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## FOREWORD

The place of academic publication in the development of education cannot be underscored going by the increasing global knowledge hunt/expansion. Bichi journal of education (BIJE) as registered its foot print in the publication of rich and qualitative theoretical/empirical research articles by way of enlarging the pool of academic knowledge. This edition (Vol.10 No.1), like the previous one, lends credence to the assiduous effort of the editorial team towards establishing an enduring academic legacy which the future academic cycle will live to appreciate and emulate. I hope our teaming contributors and subscribers will not relent in their efforts toward partnering with us to sustain the vision and goals of academic publication.

Alh. Ibrahim Jibril
*Provost.*

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# PROMOTING TECHNICAL AND VOCATIONAL EDUCATION: A WAY OUT OF GLOBAL ECNOMIC MELTDOWN

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## ABSTRACT

Recession or economic meltdown is a period when the economy of country is not very successful, a difficult time there is less trade, business activity in a country than usual. A period when industries are producing less or getting phased out and more people are recombining unemployed. However, while going through the excruciating pain of the meltdown, the country can use the practical knowledge of the technical and vocational education to catapult into greater technological advancement and breakthrough, this is the focus of this paper. The paper also discusses genesis of the global economic crisis, highlights the objectives of the National Policy on Technical Education in Nigeria and recommends the way of facing the likely challenges that may be thrown up by the crisis.

## INTRODUCTION

The world once again witnessing what some economic analysts have described as a very serious crisis of an order of magnitude comparable to that of the Great Depression of 1929. The present economic crisis termed the Global economic meltdown originated from the wall street of United States of America. The rapidity and fearsomeness of the situation is such the it has become the major topic of discourse at major world tours. The global economic crisis, the worst in seven decades, is taking its toll on the Nigeria Economy in terms of new funding constraints brought about by collapsed oil prices and real sector of the economy grapping under a crippling energy crisis is being pushed closer to the bring by spiralling interest rates. Though the Nigeria economy cannot be isolated from the effect of the global recess in the long-run but effect would have not been as immediate as it were if the country had put in places adequate enabling environment from the implementation of its National Policy on Vocation and Technical Education.

## DEFINITION OF TERMS

For the purpose of this paper, the following terms are defined thus:

**TECHNICAL AND VOCATIONAL EDUCATION:** Technical and Vocational (TVE) is used as a comprehensive term referring to this aspect of the educational process involving in to general education, the study of technologies and related science (NPE, N2004). This involves the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. Technical Education is a means of preparing for occupational urinal promoting environmentally sound, sustainable development and alleviating poverty.

**MELTDOWN:** A situation in which the prices fall by very large amount or an industry or economic situation much weak (Dictionary of Contemporary English, 2007). There is no doubt that the economy of this country is not very successful, a difficult time where there is less trade, business activity than usual. For instance, industries are producing less or getting phased out and more people are becoming unemployed. The goals of Technical and Vocational Education are to provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development which could eventually make the individual to be self-reliant economically, thereby developing the nation. It also emphasizes technological and productive entrepreneurial skills and business management so the products would set up their own business, become self-reliant and be able to employ others.

## GENESIS OF THE CRISIS

The actual economic meltdown began on Monday, September 15, (2008) when the United State Dow Jones Industrial average declined by 504 points or 4.4 percent, the largest drop since September when trading resumed after the September 11 attacks (the Nation, 2009). In less than a week, the Dow least 800-point triggering volatility in Asian and European stock markets in subsequent day in confirmation of the aphorism. When America catches cold, the rest of the world catches cold. The former American President, George Bush proclaimed that the fundamental of American economy remained strong until Meryl Lynch declared bankruptcy and very shortly, the insurance AIG and the mortgage giants fannies Mac and Freddy Mac all threatened to go under required the American Government to wade into avoid systematic collapse (The Guardian, 2008). The French and German Government announced with delight the limited impact of the crises until the fourth quarter figures confirmed then world of European

as in depression (New York Times, 2009). Indeed, it has been a crisis of unusual dimension and it can be describe as economic equivalent of a Tsunami.

Obviously the seed of the current economic meltdown were shown in the Republican Administration policies in the United State of America which encourage a deregulation of financial market and mergers of huge financial entities following the Wall Street crash of 1987; it was the Wall Street player that advised the United State Treasury to deregulate the financial market such that regulatory functions were ceded to stock market official who created trading rules that generally served the interests of the financial power house (Wall Street Journals, 2007): the result was a huge overconcentration of financial power in the hand of few super wealthy investors, who utilize mid-boggling leverages were able to manipulate the capital currency and commodities markets for profit.

The crash of the crude oil prices and major stock markets in the United State with domino effect in Asia ad Europe has been attributed to speculative activity; however, the immediate trigger for the banking crisis, which morphed into the current economic crisis, was the collapse of the US mortgage market, due to huge defaults on the so-called sub-prime loans extended to people who ordinarily could not access regular banks on account of poor credit history.

**TECHNICAL AND VOCATIONAL EDUCATIONAL AND THE MELTDOWN.**

Education is a basic objective of development. It is an important end in itself, and players a key role in the ability of a developing country to absorb modern technology and to develop the capacity for self-sustaining growth and development. This assertion was corroborated by the United Nation (1997). “Education is fundamental to enhancing the quality of human life and ensuring social and economic progress”. From the foregoing, Technical Education remains the bedrock of any nation and this has been universally accepted, acclaimed and demonstrated by the advanced countries of the world. Therefore, any Nation that neglects Technical Education does so at own peril. The advanced countries like Japan, Brazil etc. attained their present technological status through the embrace and development of science and technology while Nigeria and indeed Africa is today in a state of economic backwardness or serious recession due to the low level of technological development.

To ensure social and economic progress, of any nation including Nigeria, Technical vocational Education must be given priority. Probably this was why the National Policy on Education (Revised, 2003) took into cognizance the importance of Vocational and Technical Education and highlighted the aims of technical education as follows:-

i. To provide trained manpower in applied science, technology and commerce, particularly at sub-professional grades.
ii. To provide the technical knowledge and vocational skills necessary for agricultural. Industrial, commercial and economic development.
iii. To provide people who can apply scientific knowledge to the improvement and solution of environmental problems for the use and convenience of man.
iv. To give an introduction to professional studies in engineering and other technologies.
v. To give training and impart the necessary skills leading to the production of craft men, technician and other skilled person who will be enterprising and self-reliant and
vi. To ensure our young men and women have an intelligent understanding of the increasing complexity of the technology.

The second aim of technical education above is relevant our discussion here, if the government of this country at three tiers have been vigorously committed to the aim, of course the effect of the global meltdown would have been very minimal on the country.

The negative impact of the meltdown on the country is largely due to the neglect of the agriculture and industrial sectors of the economy by previous government administration. Since he discovery of crude oil in the 1960s the economy has been a mono-product one little or no consideration of how to use the revenue generated from the oil sector to turn country to an agricultural or the industrial giant in the world. A situation whereby the three tiers of government including the poor man on the street depend solely on revenue from crude oil for survival has endangered the Nigeria economy, since the drastic fall in the price of crude oil at the international market. A visit to most the country's technical college (post-primary and post-secondary) will elicit sympathy from a serious because visitor because of several reasons among which are: inadequate staffing, poor infrastructure; inadequate materials and consumable for practical e.t.c.

The key to economic development are human and not primary materials resources potentials are now the driving forces of global wealth creation, hence the need to solve the problem of economic meltdown; mores that our Nation is abundantly blessed with material resources.

The nation plans gave prominence to science and technology and Technical / Vocational Education, which are to prepare the products to become effective citizens who are self-

reliant, confident, competent and globally competitive. The Technical and Vocational skills required to develop the nation's agriculture, industry, transport, communication, energy and power, building and construction, water supply and other services. These plans can thrive and only be achieved by creating an environment in which business can thrive and developing and empowering people. Technical and Vocational training is highly capital intensive so it needs a strong political will on the part of government to adequately fund and finance it to achieve the desired effect. The only solution to the problems; besides al the so called palliative measures being put in place by the government is to encourage people to go back to production because this is real economy.

**CHALLENGES OF TECHNICAL AND VOCATIONAL; EDUCATION IN NIGERIA:-**

The most challenging problem of TVE is that of public apathy toward TVE and misconception that technical education is for dropouts. Even at times, policy makers find it difficult to appropriate enough fund for the running of technical education in the erroneous belief that recipients need only a little for training, yet Aina (1994) opined that any nation which subscribe to the persuasion that dropouts should chart the course of her technological development is doomed for failure. There is therefore the need for mass reorientation and public awareness campaign on Technical and Vocational Education.

Inadequate qualified and trainers as earlier mentioned, insufficient participation of private sectors and inappropriate and inadequate infrastructure pose serious challenges to effective Vocational and Technical Education in Nigeria.

**CONCLUSION**

The question before every Nigeria is, how do we achieve economic freedom and reduce the effects of this economic meltdown? The solution and indeed the African continent needs to embrace technical education and development of appropriate technologies to be able to eradicate poverty, unemployment, low life expectancy, poor infrastructures, poor standards of living and social vices.

The terrible situation of unemployment and its effects could be felt all around us, the teeming graduate 'Okada riders' Niger Delta Militant, Youth problems, senseless killings and kidnapping, thousands of graduate competing for few vacancies in public service recruitment exercises etc.

There is over population of people on our streets and roads with unskilled and jobless individuals who can only take from the society but could only give a little or even nothing back to the society due to lack of proper information by way of vocational guidance. All these could be avoided if youth involved are educated, skilled and productively engaged. We need to de-emphasize the type of education that does not prepare an individual for the world of work. There is no doubt that Vocational and Technical Education would make someone self-reliant or even be an employer of labour rather than looking for white collar jobs are not even available.

**RECOMMENDATIONS**

i. In view of the foregoing, it has become imperative more than ever before that Government and private at all levels must commence the resuscitation and revitalization of Technical and Vocational Education.

ii. The current global financial crisis and economic meltdown coupled with the downward slide of the naira due to crash of oil prices is a clear signal that we must all wake up from our slumber, fast track our technological development and diversify the economy to save the present and coming generation from economic mess and fallout.

iii. Whatever action to be taken by government must look beyond mere economic survival to economic growth and development; and this is where there is the need for proper funding of Technical and Vocation Education while concentrating on agricultural development.

iv. The government should as a matter of urgency appropriate a “right reward” for teachers at every level of education in the country and ensure adequate staff training and development both at the local and international levels in order to meet the challenges ahead.

