA'S PROBLEM SOLVING PRINCIPLES IN
TEACHING COMPONENTS OF VECTORS AND THE DIRECTION
COSINES IN THREE DIMENSIONAL SPHERES**

¹MADU CLETUS IFEANYI

²ABUR CLETUS TERHEMBA

^{1 & 2}DEPARTMENT OF MATHEMATICS

SCHOOL OF SECONDARY EDUCATION (SCIENCES)

FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

KANO

ABSTRACT

This paper applied Polya's four-step of problem solving method to solve components of vectors and the direction cosine in three dimensional spheres. The paper identifies difficulties that students encounter in understanding the identified concepts. It identified four steps of Polya's problem solving to include: understanding the problem, developing a plan, carrying out the plan and looking back. The four steps were applied in solving unit vector and the direction cosine of angles in three dimensional spheres. The paper concludes that Polya's four-step of problem solving could be used in solving problems in other fields. Therefore teachers should apply it in other fields so as to guide students answer questions during examination. This paper recommends that: Polya's four steps of solving problems should be applied to solve problems in other fields of study; Mathematics teachers should apply Polya's problem solving principles in teaching mathematical concepts at all stages.

Keywords: Problem solving, components of vectors, direction cosines and 3-dimensional spheres

INTRODUCTION

A skillful Mathematics teacher makes use of problem solving approaches during teaching. The rote learning skills which brought about purely manipulation exercises has been found inadequate (Egbo and Nnaji 2014). Polya was a professor of Mathematics, he designs a framework for solving word and other problem in Mathematics. Billstein and Lott (2018) have adopted problem-solving steps first outlined by George Polya in 1945 as: (a) understanding the problem, which means you can state the problem in your own words (b) devising a plan, here you can look for a pattern and steps on how to solve it (c) carrying out the plan, which means implement the strategy or strategies in step 2, and perform any necessary actions or computations and (d) looking back. This clearly means that you can check the results in the original problem, wherein some cases this may require a proof. Egbo and Nnaji (2014) observes that the creative teacher guides learners in analytical and creative problem solving techniques, this require that the learner have knowledge of the subject though the learner may get correct answer to the problem with insufficient knowledge of the way he/she reached the solution.

A REVIEW OF POLYA'S PROBLEM SOLVING TECHNIQUES

In 1945 George Polya published book that identified four basic principles of problem solving. The four principles according to Anie (2021) include:

- (a) Polya's first Principle: Understand the problem: Polya taught teachers to ask students questions such as: Do you understand all the words used in stating the problem? What are you asked to do or show? Can you restate the problem in your own words? Can you think of a picture or diagram that might help you understand the problem? Is there enough information to enable you to find a solution?

Following Polya's principles, students need to understand that: (i) there is a standard Cartesian coordinate system (x, y, z) starting with origin, (ii) The three-dimensional vectors are in terms of the standard unit vectors of $i, j,$ and $k.$ (iii) that ai, bj and ck are called the rectangular components vector.

- (b) Polya's Second Principle: Devise a plan: Polya mentions that there are many reasonable ways to solve problems. The skill at choosing an appropriate strategy is best learned by solving many problems. You will find choosing a strategy increasingly easy. A partial list of strategies was included: Guess and check, look for a pattern, make an orderly list, draw a picture, eliminate possibilities, solve a simpler problem, use symmetry, use a model, consider special cases, work backwards, use direct reasoning, use a formula, solve an equation, be ingenious.

The plan could be developed as:

(i) Let $A = ai, bj$ and ck then $|A| = \sqrt{a^2 + b^2 + c^2}$

(ii) the position vector or the radius vector $|r| = \sqrt{x^2 + y^2 + z^2}$

- (c) Polya's Third Principle: Carry out the plan: This step was usually easier than devising the plan. In general, all one need was care and patience, given that one have the necessary skills. Persist with the plan that you have chosen. If it continues not to work discard it and choose another. Don't be misled, this is how Mathematics is done, even by professionals.

Here just solve the problem using plans developed in step (b) above.

- (d) Polya's Fourth Principle: Look back: Polya mentions that much can be gained by taking time to reflect and look back at what you have done, what worked, and what didn't. Doing this will enable you to predict what strategy to use to solve future problems.

Check whether the answer solved in (c) above is correct or not.

Application of Polya's problem Solving Techniques in Teaching Components of Vectors and the Direction Cosine in Three Dimensional Spheres

Vector analysis is a branch of Mathematics that deals with quantities that have both magnitude and direction but not position. It requires the specification of direction as well as magnitude. Velocity, force, and displacement, acceleration are examples of vectors. A vector quantity can be represented graphically by a directed line segment, symbolized by an arrow pointing in the direction of the vector quantity, with the length of the segment representing the magnitude of the vector. A scalars quantity is any quantity with magnitude in suitable units of measure but no direction. Examples, mass can be expressed in grams, temperature in degrees on some scale, and time in

seconds. Scalars can be represented graphically by points on some numerical scale such as a clock or thermometer.

VECTOR ALGEBRA AND VECTOR REPRESENTATION

Vector according to Stroud (2011) can be represented graphically by a straight line drawn so that:

- The length of the line denotes the magnitude of the quantity according to some standard vector scale.
- The direction of the line denotes the direction in which the vector quantity acts. The sense of the line is indicated by an arrow.

A vector quantity AB is referred to as \overrightarrow{AB} or a . The magnitude of the vector quantity is written $|\overrightarrow{AB}|$ or $|a|$. The length of the line represents its measurements such as: vector \overrightarrow{AB} or $|MN|$ can be seen in figure 1 below

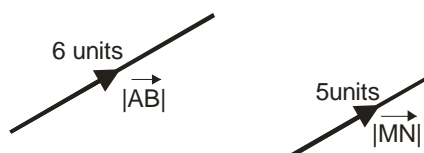


Figure 1: Vector representation of 6 and 5 units

A prototype of a vector is a directed line segment AB which can be seen in the parallelogram law of vector addition and can represent the displacement of a particle from its initial position A to a new position B . Thus vector AB in Figure 2 can be denoted by a and its magnitude by $|a|$.

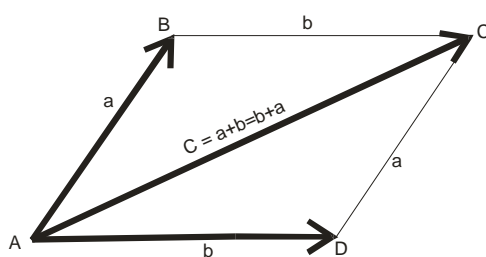


Figure 2: Parallelogram law of vector addition

Figure 2 represents a displacement of a particle from A to B and subsequently the particle is moved to a position C , so that $BC = b$, it is clear that the displacement from A to C can be accomplished by a single displacement $AC = c$. Thus, it is logical to write $a + b = c$. This construction of the sum, c , of a and b yields the same result as the parallelogram law in which the resultant c is given by the diagonal AC of the parallelogram constructed on vectors AB and AD as sides. Since the location of the initial point B of the vector $BC = b$, it follows that $BC = AD$ so that $AD + DC = AC$.