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# ACCIDENTS AND EFFECTIVE PRECAUTIONS IN CHEMISTRY LABORATORIES IN NIGERIAN SCHOOLS

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## ABSTRACT

Accidents frequently occur in the process of teaching and learning in schools. Most of these accidents are common in science laboratories. This paper intends to create proper awareness of the nature and dangers of the materials in the Chemistry laboratory, the sources of accidents in Chemistry laboratory, effective precautions in chemistry laboratory, and recommendations on how to use the laboratory in order to avoid accidents.

## INTRODUCTION

A laboratory is a place, usually a room, where scientific experiments are performed by the use of pieces of apparatus and chemical reagents (Ojokuku, 2001). He went further to say that laboratory apparatus is either made of glass, porcelain, plastic or metal. Chemistry laboratory is a place where chemicals and chemical apparatus are kept and used for experimental works. The accidents associated with chemistry laboratory result from different properties possessed by the chemicals. Some of these chemicals are corrosive, poisonous or inflammable. Some can seriously affect the skin, the nerve cells or cause serious cancer. Apart from chemicals, physical accidents can also occurs in a chemistry laboratory. According to Abdullahi (2005), most of the accidents that are physical in the chemistry laboratories are as a result of ignorance and carelessness. He went further to cite the cases of broken glass ware, hot apparatus, burning gas, electric shock, etc. as types of physical accidents frequently found in chemistry laboratories. Hence, in order to effectively prevent these accidents, a lot of precautionary measures has to be adopted by the various teachers of chemistry in our schools.

**Sources of Accidents in Chemistry Laboratories:**

Accidents cannot be prevented effectively except the sources of the accident is known. Steere (2007), stressed that people in the laboratory should be able to identify chemicals available to them, because chemical hazards occur during measuring of samples, using chemicals in unlabelled bottles, tasting of chemicals, opening of containers of volatile chemicals, etc. He asserted that in chemistry laboratories, chemicals should be classified and labelled according to their effects and hazardous nature. In the same view, Shelley (2008), insisted that chemicals in laboratories should be classified as poisonous and flammable liquids.

**Poisonous Chemicals:-** All chemicals are regarded as poisonous to human life. Some of them are harmful when in excess. There is a distinct difference between relatively safe and hazardous level of exposure of human being to any chemical. The threshold limit value of toxic gases, vapour and dust showed the average concentration the users can be exposed to the substance without adverse effect. The threshold limit value of chemicals is used as a guide for the control of hazardous materials considered acceptable by the people working in chemistry laboratories. In a study conducted in 2007, the threshold value limits of a number of laboratory chemicals are shown below:

**Threshold Limit Value of Common Chemical Substances**

| Substances | Threshold Limit Value in $mg^3$ |
|---|---|
| Ammonia | 18 |
| Benzene | 80 |
| Bromine | 0.7 |
| Chlorine | 3 |
| Hydrogen chloride | 7 |
| Iodine | 1 |

| | |
|---|---|
| Mercury | 0.5 |
| Tetrachloromethane | 65 |
| Sulphur (iv) oxide | 13 |
| Ozone | 0.2 |

Source: Husband and Themes (1999).

From the above table, it shows that substances like benzene and tetrachloromethane are cumulative poison. Care must be taken in using them because frequent and careless usage may cause laboratory accidents as they are explosives. Mercury has a low threshold limit value. This is significant when compared to the wide use of mercury in all laboratory activities. Mercury vapour forms less than 0.5mg3 which is sufficient to contaminate the air in the laboratory. Abdullahi (2005), opined that volatility and solubility of substances help to determine the potential hazards associated with the substance. He maintained that large soluble substances like benzene are dangerous and harmful to the body. Most of the organic solvents dissolve the protective secretions of the skin, and consistent usage may develop allergic reactions or cancer.

**Flammable Liquids:-** Flammable liquids used in chemistry laboratories are another sources of accidents. Flammable liquids are extremely very dangerous and must be handled with care. Some of the flammable liquids are methanol, benzene, petroleum fractions etc. These liquids should be kept in a well stoppered metal glass or plastic containers and clearly marked inflammable. The containers should be kept in cool places, as hot places may cause explosion and combustion. Flammable liquids can cause fire outbreak, skin burn, etc. in the laboratory. Ketz (2004), warned that exposure of these flammable liquids to light in our laboratories may result in severe burns and fire outbreak, and must therefore be kept away from light.

**Movement of Bulk Chemicals:-** The movement of bulk chemicals is another source that can cause physical accident in our chemistry laboratory. The movement of chemicals from the store to the laboratory, and from the shelves to the tables etc. can constitute a hazard. It may

result to the breaking of bottles, or containers and thereby exposing the carrier to harmful effect of the contents of the bottle. The physical nature of Winchester bottles mostly used in chemistry laboratories for storing chemicals, makes it easier to slip out of the hand and break on the floor, if the thickness of the glass is not sufficient to bear the weight of the content. Chlad and Hardy (2006), pointed out that Winchester bottles are one of the major causes of physical accidents in the chemistry laboratory. They suggested that Winchester bottles should be kept on the lower shelves or on the floor in the laboratory store room, so as to avoid accidents in moving and retrieving them.

**Other Dangerous Chemicals:-** These are known to be harmful to health especially after many years of exposure to them. Ketz (2004), maintained that many substances kept in the chemistry laboratories are known to cause cancer to human beings many years after exposure to them. He mentioned such chemicals as naphthalene-2-amine which can cause tumour of the bladder, chromates, nitronaphthalene, nitoamine, asbestors, chloroethane, etc.

## Effective Safety Precautions in Chemistry Laboratories

Most accidents that occur in chemistry laboratories can be avoided. This is because most of these accidents are due to ignorance or carelessness. According to Baurerle (2008), proper enlightenment of the nature and dangers associated with laboratory materials and strict adherence to the rules and regulations governing the use of the laboratories will help in minimizing, if not total eradication of the accidents. Other precautionary measures include:

**Use of Fume Cupboard:-** Chlad and Hardy (2006), stated that chemical reactions or processes which produce harmful gases or vapour are best carried out in fume cupboard. Chemicals such as benzene, phenylamine, and other liquids that are toxic which can be used in any chemical experiment must be used inside a fume cupboard. The fume cupboard should be cleaned regularly. It must be covered with the safety glass not ordinary glass. All explosive reactions are better carried out in the fume cupboard. The fume cupboard should not be used for storage purposes.

**Laboratory Rules and Regulations:-** Proper and careful adherence to laboratory rules and regulations is another effective precautionary measure. According to Bremmer (2001), students and teachers should avoid touching or stopping the centrifuge machine while in

motion. Cracked and damaged test tubes should not be used for experiments. Safety goggles or screens should be worn in case of explosions. When using strong acids, alkalis, and other dangerous substances, hand gloves should be worn. He concluded that the wearing of rubber gloves for long period of time must be avoided, as this will cause a serious infection to the skin.

**Proper Storage of Poisonous and Dangerous Chemicals**

The contents of poisonous and dangerous containers must be checked regularly. Experiment involving poisonous and dangerous substances should not be carried out in an open bench. High volatile chemical with low threshold limit value should not be heated in an open laboratory. Dangerous substances, for laboratory experiments such as cyanides must be kept under control in a locked cupboard.

**Labelling of Chemical Containers:-** Explosive, poisons and other dangerous chemicals have to be labeled. Labeling of containers helps the users of laboratories to know the type of substances in such containers. It also allows the users to know how dangerous the content of the container is. If the bottles and other containers are not properly labeled, accidents may likely occur.

**Conclusion**

Although we encounter a lot of accidents in the laboratory, effective safety precautions are what we need to overcome some of them. All laboratory users must therefore adhere to the rules and regulations governing the use of the laboratories. We must be careful in handling both chemicals and equipment in the laboratories.

Finally, all chemistry teachers must do their best to make sure that their chemistry laboratories are very safe for teaching and learning.

## Recommendations

Most Nigerian schools lack a lot of safety precautionary instruments in their laboratories. It is based on this short coming that the following recommendations are made:

- Proper labelling of chemicals should be done in order to avoid the wrong use of chemicals during experiments.
- Poisonous and dangerous chemicals should be properly covered. Any spill on the bench, table of floor should be cleaned immediately.
- Students should be warned not to eat or taste anything in the laboratory, unless when asked to do so.
- Bulk supplies of flammable liquids should be kept in a solvent store away from the main building.

Finally, every chemistry teachers should make out adequate time to teach the students laboratory apparatus, their uses, accidents, causes of accidents in the laboratory, and effective safety precautions in the laboratory.

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# ASSESSMENT OF AMMONIUM CHLORIDE AND BORAX AS FIRE RETARDANTS FOR FIBROCELLULOSIC MATERIALS

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***ABSTRACT***

This paper presents the result of the effect of inoculating printing papers with Flame Retardants (Ammonium chloride and Borax) properties of the papers were lowered and that the retardants reacted by free radical and condensed phase mechanisms respectively. The study is geared towards using locally produced industrials to combat the environmental fire disasters whose consequences have been displeasing.

## INTRODUCTION

Man has always been plagued by unwanted fire whose effect have been very disastrous. As such, it is inevitable that he sought ways to reduce the combustibility of his environment (Garba 1995). The importance of printing paper to man is unquestionable. Printing papers in forms of Calendars, Certificates, Files, Newsprints, Cardboards and Duplicating sheets are very variable to man. It is therefore quite rationale to investigate the possible use of flame retardants compounds on it is it way to decrease its readiness to burn and hence he destroyed.

Generally, Flame Retardant polymer means that some changes have been made in a polymer system so that it passes one or more of at least a hundred different flammability tests. These tests are normally designed to minimize, if not to eliminate the fire risk associated with the use of a polymer in some specific applications. Incorporation of halogenated compounds

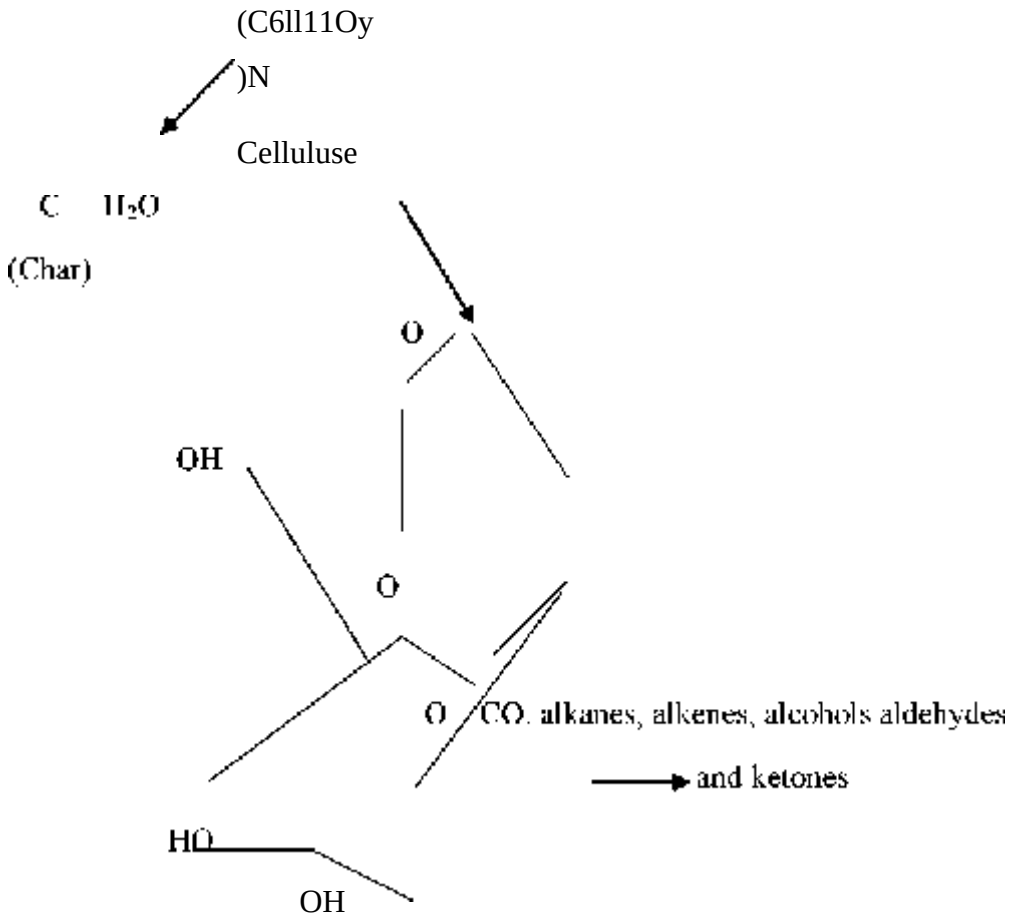
$Na_2O.2B_2O_3.\ I0H_2O$ $.Na_;O\ 2B_2O_3\ \ 5H_2O$

$> Na_2O\ 2B_2O_3\ 4H_2O$ $-Na_2O\ 2B_2O_1$.....(1)

into the polymer matrix is one of the most common approaches used to modify the burning properties of polymers hence the choice of ammonium chloride in this research work. Borax also has some flame retardant properties due to its ability to release its water of crystallization during burning. The gaseous water dilutes the effective concentration of the volatile combustible pyrolysates in the flame zone, which results in the inhibition of optimum pyrolysates.

Calcine

Cellulose, the major constituent of printing papers is believed to pyrolyse via two possible routes (Eboatu, et al, 1992




This work set to examine the possible ways through which the disturbing but unavoidable loss of valuable documents (inform of printing papers and other Cellulosic materials) to fire can be reduced to the bearest minimum, if not totally eliminated. It also sets to justify the statement that, the cost of material treatment with flame retardant element is cheaper than that involve in the repairs or replacement of the materials destroyed by fire.

**FLAMMABILITY TESTS**

With the aim of the work in mind four (4) different flammability tests were conducted on the substrates. These were:-

Add -on (%) -This refers to the weight in percent of flame retardant materials imbibed by the printing papers (Shet and Yabani, 1981)

Add on (%) = wt after treatment - wt before treatment

Wt before treatment

After Glow Time -This refers to the time in seconds between flame-out and the last visual glow

Flame Propagation Rate -This is the distance travelled in centimeters at a stipulated time interval by the fire when the sample was held vertically at room temperature and ignited (Eboatu et al, 1990)

Ignition Time -This is the time interval in seconds between striking of the lighten (Match stick) and a visual perceptible flame on the sample (Shet and Yabani 1981).

**EXPERIMENTAL**

**Materials**

Six (6) different types of printing papers were obtained from Pollyson C and Company in Sokoto, Sokoto State, Nigeria Characteristics of the papers used in this research work are presented in Table 1 below

| S\No | Type of paper | Dimension (CM) | Weight (g) | Thickness (M) | P (Density) g\m$^1$ | Designation |
|---|---|---|---|---|---|---|
| 1 | Calendar | 2 x 15 | 3 2 | 0.005 | 23.3 | A |
| 2 | Newsprint | 2 x 15 | 1 2 | 0.003 | 10.9 | B |
| 3 | File paper | 2 x 15 | 1 8 | 0.025 | 26.2 | C |
| 4 | Duplicating pape4r | 2 x 15 | 2 3 | 0.001 | 19.2 | D |
| 5 | Academic Certificate | 2 x 15 | 7 0 | 0.020 | 10.2 | E |
| 6 | Birth Certificate | 2 x 15 | 6 5 | 0.022 | 10.0 | F |

The table above shows the Characteristics of Printing Papers used for the study

Ammonium Chloride and Borax were procured from BDH, Poole, England.

For each of these chemical compounds concentrations **(**g/dm$^3$) of 0,20,40,60 and 80 were prepared for the purpose of the work.

**Methods**

Flame Retardant Treatment

Different concentrations (**(**g/dm$^3$) of the two Flame Retardant Compounds (Borax and Ammonium Chloride) were made. Weighed Printing papers (Substrates) as presented in table

1, were immersed completely in them. The residence time was 24 hours. (Bashiru 1992) on removal, they were dried at room temperature and finally cured in an air oven at 1030C for 15 minutes. The samples were then conditioned at the same temperature for 24 hours and re-weighed.

**MEASUREMENTS AFTER TREATMENT**

Add - on (%). After Glow time, Flame preparation rate and ignition time tests were conducted on the sample materials as described by Shet and Yabani (1981).

**RESULT AND DISCUSSION**

The results of the study indicate that the thermal characteristics of the papers have been altered. This is not only because the quantity of the flame retardant concentration differs but also on the different specific gravity of the materials. As expected the least compact paper (the News print) has the highest add on (%) whereas the most compact one (Calendar paper) has the least.

In all the cases there were reasonable reductions in the Flame Propagation Rates (cm $sec^2$) for all the substrates. This is so because as the quantity of the Flame Retardant Compound increases the Flame Propagation Rate decreases.

The effect of our investigation on Ignition Time (sec) increases directly with increase in concentration of the Flame Retardant Compounds in both cases.

Glow, which is a heterogeneous oxidative surface reaction depends on the amount of burnt material and availability of oxygen. The result also indicates that treatment with these Flame Retardant Compounds decreases the Afterglow time (in sec) for all the substrates.

It is generally agreed that the combustion of gaseous fuel is a high temperature process, which proceeds via a free radical Mechanism (Garba et al 1995). The overall reaction is shown thus:

Fuel + O2 ------- ► CO + H2O + heat + light - (1)

This involves a great variety of discrete reactions, which can be of the type

Mir 4- CCi **CM 1 IT** (2)

CALJ -I- T> r'LJ CO2 + H (3)

OH + RCHI RCH2 1 H2 O (4)

RCH2 + $O_2$ ---------- ► RCHO + OH

OH + O2 ----------► H + O (5)

Halogenated compounds of which ammonium chloride is one have been shown to enter into

flame chemistry via a series of reactions (Eboatu et al 1990)

$NH_4CI + OH$ ---------- ► $NH_4OH + CI$ (6)

NH4CI + O ---------- ► OH + CI (7)

NH4CI + H ---------- ► H + CI (8)

NH4CI + RCH2 ---------- ► RCH1 + CI (9)

NH4CI ---------- ► $NH_4 + CI$ (10)

In the radical trap theory of flame inhibition, it is true that equations 6 - 10 effectively compare with equation 2 - 5 for those radical species that are critical for the propagation of oh and of theory showing down the rate of energy production land resulting in the extinction of the flame.

The Flame Retardant property of Borax is due to its ability to decompose on heating thereby releasing is water of crystallization and the spongy dehydrate borax as shown below

Na2O 2B2O3 1OH2O(s) 5H2O(s) Na2O 2B2O1 5H2O1 H2O(s) \a<) 4H2O1
k
Na2O 2B2O3

There gaseous water so produced dilutes the required concentration of the volatile combustible pyrolysates in the flame zone, thereby inhibiting the attainment of the optimum pyrolysate oxygen concentration necessary for both ignition and sustenance of burning.

In addition, the spongy dehydrated borax product (Na2 2H2O3) forms an impervious envelop/layer on the pyrolysing substrate which seriously prevents the escape of the small molecules that feed the flame zone. It also reacts which the hydroxyl groups of the substrate to generate additional water and inorganic char which does not ignite readily.

**CONCLUSION**

Deductions and observations made from the results of the study indicate that flame propagation rate and afterglow time were decreased while ignition time and activation energy of pyrolysis were enhanced, thereby lowering the flammability of the printing papers.

It can therefore the conclusively said that both Borax and Ammonium Chloride are good flame-retardant compounds for our printing papers. Hence, these compounds are recommended for use in paper and other Cellulosic industries.

## RECOMMENDATIONS

1. Both Ammonium chloride and Borax have outstanding flame retardants properties.
2. Both Ammonium chloride and Borax are very good Flame Retardants for Fibrocellulosic materials
3. Both Chemicals could be use additives in various industries using Fibrocellulosic materials as Flame Retardants additives.
4. More researches on the Flame Retardancy of both elements and compounds for enhance safety of both man and his environment.

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# TOXICITY EFFECTS OF COPPER IONS CONCENTRATIONS ON CRAYFISH

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***ABSTRACT***

Forty-nine fingerlings crayfish were collected from Ogunmola fish Breed, Oyo. After the crayfish had been acclimatized in the laboratory for a week, seven each were introduced into the different concentrations of copper sulphate solution that had been prepared. A control, that contained 0.00mg/L of copper sulphate was made. These set-ups were studied and observed at different intervals of thirty minutes, one, two, four and twenty-four hours, two, three and four days. Chi-square statistical method was used for the data analysis. It was observed that the rate of mortality increased with increase in the concentration of the toxicant (copper sulphate solution). Conclusively, the environmental sample was polluted with more than lethal concentrations of copper sulphate solution, that was why the crayfish went into extinction. These recommendations were made: that the water bodies should not be sprayed with algaecides, fungicides and pesticides, chemicals should not be used to kill aquatic organisms, and that the environment should be monitored to ascertain its pollution.