Laws of Vector Algebra

If A , B and C are vectors and m and n are scalars then:

- | | |
|-----------------------|------------------------------------|
| (a) $A + B = B + A$ | commutative law of addition |
| (b) $A+(B+C)=(A+B)+C$ | associative law of addition |
| (c) $mA=Am$ | commutative laws of multiplication |
| (d) $m(nA)=(mn)A$ | associative law of multiplication |
| (e) $(m+n)A=mA+nA$ | distributive law of addition |
| (f) $m(A+B)=mA+mB$ | distributive law of addition |

Definition1: Magnitude of a vector a sometimes called the modulus of vector a is represented by $|a|$.

Definition2: The zero vector is the vector of magnitude zero. And it has no magnitude or no particular direction. The zero vector is sometimes called the null vector.

Definition 3: A unit vector is a vector whose magnitude equals 1. A non-zero, non-unit vector \vec{a} is associated with a unit vector $\hat{a} = \frac{\vec{a}}{|\vec{a}|}$ or $\vec{a} = |\vec{a}| \hat{a}$ with the same

direction as \vec{a} where $|\vec{a}|$ represents the magnitude.

Definition 4: Equality of vectors a and b are two vectors that have the same magnitude and direction.

Definition 5: The negative vector of a vector \vec{AB} is a vector \vec{BA} such that $\vec{AB} = -\vec{BA}$

Components of Vectors and the Directional Cosine in Three Dimensions

In three-dimensional space, there is a standard Cartesian coordinate system (x, y, z) starting with a point call the origin, construct three mutually perpendicular axes called x , y , and z -axis (Frank and Nykamp, 2018). See the figure 3 below.

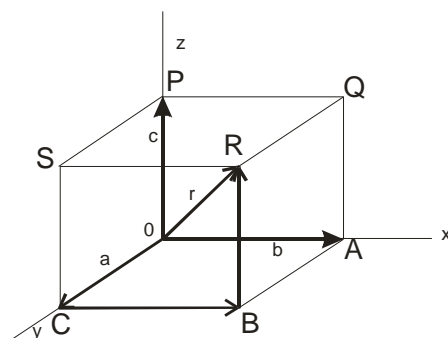


Figure 4: Resolution of Vector into Three Mutually Perpendicular

Let ai , bj and ck be the rectangular coordinates of the terminal point of vector \vec{OR} with initial point at 0. Then vector ai , bj and ck are called the rectangular component vectors or simply component vectors of \vec{OR} in the direction x , y and z respectively. The position vector or radius vector r from 0 to the point x,y,z is

$$\vec{OP} = \vec{r} = ai+bj+ck \text{ and } OP^2 = r^2 = a^2+b^2+c^2 \text{ then}$$

$$\vec{OP} = \vec{r} = xi + yj + zk \text{ and } OP^2 = r^2 = x^2 + y^2 + z^2 \text{ so that } |r| = \sqrt{x^2 + y^2 + z^2}$$

which gives the magnitude of a vector expressed in terms of unit vector.

Definition 6: Let α , β and γ be the angle which OR makes with OX,OY and OZ axes respectively then

$$\cos \alpha = \frac{x}{r} \text{ or } \frac{x}{\sqrt{x^2 + y^2 + z^2}}, \quad \cos \beta = \frac{y}{r} \text{ or } \frac{y}{\sqrt{x^2 + y^2 + z^2}},$$

$$\cos \gamma = \frac{z}{r} \text{ or } \frac{z}{\sqrt{x^2 + y^2 + z^2}}$$

$\cos \alpha$, $\cos \beta$ and $\cos \gamma$ define the directional cosine of the modulus of each vector**.

Case 1: Use Polya’s principles of problem solving to find the unit vector in the direction of

$$r = -i - 8j - 4k$$

Solution

Step 1: Understand the problem: To use Polya’s principles one need to understand that;

This is question on unit vectors in three dimensions; find the value of $|r|$, Find the value of \vec{r}

$$|r| = \sqrt{x^2 + y^2 + z^2}$$

Step 2: Develop a plan

Let $|r| = |-i - 8j - 4k|$ then $|r| = \sqrt{(-1)^2 + (-8)^2 + (-4)^2}$ and $\vec{r} = \frac{r}{|r|}$.

Step 3: Carry out a plan

$$\left| \frac{\vec{r}}{|r|} \right| = \frac{-1 - 8j - 4k}{\sqrt{(-1)^2 + (-8)^2 + (-4)^2}} = \frac{-1 - 8j - 4k}{9}$$

Step 4: Looking back

From definition (3) we recall that if $\vec{a} = |a|\vec{a}$ then $\vec{r} = \frac{r}{|r|}$, and

$$r = \vec{r} \cdot |r| \dots \dots \dots (i)$$

$$\text{But } r = -i - 8j - 4k \dots \dots \dots (ii)$$

$$|r| = \sqrt{(-1)^2 + (-8)^2 + (-4)^2} = \sqrt{1 + 64 + 16} = \sqrt{81} = 9 \dots \dots \dots (iii)$$

$$\vec{r} = \frac{-i - 8j - 4k}{9} \dots \dots \dots (iv)$$

Substitute the value of (ii), (iii) and iv in (i) to have

$$-i - 8j - 4k = \left(\frac{-i - 8j - 4k}{9} \right) 9 = -i - 8j - 4k = \vec{r} \text{ hence the value of } r \text{ is correct.}$$

Case 2: If $r_2 = 9i - 6j - 12k$ is the vector in three dimensional shapes; use Polya's principles of problem solving to find the direction cosine of r_2

Solution

Step 1: Understand the problem: Understand that, this is question on directional cosine of vectors in three dimensions; find the value of $|r_2|$, $\cos \alpha$, $\cos \beta$ and $\cos \gamma$ respectively.

Step 2: Develop a plan

Let α , β and γ be the angle which r_2 make with Ox, Oy and Oz axis respectively.

$$\text{Then from definition (6), } \cos \alpha = \frac{x}{r_2}, \cos \beta = \frac{y}{r_2}, \text{ and } \cos \gamma = \frac{z}{r_2}$$

Step 3: Carry out a plan

$$|r_2| = \sqrt{(9)^2 + (-6)^2 + (-12)^2} = \sqrt{261} = 3\sqrt{29}$$

$$\cos \alpha = \frac{3}{\sqrt{29}}, \cos \beta = \frac{-2}{\sqrt{29}} \text{ and } \cos \gamma = \frac{-4}{\sqrt{29}}$$

Step 4: Looking back

$$\text{If } \cos \alpha = \frac{x}{|r|}, \text{ then } x = \cos \alpha |r|$$

$$\text{But } \cos \alpha = \frac{3}{\sqrt{29}} = \frac{3}{5.3852} = 0.5571$$

$$\cos \beta = \frac{-2}{\sqrt{29}} = \frac{-2}{5.3852} = -0.3714 \text{ and}$$

$$\cos \lambda = \frac{-4}{\sqrt{29}} = \frac{-4}{5.3852} = -0.7427$$

$$x = \cos \alpha |r| = 0.5571(3\sqrt{29}) = 9$$

$$y = \cos \beta |r| = -0.3714 \times 3\sqrt{29} = -6$$

$$z = \cos \gamma |r| = -0.7428 \times 3\sqrt{29} = -12 \text{ defines the value of } x, y \text{ and } z \text{ hence the}$$

proof.