## INTRODUCTION

A variety of toxic substances are discharged into the environment where they may exert harmful effects on organisms vowel and Connell (1980). Toxic substances have two important aspects to their actions. Firstly, the physiological impact of the substance on the organisms and secondly the concentration in the environment or dose administered to the organism which causes that effect. The concept of toxicity includes the basic principle that harmful effects are related to dose or concentration and below a certain minimum, there will be no harmful effects. In toxicity test generally, two sorts of bioassay are identified. One is the chronic, sub-lethal test, which examines responses in essential life processes such as growth, reproduction and changes in blood composition (Hodgson and Guthrie 1980). The other, which this paper focused on, is the acute-lethality test, where the measure response

is death.

In the natural aquatic environment there is a bi-accumulation and bi-concentration of heavy metals such as copper, lead, mercury and zinc in the sediment, which later form food for aquatic organisms (Opasina and Oyewole 2000).

## STATEMENT OF THE PROBLEM

Environmental samples such as water, aquatic organisms, sediment, land and air have been faced with problems ranging from pollution, incessant burning and application of chemicals. The animal under study is not an exception to all these problems

## PURPOSE OF THE STUDY

The purpose of this study was to ascertain the toxicity effects of copper ion concentrations on crayfish and to make adequate recommendations to prevent future environmental pollution by certain metals.

## RESEARCH HYPOTHESIS

That the rate of toxicity increases as the concentrations of the toxicant increase.

That mortality rate increases as the concentration of toxicant increases.

## MATERIALS AND METHOD

Forty-nine fingerlings crayfish were collected by dip net from a local fish pond (B.K. Ogunmola fish pond along Unique Hotel road, Mobolaje Area Oyo). The crayfish were of the same size and sex. The crayfish were acclimatized to the water that was metal/ion free and not fed for a day before the test was carried out. A preliminary assay was conducted to determine the order of magnitude of copper concentration that is toxic to the crayfish. Seven five liter jars were cleaned and rinsed thoroughly, filled with water and copper sulphate solution added to make the following concentrations: 0.00, 50.00, 100.00, 150.00, 200.00, 250.00 and 300.00mg/L. The zero copper served as a control. Each jar was stocked with seven crayfish of the same size and sex; care was taken not to injure them in the process. The assay was run for four days at these intervals: thirty minutes one hour, two, four and twenty-four hours, two, three and four days (Timbrell 1982). Each crayfish was removed as soon as it was noticed dead, when no movement or respiration was observed.

## DATA ANALYSIS AND RESULTS

The data collected from the test were put into tables for statistical computation and analysis. Chi-square statistical method was used to arrive at certain information about toxicity effects of copper ions concentration son the crayfish.

**Table One: Crayfish Mortality Data**

| **Copper Concentration** | **Number of tests animals** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Surviving after | | | | | | | |
| Mg/l | 30mins | 1 | 2 | 4 | 24hrs | 2 | 3 | 4Days |
| 300.00 | 6 | 4 | 2 | 0 | 0 | 0 | 0 | 0 |
| 250.00 | 6 | 4 | 3 | 2 | 1 | 0 | 0 | 0 |
| 200.00 | 7 | 5 | 3 | 2 | 1 | 0 | 0 | 0 |
| 150.00 | 7 | 6 | 4 | 3 | 2 | 1 | 0 | 0 |
| 100.00 | 7 | 6 | 5 | 4 | 3 | 2 | 0 | 0 |
| 50.00 | 7 | 7 | 6 | 5 | 3 | 2 | 1 | 0 |
| 0.00 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |

**Table Two: Table of observed frequency (Oij)**

**Copper Concentration in mg/L**

| TIME | 0.00 | 50.00 | 100.00 | 150.00 | 200.00 | 250.00 | 300.00 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| 30 MINS | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 47 |
| I HOUR | 7 | 7 | 6 | 6 | 5 | 4 | 4 | 39 |
| 2 HOURS | 7 | 6 | 5 | 4 | 3 | 3 | 2 | 30 |
| 4 HOURS | 7 | 5 | 4 | 3 | 2 | 2 | 0 | 23 |
| 24 HOURS | 7 | 3 | 3 | 2 | 1 | 1 | 0 | 17 |
| 2 DAYS | 7 | 2 | 2 | 1 | 1 | 1 | 0 | 12 |
| 3 DAYS | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 08 |
| 4 DAYS | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 07 |
| **TOTAL** | **56** | **31** | **27** | **23** | **18** | **16** | **12** | **183** |

Key: (Oij) - This is the summation of the horizontal rows and vertical rows. The total summation for all the horizontal rows and vertical rows columns tally and is equal to 183.

**Table Three: Table of expected frequency (Eij)**

**Copper Concentration in mg/L**

| TIME | 0.00 | 50.00 | 100.00 | 150.00 | 200.00 | 250.00 | 300.00 | TOTAL |
|---|---|---|---|---|---|---|---|---|
| 30 MINS | 14.38 | 7.96 | 6.93 | 5.91 | 4.62 | 4.11 | 3.08 | 46.99 |
| I HOUR | 11.93 | 6.61 | 5.75 | 4.90 | 3.84 | 3.41 | 2.56 | 39.00 |
| 2 HOURS | 9.18 | 5.08 | 4.43 | 3.77 | 2.95 | 2.62 | 1.97 | 30.00 |
| 4 HOURS | 7.04 | 3.90 | 3.39 | 2.89 | 2.26 | 2.01 | 1.51 | 23.00 |
| 24 HOURS | 5.20 | 2.88 | 2.51 | 2.14 | 1.67 | 1.49 | 1.11 | 17.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 2 DAYS | 3.67 | 2.03 | 1.77 | 1.57 | 1.18 | 1.05 | 0.79 | 12.00 |
| 3 DAYS | 2.45 | 1.36 | 1.18 | 1.01 | 0.79 | 0.70 | 0.52 | 8.01 |
| 4 DAYS | 2.14 | 1.19 | 1.03 | 0.88 | 0.69 | 0.61 | 0.46 | 7.00 |
| **TOTAL** | **55.99** | **31.01** | **26.99** | **23.01** | **18.00** | **16.00** | **12.00** | **183** |

Key: (Eij) - This was obtained from table two when vertical summation was multiplied by each horizontal row summation and divided by total number of one hundred and eighty-three.

**DISCUSSION:**

From table one, at thirty minutes one test organism each died when the concentrations were 250.00 and 300.00mg/l respectively, leaving six organisms surviving. None was dead at concentrations zero, 50.00, 100.00, 150.00 and 200.00mg/L respectively. At one hour, three test organisms died when the concentrations were 250.00 and 300.00mg/L respectively, while two died when the concentration was 200.00mg/L. One each died when the concentrations were 100.00 and 150.00mg/l respectively. At two hours, five test organisms had died leaving only two surviving when the concentration was 300mg/L, while four died when the concentration was 200 and 250.00mg/L respectively. Three organisms died when the concentration was 150.00mg/L. Two died leaving five behind when the concentration was 100mg/L while one died when the concentration was 50.00mg/L.

At four hours, no organism survived at 300.00mg/L concentration, while only two survived at 200 and 250.00mg/L concentration. Two, three and four died at concentrations 50.00, 100.00 and 150.00mg/L. At twenty-four hours, four test organisms died leaving three, when the concentrations were 50.00, and 100.00mg/L respectively while five died when the concentration was 150.00mg/L. Six died when the concentrations were 200.00and 250. 00mg/L respectively while none survived when the concentration was 300.00. Second day, five test organisms died when the concentrations were 50.00 and 100. 00mg/L leaving only two surviving at 150. 00mg/L concentration, six test organisms died, while at 200, 250.00 and 300. 00mg/L concentrations, none of the test organism survived.

Third day, only one test organism survived at 50.00mg/L concentration. None survived at other concentrations. Fourth day, none of the organisms survived. No organism died at the zero concentration of copper sulphate solution because it served as a control.

From table two above, the horizontal rows data were summed and the summation for each row was

47, 39, 30, 23, 17, 12, 8, and 7 respectively. The vertical rows data were also summed and the summation for each was 56, 31, 27, 23, 18, 16 and 12 respectively. The total summation for all horizontal rows and vertical rows columns tally and is equal to 183. In order to obtain the expected frequency (Eij), the data from table two was used. Each vertical summation was multiplied by each horizontal row summation, the result obtained was divided by one hundred and eighty-three (183).

$$(Eij) = \frac{56 \times 47}{183} \quad \frac{56 \times 39}{180} \quad \frac{56 \times 30}{183} \quad \ldots\ldots \frac{12 \times 7}{183}$$

(Eij) = 14.38 11.93 9.18 0.46

From table three, at thirty minutes, the expected value for the first vertical column was 14.38, when the concentration was zero while it was 7.96 at concentration 50.00, it was 6.93 at concentration 100.00mg/L, while it was 5.91 at concentration 150mg/L. At concentration 200.00mg/L, it was 4.62, while at concentration 250mg/L it was 4.11 while at concentration 300. 00mg.L it was 3.08. The horizontal rows data were summed up and the summation for each horizontal row was 46.99, 39.00, 30.00, 23.00, 17.00, 12.00, 8.01 and 7.00 respectively. The vertical rows data were also summed up and the summation for each row was 55.99, 31.01, 26.99, 23.01, 18.00, 16.00, 12.00 respectively. The total summation for all the horizontal rows and vertical rows also tallied and was equal to one hundred and eighty-three (183).

From tables two and three.

$$\text{Chi-square } (x^2) = \frac{(Oij - Eij)^2}{Eij}$$

$$= \frac{(\text{observed frequency} - \text{Expected frequency})}{\text{Expected Frequency}}$$

$$\text{Chi - Squere } (x^2) = \frac{(7 - 14.38)2}{14.38} + \frac{(7 - 7.96)2}{7.96} + \frac{(7 - 6.93)2}{6.93}$$

Chi Square (x2) = 3.79 + 0.12 + 0.0007

Chi square calculated =52.5119

At 5% level of significance and at 45 degree of freedom, the chi - square (x2) critical (i.e. from the table is 61.6560). Since chi-square calculated was less that chi-square (x2) critical value, the hypothesis formulated which “States that the rate of toxicity increases as the concentrations of the toxicant increase, and that the mortality rate increases as the concentration of the toxicant increases, then the hypothesis was accepted.

## CONCLUSION

In conclusion, the environmental sample under studied was contaminated and concentrated by copper sulphate solution. This adversely affected and led to the death of the organism under study.

## RECOMMENDATIONS

To prevent toxicity and concentration of the natural environmental samples, such as surface water, sediment, aquatic plants and animals with toxic substances, the following recommendations were made:

1. That the water bodies should not be sprayed with algaecides, fungicides and pesticides.
2. That containers from factories or industries should not be dumped into water bodies, as this was injurious to the aquatic organisms.
3. That chemicals should not be used to kill aquatic organisms.
4. That the environment should be monitored to ascertain its level of pollution.
5. That routine analysis or examination be carried out to determine the level of toxic pollutants in the environment periodically.

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# AN ASSESSMENT OF THE USES AND MANAGEMENT OF PHYSICAL FACILITIES IN PRIMARY SCHOOLS IN OMUMA LOCAL GOVERNMENT AREA OF RIVERS STATE

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***ABSTRACT***

The availability, utilization and management of physical facilities in schools is a major prerequisite to effective teaching and learning. This study was designed to find out the problems associated with proper utilization of physical facilities, the constraints to facility management and consequences of poor management of facilities in primary schools. Three research questions were designed while two null hypotheses were postulated. A sample of one hundred teachers out of four hundred and fifty-two primary school teachers in Omuma local government area (OMULGA) of Rivers State were used. The findings showed that there is inadequate facilities and low quality of materials supplied in the schools, lack of regard and care for the school facilities and ineffective instructional process which is as a result of non-conducive learning environment among others. Recommendations were finally made, among them was that teachers should be creative so as to improvise certain materials needed for the teaching while the school heads should see themselves as facility managers.

## Introduction

The state of public schools in Nigeria in this 21$^{st}$ century is disheartening. The lack of necessary facilities, the dilapidated classroom blocks, mismanagement of school properties and general lack of maintenance culture constitute serious problem to achieving the goals set out for schools.

The availability of physical facilities in the school has been rated high as a major prerequisite in the realization of educational aims and objectives at various levels. Adegbesan, (2007) writing on the adequacy of school facilities in Nigerian Vocational and Technical colleges commented that physical facilities are essential resources that are required for the effective operation and maintenance of standard in schools. He categorized the facilities into building, furniture, equipment, personal resources, laboratories, workshops, and instructional aids. While Etuk (2007) divided facilities into broad categories, namely human resources, environmental resources and instructional materials. Similarly, Enaohwo and Eferekaya (1989) in Ebong (2006) classified facilities into three - Instructional, recreational, and residential. While Instructional facilities comprises of those facilities that have direct bearing to teaching and learning, recreational and residential are non-direct.

It is widely accepted that the effect of teaching and learning cannot be felt if the facilities are not adequately provided. Amasuomo (2001) stated that the learning process is facilitated and made more meaningful when students study in classrooms of suitable size, well ventilated, tidy and adequately equipped with furniture and teaching aids. Commenting on the state of primary schools in Nigeria, Emetaron (2005) pointed out that the situation is deplorable and therefore need urgent attention. The study conducted by UNESCO (1998) also showed that the general school environment in Nigerian primary schools did not encourage quality teaching and learning. According to the study, 77% of the pupils observed, had no textbooks, 36% do not have enough writing materials, 38% of the classroom observed had no ceilings. Out of 47% of the schools sampled, furniture was grossly inadequate, 12% of the pupils sat on the floor or on building blocks, 87% of the classrooms were overcrowded. They also observed a very poor sanitary conditions in the schools, in 58% of the schools, water was obtained from the wells, only 68% had toilet facilities, but half of them were pit latrines, whereas 3% of the schools had no chalkboards.

Resources management on the other hand is central to quality control in any system. It involves determining the type of facilities that are required for the achievement of educational objectives. Akpa (2002) stated that ‘resource management entails maintaining what we have, maximizing the use of what we have, improvise in the provision of needed resources, showing personal commitment in the provision of resources as partners in the growth and development of education enterprise.’ Therefore, Ebong (2006) opined that the effectiveness of resources

can only be realized if the materials available are put to use. The above assertions revealed that the school heads have a laudable role to play in the management of facilities. In this respect Nwogu (2006) observed that many school heads do not realize that they have a duty towards ensuring the maintenance and upkeep of the school plants. Emphasizing on the role of school heads in facility management, Nwogu (1992) and Ani (1997) in Nwogu (1997) pointed out that such roles include:-

Identification of plants that need repairs, establishment of a maintenance workshop, renovation of dilapidated school plants, appointment of teachers to custodial duties, instruction to students on the careful use of the school plants ... replacing damaged parts on time ... supervising school custodian staff, providing working materials for the staff, reporting all major repairs to the government on time, teaching students to treat plants as personal properties instead of government properties.

In performing these roles, the school heads may not necessarily use their money to provide for the needed materials. Rather, they are encouraged to involve parents in the school management by establishing parents programme. Parents programme according to Akpakwu (2005) is a social programme organised by the school whereby parents are involved together with the staff in the planning and organisation. This helps to get parents acquainted with the pupils' behaviour and school needs.

**Statement of the problem**

In view of the fact that education is meant for the acquisition of appropriate skills and the development of material, physical, and social abilities to enable the individual live effectively and contribute to the development of the society, proper utilization and effective management of educational facilities are therefore thoughtful. Previous studies revealed that the learning environment has not been challenging enough, which is as a result of inadequate provision of facilities and poor facility management. This study therefore seeks to find out the problems associated with utilization of physical facilities, constraints to facility management and to examine the consequences of poor facility management in primary school.

**Purpose of the study**

This study is aimed at finding out:

1. the problems involved in the proper utilization of physical facilities.
2. the constraints to facility management
3. the consequences of poor management of physical facilities in the primary schools.

**Significance of the study**

The study will be very useful to teachers because of the strategic role they play both in the usage and provision of instructional materials. The pupils as well as the members of the society will benefit through the knowledge that school properties are not just government properties but theirs. The head teachers will also understand that they are facilities managers.

**Research questions**

1. What are the problems associated with the proper utilization of physical facilities in the primary schools?
2. What are the constraints to facility management?
3. What are the consequences of poor management of physical facilities?

**Hypotheses**

1. There is no significant difference between the male and female teachers on their use and management of physical facilities.
2. There is no significant difference between the male and female head teachers on the management of physical facilities.

**Methodology**

The study was a descriptive survey research analyzed with an inferential statistic. The population comprised of the four hundred and fifty-two primary school teachers in OMULGA in Rivers State while a sample of one hundred teachers representing 22.1% of the population was used. The stratified sampling technique was employed. The local government was divided into three major strata comprising Omuma North, Omuma South and Omuma central, whereas

the respondents were chosen from each strata through simple random sampling.

**Instrumentation**

The instrument for data collection was 'Questionnaire on Use and Management of Physical Facilities (QUMPF)' which was designed by the researcher. While section 1 contain the demographic data, section II was made up of a set of questions which were constructed to take care of the research questions and hypotheses. It has four different options of well accepted, accepted, not accepted, and very unaccepted with rating scales of 4, 3, 2, and 1 respectively.

The reliability of the instrument was carried out using a test-retest method. The correlation co-efficient of 0.85 was obtained using the Pearson product moment correlation technique. The instrument was validated by a lecturer in the department of educational management.

The researcher made use of one research assistant in administering the questionnaire. A total of 100 copies were administered, ninety-one retrieved while only eighty-six were fully completed and used for analysis. The research questions were answered using percentage and chart while t-test was used to test the hypotheses.

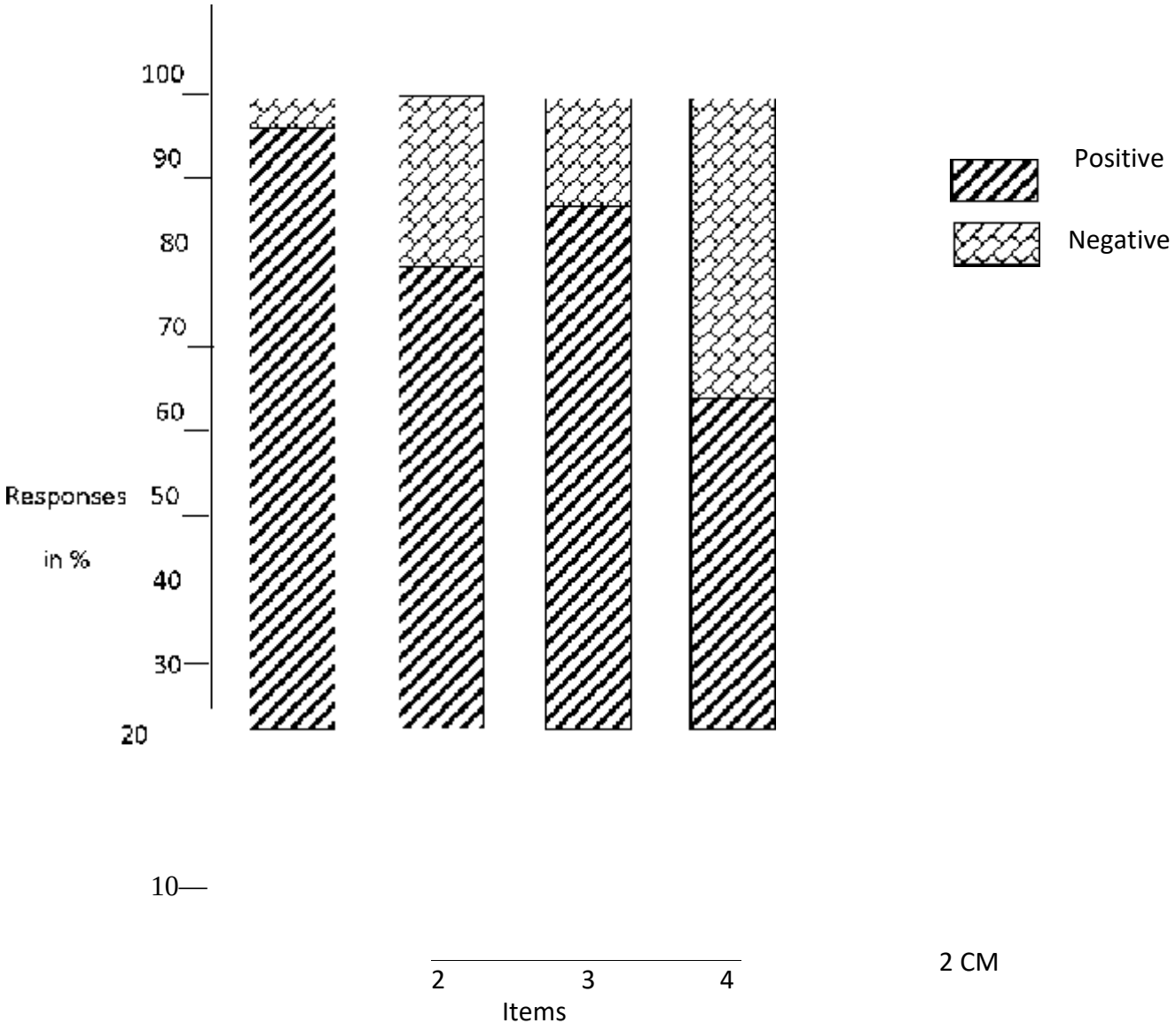
**Analysis of data**

Research question one: What are the problems associated with proper utilization of physical facilities?