CONCLUSION

When vectors are expressed in coordinate form, they are expressed in their components that specify the geometry of the vector in terms of the coordinate system. This can be in two or three dimensions by drawing pictures of a plane or of space. Polya's four-step of problem solving in Mathematics provides facts, concepts and procedures of solving components of vectors and the direction cosine in three dimensional shapes. This paper concludes that; Polya's four-step of problem solving could be used in solving problems in other fields; therefore teachers should adopt it in other fields so as to guide students' answer questions during examinations.

RECOMMENDATIONS

- Polya's four steps of solving problems should be extended and applied to solve problems in other fields of study.

- b. Mathematics teachers should adopt Polya's problem solving principles in teaching difficult concepts in Mathematics at all stages.
- c. Workshops, conferences and seminars should be organized by stakeholders and mathematicians to educate people on the importance of Polya's principles so as to apply them in solving problems in other fields.

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CORRELATION STUDY OF THE PERFORMANCE OF MATHEMATICS AND COMPUTER SCIENCE STUDENTS DURING 2017/2018 AND 2018/2019 ACADEMIC SESSION TEACHING PRACTICE

¹HASSAN LAJAWA

²ABUR CLETUS TERHEMBA

AND

³DAYYABU MUHAMMAD

^{1, 2 & 3}DEPARTMENT OF MATHEMATICS

SCHOOL OF SECONDARY EDUCATION (SCIENCE),

FEDERAL COLLEGE OF EDUCATION (TECHNICAL) BICHI

P.M.B 3473 KANO,

ABSTRACT

This research work correlated students' performance of Mathematics and Computer science at F. C. E. (T) Bichi between 2017/2018 to 2018/2019 academic session. The design of the study was correlation research design. Area of study was F. C. E. (T) Bichi. The study was guided by 2 research questions and 2 hypotheses. Population of the study consists of 603 students from Mathematics and Computer science departments. The sampled population was 100 students. Simple random sampling was used for the study. Instrument used for the study was students teaching practice scores of two consecutive years. Mean, standard deviation and Pearson Product Moment Correlation Coefficient was used to test the relationship that exist between two subjects. χ^2 -test statistics was used to test the relationship that exist between Mathematics and Computer science in two years. The study concludes that; the government, stake holders and administrators should improve quality of teacher education by ensuring that all necessary materials/skills needed for teacher education are provided for effective training and supervision. Based on data collected and analyzed findings revealed that: there exist a significant relationship between teaching practice achievement scores between Mathematics and Computer science. The study recommends that: teaching practice allowances should be improved and must be paid on time, student teachers should have good knowledge of subject matter before going in for teaching practice.

INTRODUCTION

Mathematics education as a field of study is concerned with all it takes to learn and teach Mathematics effectively. According to Iji, Abbah and Anyor (2018), Mathematics education is a field of study that deals with tools, methods and approaches that facilitate and promote the practice of teaching and learning of Mathematics. Therefore, students of Mathematics education are prepared for quantitative and symbolic reasoning and apply mathematical skills through general education, services, skills acquisition and problem solving. Jeffa, (2020) observes that Mathematics education is considered in its relationship with the nature of Mathematics as a discipline; considerations of teaching and teacher learning; the design, implementation and effects of curriculum and instructional interventions, implementation and effects; contemporary developments in learning theories and technologies; issues of equity and social justice. With the nature of Mathematics

education as explained above, Mathematics education research primarily was focused on identifying problems that bother on teaching and learning of Mathematics, identifying solutions to them and broadening the knowledge base of the field generally. Jeffa, (2020) adds that research in Mathematics education has primarily two purposes: first to better understand the nature of mathematical thinking, teaching, and learning; and second to use such knowledge in practice for learning and teaching Mathematics. This gives a good summary of Mathematics education research. Thus primarily in this work, Mathematics education plays important role of guiding students in recording, storage and analysis of data.

Teaching Practice is an important component towards becoming a teacher. It provides experiences to student teachers in the actual teaching and learning environment. During teaching practice, a student-teacher is given opportunity to try the art of teaching before actually getting into the real world of the teaching profession. Student-teacher also lean values of teaching practice and perceive it as an important aspect of preparation for teaching profession since it provides for real interface between student hood and membership of the profession (Rakesh Ranjan, 2013). Teaching practice according to Topara (2020) is an integral part of teacher education program that is aimed at providing students-teacher an opportunity to put into practice theoretical knowledge in a real school life situation. It also offers teachers education a golden opportunities for practical appraisal of effectiveness of teacher educational program. The author further listed some basic objectives of teaching practice as follows:

- a. To expose student-teacher to real life classroom experiences under the supervision of professional teacher.
- b. To provide the forum for student-teacher to translate educational theories and principles into practice.
- c. To enable student-teachers discover their own strengths and weakness in classroom and provide opportunities to enable them overcome their weaknesses.
- d. To familiarize student-teacher with the school environment as their future work place
- e. To provide student-teacher with an opportunity for further acquisition of professional skills, competence, personal characteristics and experience for full time teaching.

Teaching according to Yahaya and Muhammad (2020) is an interaction between a teacher and learner in which the teacher is expected on a period to educating the learner on predetermined objectives. It is the process of impacting worthwhile knowledge on the expected learner. This worthwhile knowledge is also called values, which are highly needed by society for meaningful developments. Teachers in a society are thought to be agents of change as they are central to the delivery of quality education. Quality teachers are the greatest determinant of student achievement and their impact can promote child knowledge, skills and talents for future use. They can also influence the economic dynamism of the country by imparting skills that translate into innovation and productivity in the workplace. Because of the current changing and challenging world, teachers should be provided with a range of skills,

knowledge, attitudes and relevant educational experience that can enable them to cope with societal challenges. Education is expected to play several key roles in an effort of developing countrys socio-economic and cultural status. However, it is impossible to think of quality education without having academically qualified and professionally responsible teachers on the schools. Thus, for teachers to play their role effectively in schools, there must be a well-designed and successfully implemented teaching practice program for student teachers that aims at producing teachers who are academically qualified, professionally skilled, and attitudinally; ethically committed and updating knowledge from time to time to adapt with current changes in science, technology and computer world (Benedicto, Stelyus and Wang 2016).

Mathematics provides theoretical basis for many subfields of computer science, and important analytic tools for others; since most elements of computer comes from Mathematics. Computer scientists thus apply specific mathematical skills to specific computing problems(Jensen and Sherry, 2019).Previous studies show that Computer course are so difficult because of Mathematical skills involved in it (Jensen and Sherry, 2019). Mathematics improves students' performance in Computer science and other fields hence the skills obtained help students' teacher during teaching practice (Jers, 2010). Hence, students must have a strong background in Mathematics in which some studies predict success in Computer science and its teaching (Duran, 2020). Works of literature also suggest that Mathematics scores on the College Entrance Test correlate with programming grades in computer science (2018). As such, there is a tendency that students who get high scores in Mathematics during teaching practice can as well perform better in teaching practice in Computer science and other fields. Hence, scores in Mathematics specifically, can be a factor to consider whether a student can be accepted into computer science courses or not (Ali and Farag, 2021). On the other hand, mathematics is found to be significant in dealing with programming courses because it is a good indicator of having the essential cognitive growth to learn to program.