Table 1.00: Problems associated with the proper utilization of physical facilities.

| **S/No** | **Statements** | **Response in %** | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| 1 | The pupils do not have recommended | 95% | 5% |
| 2 | Provision of low-quality materials (desks, chairs) etc. | 72% | 28% |
| 3 | Inadequate teaching materials. | 83% | 17% |
| 4 | Less regard for school properties. | 51% | 49% |

The data above is analyzed using the bar chart as shown below:

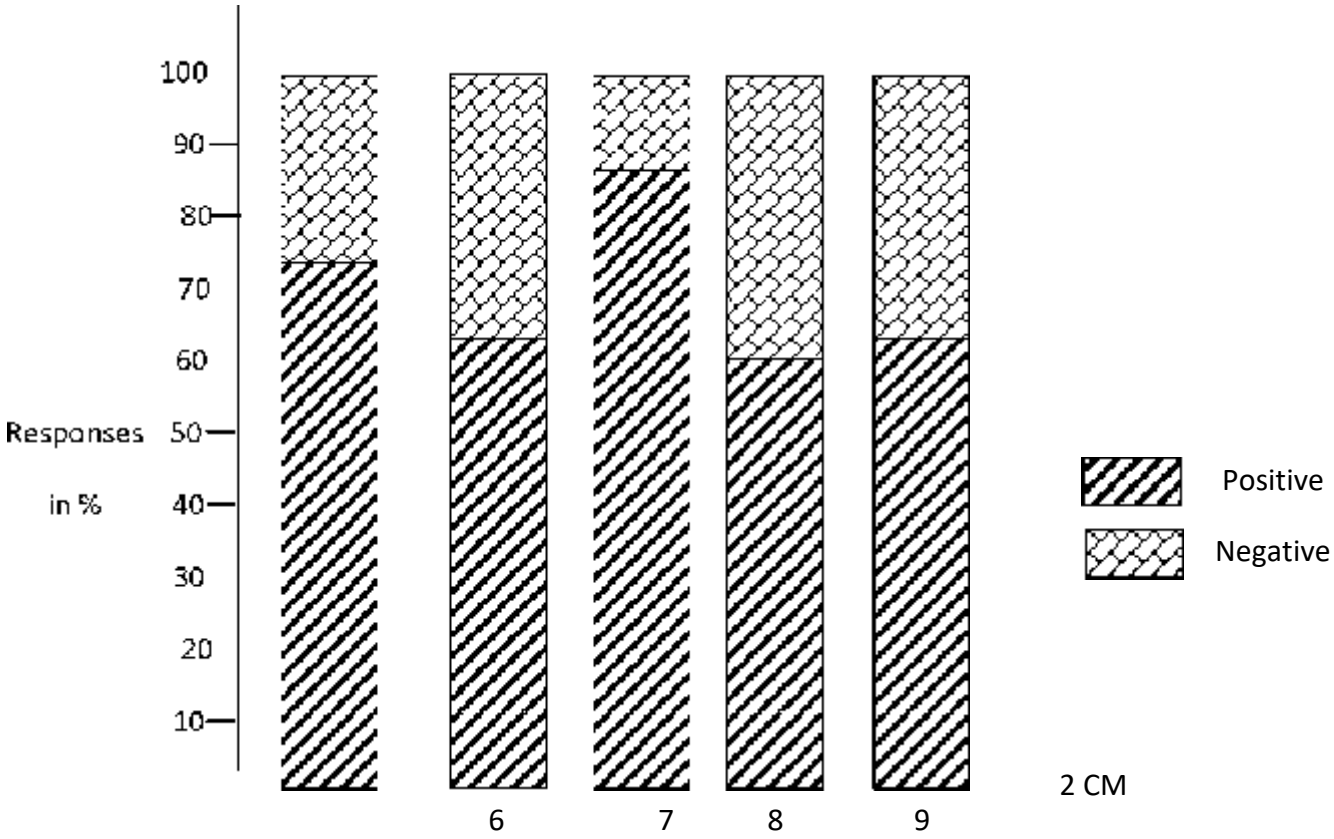


Research question two: What are the constraints to facility management?

Table 1.01**:** Constraints to facility management

| **S/no** | **Statements** | **Response in %** | |
|---|---|---|---|
| | | **Positive** | **Negative** |
| 5 | Irregular maintenance | 72% | 28% |
| 6 | No functional property committee | 62% | 38% |
| 7 | Lack of finance for the upkeep of the facilities. | 87% | 13% |
| 8 | Inability of the school heads to see themselves as facility managers. | 60% | 40% |
| 9 | Irregular visit of inspectors. | 62% | 38% |

The data above is analyzed using the bar chart as shown below:



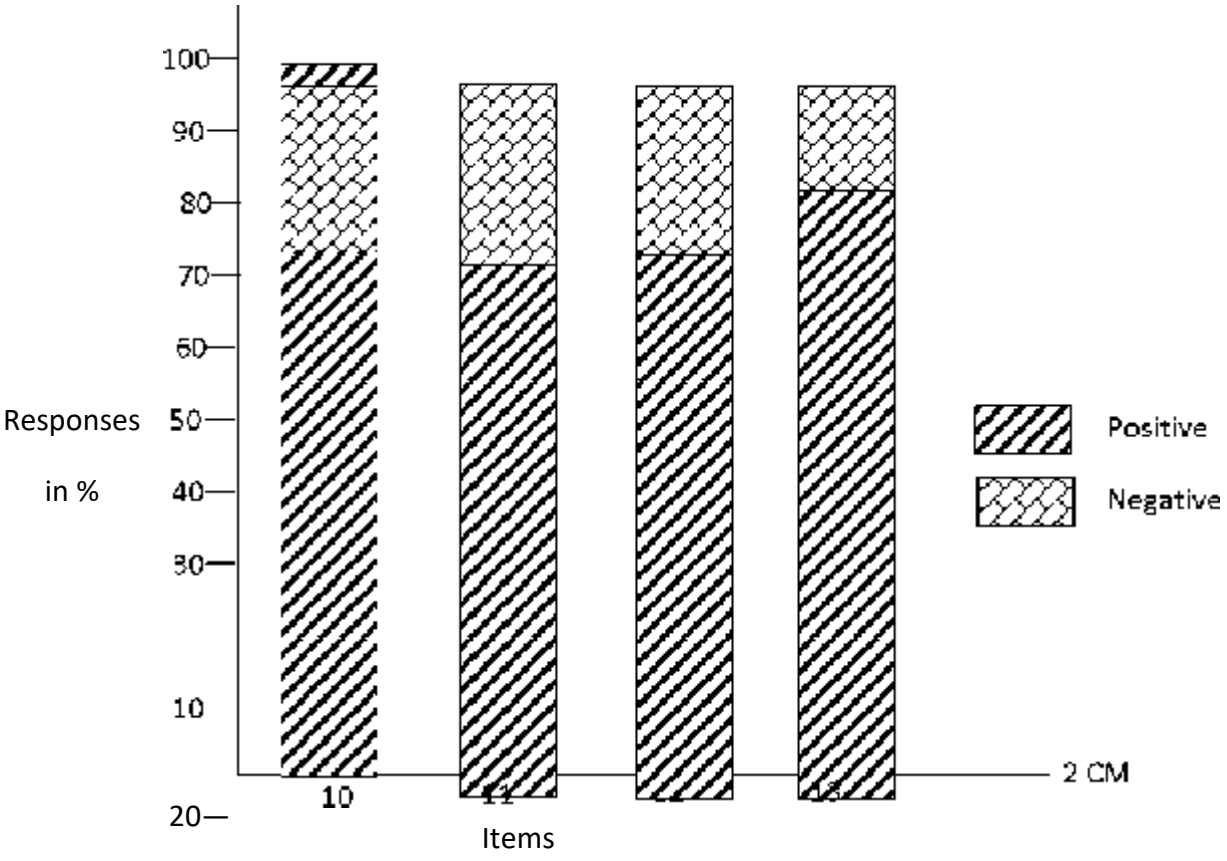

Items

Research question three: What are the consequences of poor management of physical facilities?

Table 1.02: Consequences of poor management of physical facilities.

| S/No | Statements | Responses in % | |
|---|---|---|---|
| | | Positive | Negative |
| 10 | Ineffective instructional process due to lack of teaching materials. | 78% | 22% |
| 11 | Low performance due to unattractive learning environment. | 76% | 24% |
| 12 | Pupils engage in domestic activities during school periods due to general poor performance of the school. | 77% | 23% |
| 13 | Lack of commitment on the part of teachers due to poor perception of school environment. | 87% | 13% |

The data above is analyzed using the bar chart as shown below:



**Testing of hypotheses.**

The hypotheses were tested with t-test at a chosen alpha level of 0.05 and at 84 degrees of freedom.

Hypothesis One: There is no significant difference between the male and female teachers on the use and management of physical facilities.

Table 03: T-test comparison of the male and female teachers on the use and management of physical facilities.

| | N | X | Sd | t-value | df | tcri | Decision |
|---|---|---|---|---|---|---|---|
| Male teachers $X_1$ | 36 | 6.7 | 1.6 | 14.3 | 84 | 1.98 | Reject |
| Female teachers X2 | 50 | 5.84 | .8 | | | | |

Table 1.03 shows that the calculated t-value (14.3) is more than the critical value (1.98) at 0.05 level of significance under 84 degrees of freedom. Therefore, the null hypothesis is rejected. This implies that there is no significant difference between the female teachers and male teachers on the use and management of physical facilities.