STATEMENT OF THE PROBLEM

Teaching Practice (T.P) is very important and necessary program for all education students because it guide students to develop conceptual knowledge and teaching skills. However, most students did not find it easy to pass through this program. This shows that most students' performances in teaching practice were not encouraging. This was observed by the researcher during the process of supervising students on TP. Difficulties here means students inability in presentation of concept, poor knowledge of the subject matter, poor lesson plan, lack of instructional materials, class control, among others. Poor performance and achievement during teaching practice bring about students frustration, loss of control, confused, low grade, intimidation, drop out, anxiety among others. It also discourages students in furthering their studies. This comes to the mind of the researcher to correlate students' achievements TP scores between Mathematics and Computer science so as to find out the level of students' performance at regular interval and proffer solutions toward low performance.

PURPOSE OF THE STUDY

The aim of this study is to correlation students' teaching practice performance of two consecutive years with the following specific objectives:

- (a) Determine the relationship between Mathematics and Computer science students' mean scores during teaching practice in 2017/2018 academic session.
- (b) Determine the relationship between Mathematics and Computer science students' mean scores during teaching practice in 2018/2019 academic session.

RESEARCH QUESTIONS

The following research questions were used in the conduct of this study:

- i. What is the relationship between mean scores of Mathematics and Computer science students during teaching practice in 2017/2018 academic session?
- ii. What is the relationship between mean scores of Mathematics and Computer science students during teaching practice in 2018/2019 academic session?

HYPOTHESES

The following hypotheses were developed for this study:

- (a) There is no significant relationship between students' teaching practice achievement scores of Mathematics and Computer science in 2017/2018 academic session.
- (b) There is no significant relationship between students' teaching practice achievement scores of Mathematics and Computer science in 2018/2019 academic session.

RESEARCH DESIGN

The research design for this study was correlation research design, this was because students' achievements scores of teaching practice for two consecutive years were analyzed and correlated to observed students achievement trend.

AREA OF STUDY

The area of this study is F.C.E (T) Bichi. The choice of F. C. (T) Bichi for the study was based on the fact that, the researcher had observed poor performance of students during teaching practice supervision for over five consecutive years in the above school.

POPULATION OF THE STUDY

The population of this study consists of 603 students from Mathematics and Computer department of the above school. The following was the breakdown of the population: 89 Mathematics students, 220 Computer students in 2017/2018 session and 78 Mathematics students, 216Computer students in 2018/2019 academic session respectively.

SAMPLE AND SAMPLING TECHNIQUES

The researcher randomly sampled 50 students in the first and second years which gives the total of 100 sampled students. Simple random sampling was used for the

study because the researcher wishes each element of the population to have equal and independent chances of being included in the study.

INSTRUMENTATION

Instruments used for the study includes students’ teaching practice scores of Mathematics and Computer department of the above school from 2017/2018 and 2018/2019 academic session.

DATA ANALYSIS

Data was analyzed using Pearson Product Moment Correlation Coefficients and t -test statistics. This was because both the research questions and hypotheses

are testing the relationship between two variables. Thus $t = r \sqrt{\frac{n-2}{1-r^2}}$, where

r = the value of correlation,

n total number of cases and $2= 2$ degree of freedom.

DATA ANALYSIS AND RESULT

Research question 1:What is the relationship between mean scores of Mathematics and Computer science students during teaching practice in 2017/2018 academic session?

Table 1: Mean and Standard Deviation of Mathematics and Computer science students during teaching practice in 2017/2018 academic session

S/no	Session	Department	N	Mean	S.D	r
		Mathematics	50	60.14	10.45	
1	2017/2018	Computer	50	53.68	8.88	0.54

Table 1, the mean scores of Mathematics students’ teaching practice in 2017/2018 academic session was 60.14 and the standard deviation was 10.45. On the other hand the mean scores of Computer students in the same year was 53.68 with standard deviation of 8.88. Comparing the relationship that exist between Mathematics and Computer gives the value of $r = 0.54$. This shows that there exists a significant relationship between Mathematics and Computer students’ achievements scores in 2017/2018 academic session. This was because the mean and standard deviation of both departments was above average of 50 marks and the value of r was positive.

Research question 2:What is the relationship between mean scores of Mathematics and Computer science students during teaching practice in 2018/2019 academic session?

Table 1: Mean and Standard Deviation of Mathematics and Computer science students during teaching practice in 2019/2018 academic session

S/no	Session	Department	N	Mean	S.D	r
		Mathematics	50	59.30	10.33	
1	2018/2019	Computer	50	52.94	8.32	0.51

In 2018/2019 academic session, the mean scores of Mathematics students was 59.30 and the standard deviation was 10.33. Mean scores of Computer students was 52.94 and standard deviation of 8.32. Comparing the relationship that exist between Mathematics and Computer gives value of $r = 0.51$. This shows that there exist a significant relationship between Mathematics and Computer students' achievements scores in 2018/2019 academic session. This was because the mean and standard deviation of both departments was above average and the value of r was positive.

TESTING OF HYPOTHESES

- (a) H_{01} : There is no significant relationship between students' teaching practice achievement scores of Mathematics and Computer science in 2017/2018 academic session.

Table 4: Analysis of students' teaching practice achievement scores of Mathematics and Computer science in 2017/2018 academic session

S/no	n	r	d.f	t_{cal}	t_{crit}	α -level	Decision
1	100	0.54	98	6.35	1.96	0.05	Reject H_0 and retain H_1

Table 4 $t_{cal} (98) = 6.35 > t_{crit} (1.96)$; $\alpha = (0.05)$, H_0 was rejected and H_1 was retained therefore there exist a significant relationship between students' teaching practice achievement scores between Mathematics and Computer science in 2017/2018 academic session.

- (b) H_{02} : There is no significant relationship between students' teaching practice achievement scores of Mathematics and Computer science in 2017/2018 academic session.

Table 5: Analysis of students' teaching practice achievement scores of Mathematics and Computer science in 2018/2019 academic session

S/no	n	r	d.f	t_{cal}	t_{crit}	α -level	Decision
1	100	0.51	98	5.87	1.96	0.05	Reject H_0 and retain H_1

Table 5 $t_{cal} (98) = 5.87 > t_{crit} (1.96)$; $\alpha = (0.05)$, H_0 was rejected and H_1 was retained therefore there exist a significant relationship between students' teaching practice achievement scores between Mathematics and Computer science in 2018/2019 academic session.

DISCUSSION

The results of data analysis showed a mean achievement score of students' teaching practices in two consecutive years and the relationship that exist between two variables. Students' achievement scores in 2017/2018 academic session has mean scores above average of 50 marks in the two variables, meaning good performance. Students' achievement scores in 2018/2019 academic session also have mean scores that was above average in the two variables, this also gives good performance. The result of two hypotheses indicated that there was a significant relationship between students' teaching practice achievement scores of Mathematics and Computer science in two years. This was because the value of $t(98)$ calculated was greater than the table value. This shows that most students have good knowledge of subject matter, good lessons plan, and good teaching methods; provide instructional materials and make good use of them, among others. It also shows good teaching skills given to students teachers by school. These could motivate student teacher to perform well after graduation.

CONCLUSION

The result of this study has provided an empirical basis that most students did perform well during teaching practices especially in two academic session. This shows good effort done by the school to ensure effective students' performance during teaching practice and beyond. This study concludes that; government, stake holders and school administrators should promote quality of teacher education by ensuring that all necessary materials/skills needed for teacher education are provided for effective teaching and evaluation.

RECOMMENDATIONS

Based on the findings, this study recommends that:

- (a) Teaching practice allowances should be improved by the government and school administrators and should be on time so as to help teachers teach students going for teaching practice effectively.
- (b) Student teachers should have good knowledge of the subject matter before going in for teaching practice.
- (c) Required materials necessary for teacher education should be provided by the government and administrators.

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APPENDIX A
Students Achievements Scores of TP in Two Years

	2017/2018	2018/2019			
S/no	x	y	x²	Y²	xy
1	55	55	3025	3025	3025
2	65	56	4225	3136	3640

	2017/2018	2018/2019	x²	Y²	xy
3	63	52	3969	2704	3276
4	64	50	4096	2500	3200
5	62	57	3844	3249	3534
6	56	43	3136	1849	2408
7	63	42	3969	1764	2646
8	42	51	1764	2601	2142
9	63	55	3969	3025	3465
10	67	57	4489	3249	3819
11	57	42	3249	1764	2394
12	44	55	1936	3025	2420
13	55	45	3025	2025	2475
14	60	54	3600	2916	3240
15	55	66	3025	4356	3630
16	64	42	4096	1764	2688
17	60	56	3600	3136	3360
18	55	64	3025	4096	3520
19	64	41	4096	1681	2624
20	65	55	4225	3025	3575
21	56	64	3136	4096	3584
22	56	56	3136	3136	3136
23	44	56	1936	3136	2464
24	42	55	1764	3025	2310
25	62	53	3844	2809	3286
26	41	46	1681	2116	1886
27	66	62	4356	3844	4092
28	60	55	3600	3025	3300
29	43	47	1849	2209	2021
30	43	61	1849	3721	2623
31	54	61	2916	3721	3294
32	65	57	4225	3249	3705
33	47	57	2209	3249	2679
34	43	53	1849	2809	2279
35	60	55	3600	3025	3300
36	43	54	1849	2916	2322
37	50	61	2500	3721	3050

	2017/2018	2018/2019	x ²	Y ²	xy
38	50	56	2500	3136	2800
39	53	44	2809	1936	2332
40	45	65	2025	4225	2925
Total	2202	2156	123996	117994	118469
Mean	55.05	53.9	3099.9	2949.85	2961.725
S.D	8.436642	6.766433	906.4175	715.7444	562.3701

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}} = -0.09828$$

APPENDIX II

Male and Female Students' Achievement Scores of TP in 2017/2018 Session

			Male	Female	
S/n	x	y	x ²	y ²	xy
1	66	54	4356	2916	3564
2	62	57	3844	3249	3534
3	56	43	3136	1849	2408
4	63	42	3969	1764	2646
5	42	51	1764	2601	2142
6	63	55	3969	3025	3465
7	67	57	4489	3249	3819
8	57	42	3249	1764	2394
9	44	55	1936	3025	2420
10	55	45	3025	2025	2475
11	65	54	4225	2916	3510
12	55	66	3025	4356	3630
13	64	65	4096	4225	4160
14	60	56	3600	3136	3360
15	55		3025	0	0
16	64		4096	0	0
17	65		4225	0	0
18	56		3136	0	0
19	56		3136	0	0

20	44		1936	0	0
21	42		1764	0	0
22	62		3844	0	0
23	41		1681	0	0
24	66		4356	0	0
25	60		3600	0	0
26	43		1849	0	0
Total	1473	742	85331	40100	43527
Mean	56.65385	53	3477.357	2864.286	3109.071
S.D	8.671527	7.716117	932.8948	1571.505	1650.532

ENTREPRENEURIAL EDUCATION AND SMEs: CURBING EMERGING CHALLENGES IN KANO STATE, NIGERIA
DR. (MRS) AMAKA CORDELIA EGELE
DEPARTMENT OF BUSINESS EDUCATION
SCHOOL OF VOCATIONAL EDUCATION
FEDERAL COLLEGE OF EDUCATION, KANO

ABSTRACT

This study evaluated the effect of entrepreneurial education on small and medium scale enterprises (SMEs) operators in curbing emerging challenges in Kano State, Nigeria, using 393 respondents selected from manufacturing, education, trade and other services in Kano state, Nigeria. SMEs' efforts toward providing solution to the problem of unemployment in Nigeria and the world at large face stiff opposition from their conception as a result of many factors being responsible. The study employed cross sectional research design in which data was collected using questionnaire, results using Pearson's linear correlation and regression analysis show positive and significant relationship. Entrepreneurial education on SMEs measure had a significant effect (F – statistic = 13.101; t – statistic = 3.620) and was significant. The study adds value to the growing body of knowledge in the field of entrepreneurial development activities. The study serves as a reference to anyone who is interested in establishing his personal business as it provides insight into the improvement of entrepreneurial education in starting a new business and also for any organization that is interested in achieving profitability or continue sustaining effective business venture for curbing emerging challenges in Kano state Nigeria. The study recommends that entrepreneurial education should be encouraged by inspiring deserved workers/operators to acquire more knowledge while in service by attending workshops, conferences and leadership training and ensure that such trainings are done frequently so that their abilities can be broadened and improve their curbing of emerging challenges.

Keywords: *entrepreneurial education, small and medium scale enterprises (SMEs), SMEs measures.*

1. INTRODUCTION

The explosion and growth of small and medium scale enterprises (SMEs) undoubtedly has positively affected bottom-line economic activities. The upward economy boom has led to the creation of employment, alleviation of poverty, improved standards of living, generated more revenue for governments, enhanced the use of local raw materials, creating viable markets, act as a training ground for future entrepreneurs and reduction in crime rate (Kunday, 2014). Kano State in Nigeria has been a center of industrial and commercial activities for centuries and has greatly contributed to the economic development of Nigeria (K-SEEDS, 2004). SMEs in Kano for some years now have not performed creditably well and hence have not played the expected vital and vibrant role in the economic growth and development of Nigeria (Kabiru & Kabir, 2014; Taiwo, Agwu & Falohun, 2016). Although the Nigerian government is turning to SMEs as a means of economic development and

solving problems of unemployment, several challenges are currently facing Nigerian SMEs such as lack of necessary business ideas (Adesanya, 2014), lack of appropriate and adequate managerial and entrepreneurial investment (Gbandi & Amissah, 2014), poor funding (Aminu, Salau, & Pearse, 2013), lack of infrastructure (SMEDAN, 2013), government policies (Nevin, Olatunji & Akinbiyi, 2016; Abeh, 2017), lack of action plan to deal with eventualities (Ebitu, Basil, & Alfred, 2016), inadequate preparation of the entrepreneurs in form of training (Oyebola, Irefin & Olaposi, 2015), inexperience (Darus, Yunus, & Rahman, 2017) and widespread corruption and harassment of SMEs in the country by some agencies of government over unauthorized charges and levies which have plagued curbing emerging challenges of SMEs in the country (Aminu, Salau & Pearse, 2013). SMEs curbing emerging challenges is also constrained by internal and external factors, such as the carrying capacity of the environment, competition, government regulations and bureaucratic procedures (Ebitu, Basil & Alfred, 2016; Eniola & Entebang, 2015; Adisa, Abdulraheem & Mordi, 2014; Bubou, Siyanbola, Ekperiware, & Gumus, 2014; Oni & Daniya, 2012).