**Hypothesis two**

There is no significant difference between the female head teachers and male head teachers on the management of physical facilities.

Table 1.04: T-test comparison of the female head Tr and male Tr. On the management of physical facility.

| | N | X | Sd | t-value | df | tcri | Decision |
|---|---|---|---|---|---|---|---|
| Male teachers $X_1$ | 36 | 6.8 | 0.3 | 0.5 | 84 | 1.98 | Accept |
| Female teachers X2 | 50 | 5.62 | 0.86 | | | | |

Table 1.04 shows that the calculated t-value (0.5) is less than the critical value (1.98) at the 0.05 level of significance under 84 degrees of freedom. Therefore the null hypothesis is accepted. Showing that there is no significant difference between the female head teachers and male head teachers on the management of physical facilities.

**Results and Discussion**

The findings from the data analyzed shows that there is gross inadequacy of school facilities which constitute problem to facility utilization. When facilities are not adequate, it implies that the available ones will be over utilized. This supports Ebong's (2006) opinion that the availability of facilities used by the students determines the rate of utilization. It was observed that a good number of people have less regard for the school facilities with the notion that they are government properties. This laissez-faire attitude poses a threat to proper utilization of physical facilities. In most schools' desks and chairs are carried away and turned into firewood by some members of the community, whereas some damaged infrastructures are totally ignored until they are useless just because they are regarded as government properties.

It was also observed that the quality of some facilities are below standard. For instance, some textbooks supplied are not durable and therefore affect the utilization.

It was found out that the irregular visits on the part of the ministry of education constitute a hindrance to facility management. Another hindrance is insufficient and irregular funds from the government for the upkeep of the school. No wonder most schools' plants are outdated, some in a very bad condition, while others have turned out to dangerous gadgets. In addition, there was irregular maintenance of school facilities. This the researcher felt might be as a result of lack of adequate supervision. More so, the inability of the school heads to see themselves as facility managers constitute a hindrance to facility management. This corroborates Nwogu's

(2006) assertion that many school heads do not realize that they have a duty towards ensuring the maintenance and upkeep of the school plants. Poor management of physical facilities can lead to unattractive learning environment. This affects teachers' perception of the school environment which often times cause teachers to develop negative attitude to work. This equally affects the learners who might not take school work serious. From the findings, 77% of the respondents confirmed that most pupils engage in domestic activities during school periods. This affects generally teaching and learning, going by Omoniyi's assertion as pointed out by Amasuomo (2001) that learning process is facilitated and made more meaningful if the classrooms are adequately equipped with furniture and teaching aids. Lastly, poor management cause outsiders to have free access to the school environment - such may encourage looting and stealing.

**Conclusion and Recommendations**

The importance of physical facilities in the primary schools cannot be overemphasized. This is as a result of the position occupied by the primary education in National development. If the other levels of education (Secondary and tertiary) can achieve their aims and objectives as stated in the National Policy on Education, the situation should not be different at the primary school level. Facilities of various kinds should be adequately provided which will ensure effective utilizations. Teachers should be creative so as to improvise certain materials needed for teaching. School heads should also see themselves as facility managers.

State Government should incorporate maintenance of physical facilities in her annual budget. More importantly, it should be noted that management is a continuous process for this ensures proper maintenance of facilities.

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# DAY-TO-DAY VARIABILITY IN SOME IONOSPHERIC PARAMETERS IN THE QUIET EQUATORIAL IONOSPHERE (CASE STUDY: IONOSPHERIC CRITICAL FREQUENCY OF THE E-REGION, $f_0E$)

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## ABSTRACT

Day- to -day variability in some ionospheric parameters in the quiet equatorial ionosphere, case study: foE is hereby presented. The diurnal variation of foE shows a symmetrical one with a peak value at noon. The seasonal variation curve of foE has two maximum points in the months of April and August. It is also shown that for short time variation, the day-to-day variability in the E - region of the ionospheric critical frequency, foE, is not due to season nor relative sunspot number Rz. The test of significance carried out between the standard errors of foE before and after correction shows no significant difference at 95% level of significance.

## Introduction:

It has been shown that day-to-day changes in the F region critical frequency were closely related on an average to day-to-day changes in the noon values of Sq (rate of electron production) at the magnetic equator (Bates D,R and Massey H.S.W, 1997). They attributed this correspondence to day - to - day differences in the dynamo electrostatic field generated by winds near or within the E-region. There is little information about the E-region of the ionosphere because at night the critical frequency foE lies outside the working range of most ionosonades. It has been shown that at night foE varies so much from hour to hour and from night to night; that it is impossible to describe a regular behaviour (Yokoyama, 2004). This variability is probably evidence that at night the phenomenon of Es, is particular noticeable.

Also, no enough records of foE at night as a result of slow decay of ionization produced during

the day by photo-ionization and due to slow recombination process. It therefore becomes necessary to study these behaviours in the E-region so as to provide the data needed for the description of the ionospheric E layer, which is essential for the maintenance of radio communication. The observation would make possible complex calculations of temperature, of composition of the air, and of properties of the earth's magnetic field.

**Data collection:**

The data used for this study were collected from the readings of an ionosonade which were recorded into booklets. The ionosonade is the ionospheric sounder used in Ibadan. The period covered by data is January to December 1996. An Ap indices (Ap <10) was taken as indicating a quiet day (arbitrary) and the results, therefore describe the behaviour of the undisturbed E-region.

**Terminologies used:**

Daytime: Hours between 0600 and 1800 hours

Night time: Hours between 1900 and 0500 hours

Seasons: Following the division of the year into seasons, by (Barry, 1945) the different seasons are given by March and April representing March equninox, May to August representing June solstice.

$f_oE$: Ordinary wave critical frequency of the E-layer.

**Analysis/Results/Discussion:**

foE daytime variation (Diurnal Variation) tables 1 and 2 are observed values of foE at each hour of the day for which observations were made.

**Table 1**

**March Equinox (Month of April) foE VALUES (OBSERVED) MHz**

| Q.D | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Rz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 2.10 | 3.05 | 3.60 | 4.00 | 4.30 | 4.30 | - | - | 4.20 | 3.95 | 3.60 | 2.85 | 1.70 | 246 |
| 9 | 2.30 | 3.10 | - | 4.10 | - | 4.35 | 4.50 | - | 4.20 | - | - | - | - | 204 |
| 10 | 2.20 | 3.05 | 3.65 | 4.05 | 4.40 | - | - | - | - | - | - | - | - | 197 |
| 11 | 2.10 | 3.10 | 3.60 | 3.90 | 4.30 | 4.30 | - | - | - | - | - | 2.80 | 1.60 | 159 |
| 12 | 2.10 | 3.05 | 310 | 4.05 | 4.15 | 4.30 | 4.40 | 4.30 | 4.10 | 3.75 | 3.40 | - | 1.80 | 140 |
| 13 | 2.10 | 3.05 | - | 4.00 | 4.20 | 4.35 | 4.35 | 4.30 | 4.05 | 3.80 | - | 2.65 | 1.60 | 127 |
| 22 | 2.30 | 3.20 | 3.65 | 4.00 | - | 4.30 | - | 4.30 | - | - | 3.40 | - | - | 212 |
| 23 | 2.30 | 3.35 | 3.75 | 4.08 | 4.29 | 4.33 | 4.39 | 4.33 | 4.19 | 4.00 | 3.76 | 3.30 | 2.57 | 201 |

**Table 2**

**June Solstice (Month of June) foE Values (observed) MHz**

| Q.D | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | Rz |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | 2.50 | 3.20 | 3.20 | 4.00 | 4.15 | 4.30 | 4.30 | 4.20 | - | 3.80 | 3.35 | 2.85 | 1.80 | 181 |
| 4 | 2.50 | 3.20 | 3.20 | 4.10 | 4.40 | 4.40 | 4.45 | - | - | 4.05 | 3.45 | 2.80 | 1.90 | 195 |
| 5 | 2.45 | 3.30 | 3.70 | 4.00 | 4.30 | 4.45 | 4.40 | 4.35 | 4.15 | 3.80 | 3.35 | 2.95 | 1.85 | 195 |
| 13 | 2.25 | 3.15 | 3.65 | 3.65 | 4.20 | 4.20 | 4.20 | 4.25 | 4.15 | 4.00 | 3.85 | 3.40 | 2.90 | 176 |
| 16 | 2.30 | 3.15 | 3.65 | 4.00 | 4.20 | 4.30 | 4.30 | 4.30 | 4.00 | 3.75 | 3.30 | 2.70 | 1.80 | 100 |
| 17 | - | - | 3.80 | - | 4.20 | 4.35 | 4.35 | 4.20 | 4.00 | - | 3.45 | 2.95 | 1.90 | 113 |
| 18 | 2.20 | 3.10 | 3.35 | 3.85 | - | 4.25 | 4.25 | - | 3.90 | 3.60 | 3.35 | 2.70 | 1.80 | 100 |
| 20 | 2.20 | 3.20 | 3.65 | 3.95 | 4.15 | 4- | - | - | 3.95 | 3.65 | 3.30 | 2.80 | 1.80 | 107 |