These challenges have led to gradual collapse of the sector according to Olubukola (2013) and so no vibrant SME sector with capacity to absorb unemployed youths (Ayozie, Jacob, Umukoro & Ayozie, 2013; Olubukola, 2013; Nigerian Bureau of statistics News, 2016). This unemployment has led to serious current wave of kidnappings, political thuggery and youth restiveness in the nation as reported by Nigerian Bureau of statistics (News, 2016). Previous studies showed that many factors responsible for SMEs curbing emerging challenges are lack of necessary business ideas, lack of appropriate and adequate managerial and entrepreneurial skills, low funding, poor infrastructure, unsupportive government policies, poor planning, and inexperience. No study has been conducted to specifically establish the effect of entrepreneurial education in curbing emerging challenges of SMEs particularly in Kano state Nigeria. Therefore, the need for this study to answer the following research question “What is the effect of entrepreneurial education in curbing emerging challenges of SMEs in Kano State, Nigeria?” Hence the following null hypothesis (*H₀*) “Entrepreneurial education has no significant effect on curbing emerging challenges of SMEs in Kano State, Nigeria”.

2. LITERATURE REVIEW

2.1 Entrepreneurial education

Entrepreneurial education is the process or series of activities which aim to enable an individual assimilate and develop knowledge, skills, values and understanding which allow a broad range of problems to be defined, analyzed and solved (Njoroge & Gathungu, 2013). Njoroge, *et al* (2013) emphasized that it is more planned and systematic effort to modify or develop knowledge, skills through learning experiences to achieve effective performance in an activity or range of activities. Entrepreneurial education according to Wanger (2010) incorporates both informal and formal methods. The methods used content delivery and it varies depending on the learner’s group. The formal aspects of entrepreneurial education focus on providing the theoretical and conceptual frameworks which underpin entrepreneurship for example primary, secondary school studies, vocational education and education at tertiary

studies (Colleges and University). The educator acts as an expert by instructing and facilitating the learning process. The informal aspects of entrepreneurial education focuses on skills building, attribute development and behavioral change (practical) for instant, learning at capacity building center, incubation centers training, experts' visiting at work stations, TV/Radio talk shows, newspapers articles or related studies. To Wanger (2010), the informal education combines and integrates with the formal aspects of education to enhance curbing emerging challenges. Wanger (2010) emphasized that entrepreneurial education and training reinforce knowledge, skills and attitudes.

To Ganyaupfu (2013) entrepreneurial education includes managerial competence and industry experience. Experience is the significant characteristic that leads the entrepreneur to manage resource toward the set goal of the enterprises, (Akinruwa, Awolusi, & Ibojo 2013). Entrepreneurial experience is relevant to the growth of the firm and ownership position. Manager' experience has an impact on the growth of a company's performance; it also brings about perfect corporate governance. Entrepreneurial competence is defined as the individual characteristics including attitude and behavior, which allow the entrepreneur to achieve business success (Sarwoko, Surachman, Armanu & Hadiwidjojo, 2013). Kiggundu (2012) noted that entrepreneurial competency is the sum total of the entrepreneur's requisite attributes for successful and sustainable entrepreneurship which includes attitudes, values, beliefs, knowledge, skills, abilities, personality, wisdom, expertise (social, technical, managerial), mindset and behavioral tendencies. Han (2016) defined entrepreneurial competencies as the capability of entrepreneurs to face effectively a critical situation by making sense of environmental constraints and by activating relational and internal specific resources. Nerisa (2015) argued that entrepreneurial competencies are strongly associated with managerial competencies. Entrepreneurial education itself is a means through which knowledge can be gained and includes all the teaching, formal and informal learning, tutoring and instructing individuals receive in their background years (Kunene 2008).

Adesanya, (2014 reported that higher levels of entrepreneurial education such as university, or college level education were significantly related with higher performance of the entrepreneurs in relation to sales or profitability and which was also true for sustainability. The implication of Adesanya's finding is that for an entrepreneur to succeed, university or college level education acquired is put in use in his business as it is very important and the rate of company's business failure will be low. People with higher university or college level education actively search for new opportunities, which are positively related to higher growth. Rauch and Rijdsdijk, (2013) stated that higher university or college level education of entrepreneurs is in negative relation with their company's business failure. Higher university or college level education is an advantage for the entrepreneur to maintain the sustainability of the company and which is the opposite case for those without a higher formal educational background. From Rauch and Rijdsdijk, (2013) findings', its implication is that higher university or college level education has connection with searching for new opportunities in business which relate positively to growth and negatively to failure. Also individuals with advanced educational backgrounds develop more

intellectual capability and knowledge that can aid them in making strategic choices which can lead to firm presentation in any business environment.

This present study therefore investigated both the formal and informal levels of entrepreneurial education as defined by Wanger (2010) and Sarwoko, *et al* (2013) because they combined both learning at conventional schools setting such as primary school, secondary school studies, education at tertiary studies (colleges and university) and trainings /learning at capacity building center, experience and competencies, incubation centers training, experts' visiting at work stations, TV/Radio talk shows, newspapers articles or related studies and vocational training. All these can be blended together to give customer satisfaction in the firm thereby leading to firm's success in curbing emerging challenges in contemporary Nigeria.

2.2 Small and Medium scale Enterprise (SMEs)

There is no single definition of small and medium scale enterprise business that is universally accepted. For instance, different sectors of the economy have different interpretations of the SMEs business. Although different countries define SMEs businesses differently, it is accepted practice to make use of quantitative and qualitative criteria when attempting to define small and medium scale enterprise business. In the European union the most frequent upper limit designation of SME is 250 employees, but some countries set the limit to 200, while the United States consider SME to include firms with fewer than 500 employees (Organization For Economic Cooperation and Development, 2005). SMEs from Nigeria context are described thus: The Federal Ministry of Commerce and Industry, Nigeria described SMEs as firms with a total investment N750, 000 as capital but excluding costs of land and paid employee of up to fifty (50) persons (Osamwonyi, 2010). Central Bank of Nigeria (CBN) defined SMEs as those enterprises with turnover of up to N500, 000 only. National Council on Industry Nigeria (2001), defined SMEs as enterprises with a labour size of 11-100 workers or a total cost of not more than N50 million, including working capital but excluding cost of land. The study adopted the definitions given by the National council of industry (NCI, 2001) as the operational definition of SMEs. The choice was made considering the total cost (#50 million) employed and the number of employees (11- 100) as measuring indicators and also as they enabled the researcher to capture several SMEs at the grass root level of the areas.

2.3 SMEs measures in curbing contemporary challenges in Nigeria

In the field of entrepreneurship, SME has been considered as an important construct. There has been no agreement, however, among researchers on the appropriate measure of SMEs presentation. Previous studies have suggested that growth and financial are important presentation of measures for small and medium enterprises (Parker, 2000; Soriano, 2010; Sefiani & Bown, 2013). Omar, (2010) used non-financial measures of SMEs presentation such as customer and product performance, customer satisfaction and employee turnover. Egele (2018) revealed nine important criteria that are often used as indicators of business success thus: Profit, growth and innovation, firm-survival or longevity, contributing back to society, personal satisfaction, satisfied stakeholders, in particular customer satisfaction and employee

satisfaction, achievement of work-life balance and public recognition. Financial measures are considered critical in determining the survival and success of the firm. SME measurement is classified into four namely: (i) Profit which include: return on assets, return on investment and return on sales (ii) Growth in term of: sales, market share and wealth creation (iii) Stakeholder satisfaction which include: customer satisfaction and employees satisfaction and (iv) competitive position which include: overall competitive position and success rate in launching new product (Egele (2018)). This study adopted profit, sales growth, innovation, years of survival and personal satisfaction from the literature as measures of SMEs in curbing contemporary challenges in Kano state Nigeria.

2.4 Empirical Review

Prior empirical studies have established a positive relationship between entrepreneurial education and SMEs measures. For example, Akujo and Akele, (2017) examined encouraging entrepreneurship education among students of tertiary institutions in Imo state; challenges and strategies, they used questionnaire to collect information from 50 self employed graduates in small business firms. The result revealed that entrepreneurship education equips the unemployed with better skill to be self reliant. This indicates that success of SMEs business depends largely on education possessed by owner-managers.

Okoye (2017) investigated ICT skills required of business educators for effective entrepreneurship education in tertiary institutions in Anambra state. 45 business educators were collected information from using structured questionnaire. The result revealed that communication technology, managerial and organization ICT skills are required of business educators for effective entrepreneurship education. This suggests that curbing emerging challenges of SMEs will depend on communication technology, managerial and organization ICT skills which will enable operators to perform effectively when such skills are acquired through entrepreneurship education. Enyokit and Ogwunte (2017) examined the tacit knowledge management and entrepreneurship education skills development among university students for sustainable development in Rivers state. They obtained information from a sample of 141 students with self structured questionnaire. The result from the analysis revealed that tacit knowledge management skill is relevance in entrepreneurship education which will enable operators to be self confidence in specific business areas such as technical, negotiation, planning marketing, time management, and financial management skills. This means that the SMEs will grow beyond the first stage of enterprise development to other stages, suggesting that curbing emerging challenges of SMEs depends on tacit knowledge management skills entrepreneurs acquired through formal education. It becomes pertinent that SMEs owners, managers and staff that do not adhere to such education for effective competence to carry out the accounting and marketing performance as cited in Akinruwa, *et al* (2013) will not improve the performance of their firms in curbing emerging challenges.

These imply that formal education that is university or college level could be a motivator. It enables one to see opportunities more clearly, through both informal and formal interactions. A skill in the area of specialization enhances the chances of identifying available opportunities in their areas of specialization which can be

through innovation. Acquiring education will enable entrepreneurs achieve success in their firms. This also indicates that innovation is very important for success of business, entrepreneurs that acquire education are creative in initiating actions and carrying out their business activities as growth and business success are related to educated labour force which assist businesses to gain some competitive advantage. Similarly, Zannah, Mahat, Ariffin and Ali (2017) examined the role of demographic factors of owners- managers on small and medium enterprises (SMEs) performance in Yobe State, Nigeria. Results indicated that education and other variables had a positive and significant relationship with the SMEs performance. The implication in Zannah, *et al* (2017) findings is that entrepreneurs in SMEs acquired education that relates to their entrepreneurial business activities as their findings have positive and significant relationship with the SMEs performance. These enabled the entrepreneurs set clear goals at the beginning of their business venture which made them have higher chances of competing and even perform better than those who do not. In a related study, Ajani and Oluyemi (2016) examined the relationship between entrepreneurial characteristics and performance of small and medium scale enterprise (a study of SMEs in Yaba LCDA). Results revealed that entrepreneurial characteristics, entrepreneurial competency, orientation and the level of education of an entrepreneur all had significant effect on the performance of SMEs in Yaba, Nigeria. This implied that acquiring education enabled the entrepreneurs achieve success in their firms which enable them set goals, write their business plans, evaluate staff, communicate views and ideas and networking's which lead to their business success.

3. METHODOLOGY

The study adopted a cross-sectional survey design to collect data from a sample of 393 owners, managers and staff in Kano state, using purposive and stratified random sampling techniques. Only those SMEs registered with the Ministry of Trade, Commerce and Industries Kano state and had operated for two years and above and were in manufacturing, education, trade and other services were selected. Data was collected using a questionnaire. The instrument was based on a five point Likert scale as used Morgan and Hunt (as cited in Zainudin, 2014) where 1 = very low; 2 = low; 3 = moderate; 4 = high; 5= very high. The questionnaire had seven items on IV entrepreneurial education and 13 items for DV SMEs measure in curbing emerging challenges, formulated by the researcher using literature. The questionnaire was tested for validity using experts from Bayero University Kano and reliability using Cronbach alpha test which had average of 0.752 for entrepreneurial education and 0.952 for SMEs measure, meaning that the instrument adequately measured what was intended since it was above the recommended value of 0.70 (Zainudin, 2014). Data was presented and analyzed using means, standard deviations, Pearson's linear correlation coefficient and linear regression. In this study the level of significance is 5% which is equal to 0.05 sig value and was used to test the null hypothesis. Screening the raw data was done through checking common method variance, missing values, outlier detection and handling, normality, linearity, sampling adequacy and sphericity and multicollinearity. All these tests were first confirmed with the required rules of thumb before final analysis was done.

4. FINDINGS AND DISCUSSION

The study investigated the effect of entrepreneurial education of SMEs operators in curbing emerging challenges in Kano State, Nigeria. Data on entrepreneurial education and SMEs measures in curbing challenges were collected using 20 items in the questionnaire. Respondents' rating on extent of their entrepreneurial education exposure and SMEs measures in curbing challenges were summarized using descriptive statistics. (Appendix 1).

The results revealed that respondents rated their entrepreneurial education exposure to be generally low. This was indicated by an overall average mean index for entrepreneurial education of 2.49 and standard deviation of 0.743 falling under low extent on the interpretation scale. The low rating suggested that respondents were not acquainted with the entrepreneurial education at five elements of entrepreneurial education whose mean scores fell under low extent such as exposure to secondary school, exposure to capacity building/seminar/workshops, exposure to business incubation, exposure to expert visit and exposure to TV/Radio talks. The moderate levels of exposure rating in the interpretation guide were exposure to tertiary studies (colleges and university) and exposure to newspapers. This indicates that SMEs owners, managers and staff in Kano state, Nigeria that had moderate exposure of entrepreneurial education acquired that at tertiary studies (colleges and university) and their ability to read newspapers implying that majority of the SMEs operators lacked expertise from these two areas as they never underwent any training on such levels.

Generally, respondents rated their SMEs measures as being moderate, as indicated by the average mean of 3.31 and low score on standard deviation 0.690, suggesting that scores did not deviate much from the mean. The highest scored aspect of SMEs measure was competitive strength, suggesting that SMEs viewed their business competitive strength as being the best asset they had. The overall picture on SMEs measures suggested that the owners, managers and staff were not very satisfied with the current level of their measures, since they were not able to rate any aspect of the measuring variable very high. It is also important that the SMEs were able to identify what was not doing well in their enterprises, an indication that they could improve.

4.1 Relationship between Entrepreneurial education and SMEs measures in curbing emerging challenges in Kano state, Nigeria

Under correlation analysis, the researcher ascertained the extent to which measures of SMEs was correlated with the entrepreneurial education in Kano state, Nigeria. The two variables were correlated using Pearson's linear coefficient correlation as indicated in table 1.

Table 1: Pearson's linear Correlation Coefficients for Entrepreneurial Education and SMEs measure in curbing emerging challenges in Kano state, Nigeria

Variables correlated	R-value	Sig	Interpretation
Entrepreneurial education Vs SMEs measure	0.180	P<0.001	Significant correlation

Correlation Sig. (1-tailed).

Source: Researcher's Computation (2019)

Based on the results in Table 1, entrepreneurial education versus SMEs measure r-value (zero order) = 0.180 is significant at 0.000, therefore the corresponding study design was achieved with the revelation that entrepreneurial education significantly correlated with SMEs measure in curbing challenges in Kano state Nigeria, because this result is in line with the threshold of its significance level being below 0.05. This also conforms to the postulations of the theories on which this study was based. It indicated that entrepreneurial education enhances human knowledge (Egele, 2018), further suggesting that increased entrepreneurial education stimulates SMEs entrepreneur in curbing challenges in Kano state Nigeria. However, the correlate is positive but weak, which may imply that entrepreneurial education received and therefore possessed was not in line with what was needed to run their ventures.

4.2 Testing the null hypothesis

Null hypothesis was stated that “Entrepreneurial education has no significant effect on curbing emerging challenges of SMEs in Kano State, Nigeria”.

To test this, data on entrepreneurial education was regressed with the data on small and medium scale enterprises measures (appendix 1). Results are indicated on table 2.

Table 2: Regression Analysis for Entrepreneurial Education and SMEs measure in curbing emerging challenges in Kano state, Nigeria

Variables Regressed	Adjusted R square r²	F-value	Sig.	Findings
Entrepreneurial education Vs SME measures	.030	13.101	.000	Significant
Coefficients	B	t	p- value	Decisions
(Constant)	2.873	23.065	.000	Rejected
Entrepreneurial education	.171	3.620	.000	Rejected

Source: Researcher’s Computation (2019)

The results of linear regression in Table 2 show that the model was significant since the sig value (0.000) was less than 0.005. The adjusted r square (r²) indicate that the predictor (entrepreneurial education) explains 3% variations in SMEs measures (Adjusted r square= 0.030). The F statistic and p- value show that the model is significant at 0.000. Based on these results, the null hypothesis is rejected and we infer that entrepreneurial education can significantly affect SMEs measures in curbing emerging challenges in Kano state, Nigeria. The coefficients suggest that a one unit increase in entrepreneurial education can bring a 0.171 improvement in SMEs measures and vice versa (Beta = 0.171) and this is statistically significant (sig = 0.000, t = 3.620).

5. DISCUSSION

The study intended to establish whether entrepreneurial education can significantly influence SMEs measures in curbing emerging challenges of SMEs in Kano State,

Nigeria. The findings did not support the null hypothesis rather it revealed, that entrepreneurial education significantly affect SMEs measures in curbing emerging challenges of SMEs in Kano State, Nigeria. This finding is consistent with many prior empirical studies. Specifically, the positive effect between entrepreneurial education and SMEs measures is consistent with the findings by Akinruwa, Awolusi, and Ibojo (2013) who indicated that possession of adequate entrepreneurial education results into enhanced performance of SMEs entrepreneurs; founder's level of education are prerequisite for successfully business running. (Ganyaupfu, 2013); higher education is an advantage for the entrepreneurs to maintain the sustainability of their companies and which is the opposite case for those without a higher formal educational background (Rauch & Rijdsijk, 2013); education possessed by owner-managers of SMEs influences growth of business (Ajani and Oluyemi, 2016; Akujo & Akele, 2017); communication technology, managerial and organization ICT skills enable operators to perform effectively (Okoye 2017); higher levels of entrepreneurial education enhances performance of the entrepreneurs in relation to sales or profitability and which is also true for sustainability (Adesanya, 2014; Enyekit & Ogwunte, 2017).

Ajani, *et al* (2016) who reported that level of education of an entrepreneur have significant effect on the performance of SMEs , also Zannah, *et al* (2017) reported that demographic factors of owners/managers especially education significantly and positively influenced SMEs performance.

5. CONCLUSION

Entrepreneurial education if well-developed can positively and significantly influence SMEs measures in curbing emerging challenges in Kano state, Nigeria. The results of this study serves as reference to anyone who is interested in establishing his personal business which will provide insight into entrepreneurial education in starting a business and also for any organization that is interested in achieving profitability or continue sustaining effective business to achieve growth and sustainable development thereby curbing emerging challenges in Kano state, Nigeria.

6. RECOMMENDATIONS

- a) Entrepreneurial education should be enhanced by owners of SMEs through putting measures for acquiring more knowledge by the staff while in service.
- b) In-service training measures such as workshops, conferences and inviting experts for talks, leadership training for owners and managers and so on should be sustained and continuous as these will encourage deserved workers and owners to attend. This can be done through linkage by the stake holders - government, nongovernmental organization and owners.

These operators' capabilities enhancement will help to positively influence SMEs in their performance and continually curbing emerging challenges in Kano state and Nigeria in general.

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Appendix 1

Means and standard deviations on entrepreneurial education and SMEs' measure in curbing emerging challenges in Kano state, Nigeria

Entrepreneurial education elements	Mean	SD	Interpretation	Rank
Tertiary studies (colleges and university)	2.89	1.273	Moderate	1
Newspapers	2.75	1.263	Moderate	2
TV/Radio talks	2.58	1.305	Low	3
Secondary school	2.51	1.123	Low	4
Capacity building,	2.37	1.182	Low	5

seminars/workshops				
Expert visit	2.23	0.927	Low	6
Business incubation	2.09	1.087	Low	7
Average mean	2.49	0.743	Low extent	
SMEs measures indicators	Mean	SD	Interpretation	Rank
Competitive strength	3.63	0.833	High	1
Customer satisfaction	3.54	0.707	High	2
Sales volume	3.48	0.932	High	3
Increase in number of customers	3.45	1.042	High	4
Increase in profit	3.42	0.989	High	5
Supply of inputs	3.36	0.808	Moderate	6
Meeting benchmark	3.31	0.852	Moderate	7
Personal satisfaction	3.26	0.718	Moderate	8
Constant innovation	3.17	0.711	Moderate	9
Business survival	3.16	0.836	Moderate	10
High business asset	3.16	1.111	Moderate	11
High working capital	3.10	0.862	Moderate	12
Staff strength	3.04	0.740	Moderate	13
Average mean	3.31	0.690	Moderate	

Source: Researcher's Computation (2019)