The day time variation curves are as shown in figure 1

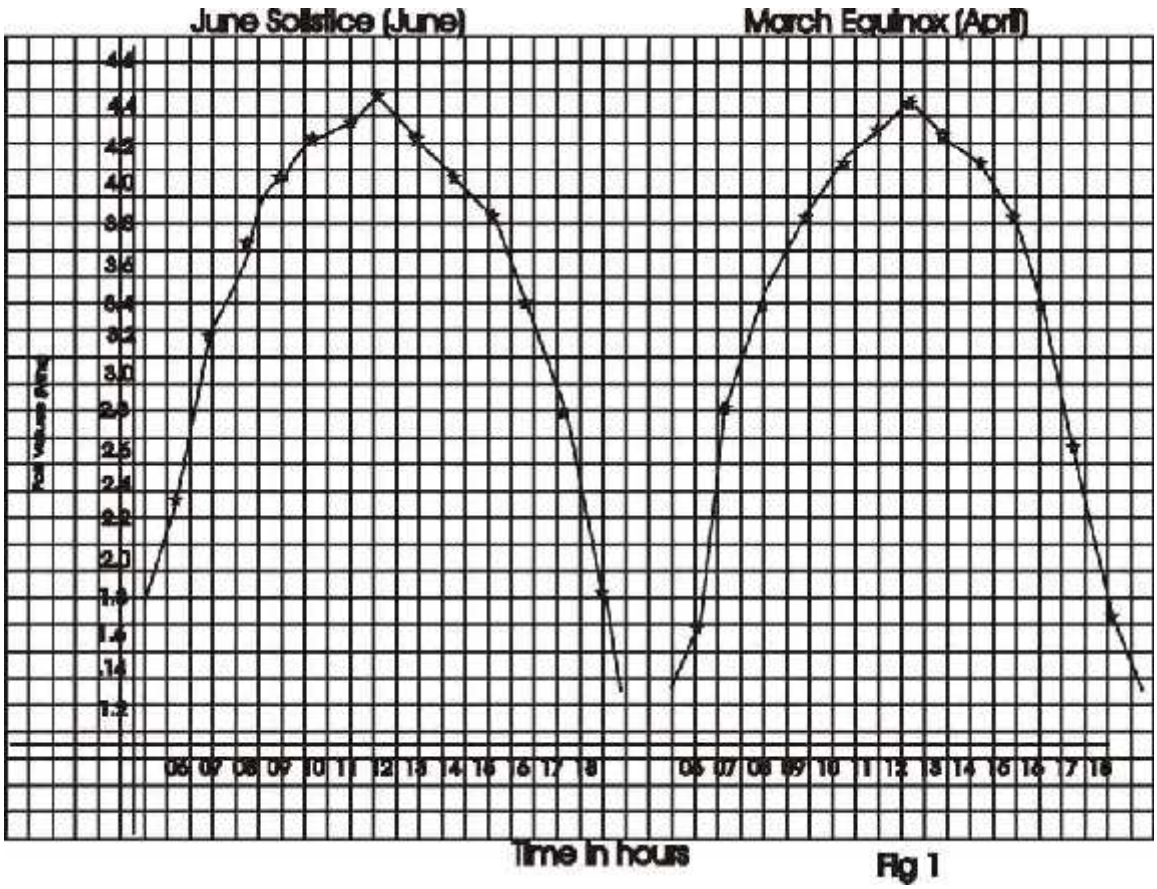



Fig 1

The curves show a symmetrical one with peak value at noon, it is important at this point, to mention that from the diurnal variation curve of foE, the recombination coefficient x, can be determined from.

Dt. = 1 (Appleton E,V 1959)

seasons are represented by the months that belong to the season and the standard errors determined at some chosen hours of the day.

Month of April (March Equinox)

Month of June (June Solstice)

<u>For example: March Equinox</u>

At 0700 hours

Mean foE = 3.10MHz

Standard deviation = 0.05

Standard error = 0.02

Hence foE = (3.10 + 0.02) MHz

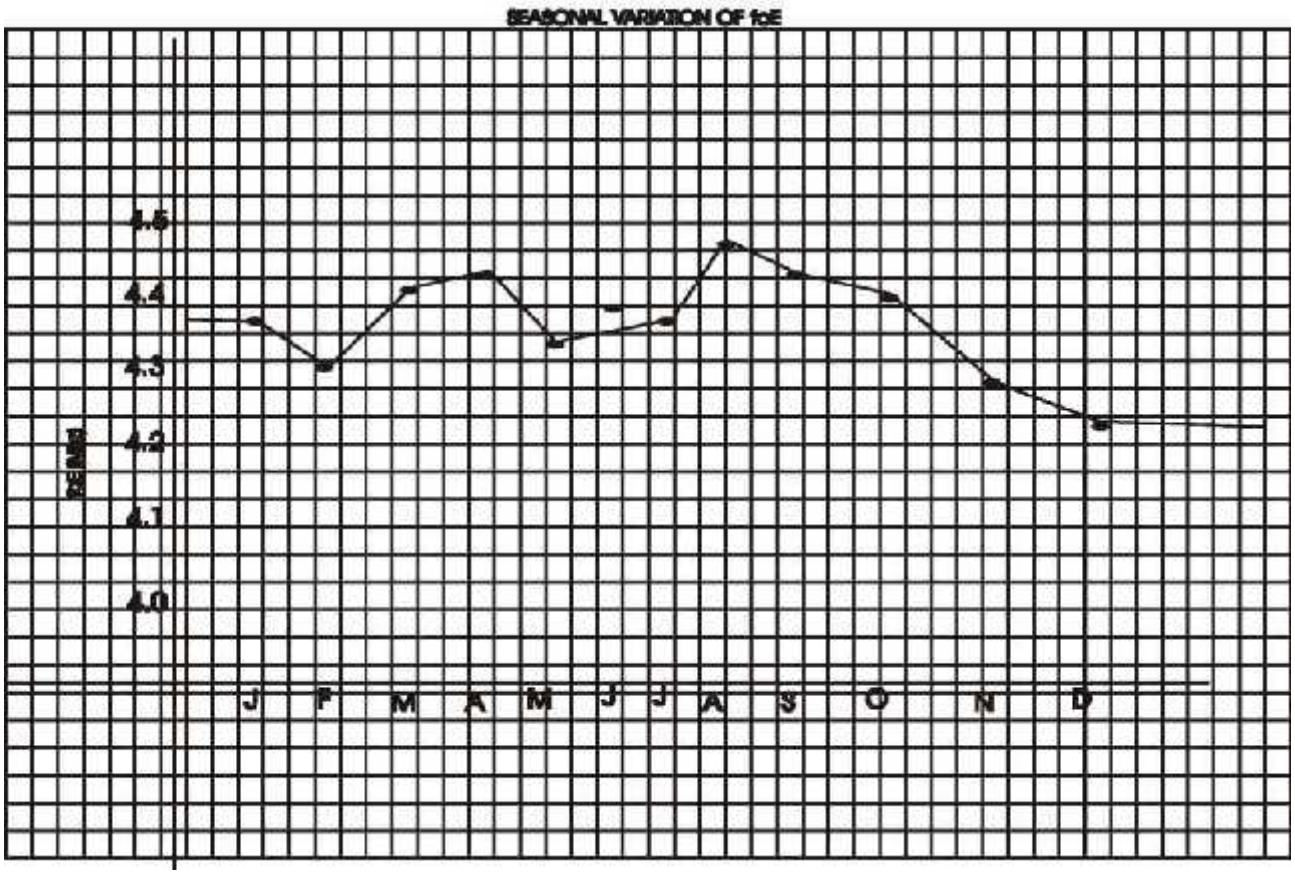
Similar analysis was carried out at various times of the day

**$f_oE$ seasonal variation.**

Table 3 shows the mean values of $f_oE$ by month for the year under consideration

| **MONTHS** | **foE (MHz)** |
|---|---|
| January | 4.35 |
| February | 4.31 |
| March | 4.40 |
| April | 4.41 |
| May | 4.33 |
| June | 4.36 |
| July | 4.35 |
| August | 4.46 |
| September | 4.42 |
| October | 4.38 |
| November | 4.28 |
| December | 4.24 |

This was used to plot the seasonal variation curve shown in fig 2




**Mor*w**

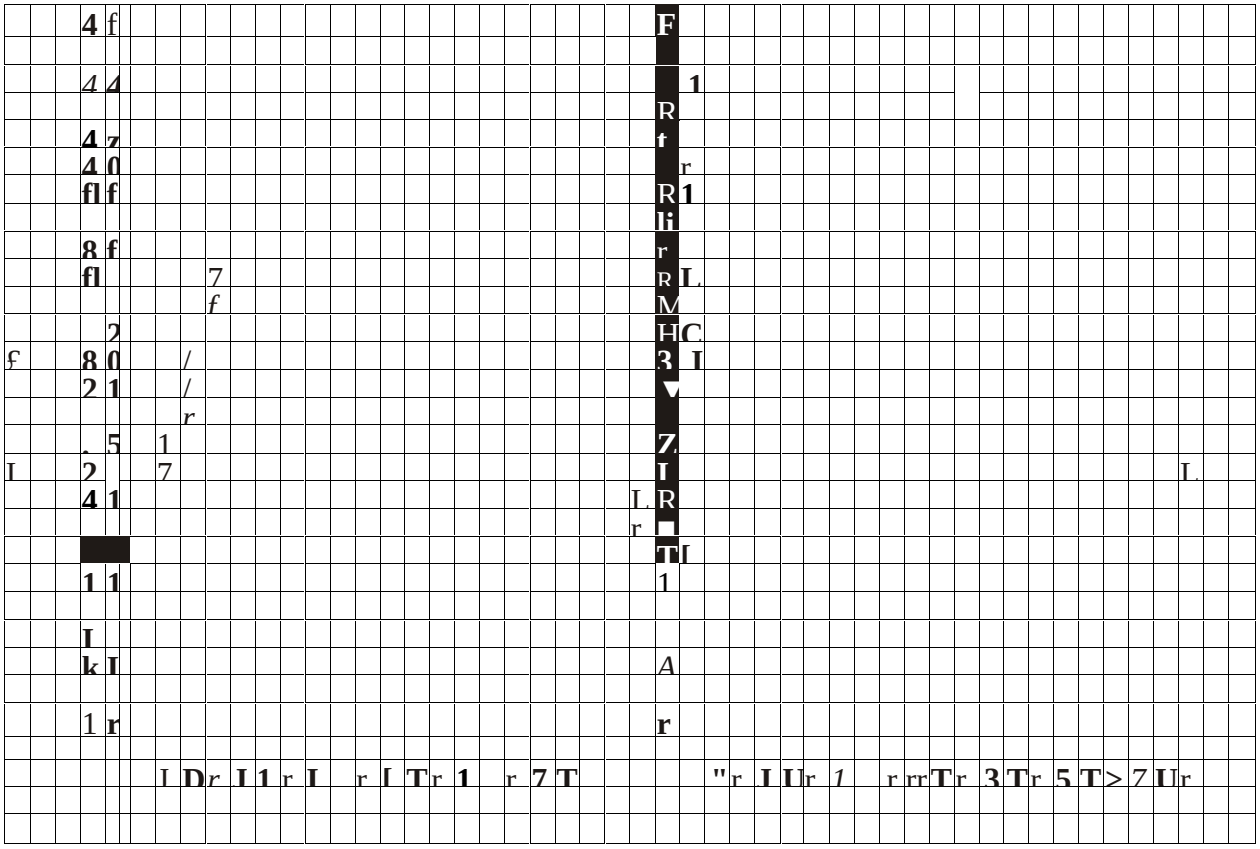
**Hg2**

The curve has two maximum points in the months of April and August. It is important to note that the concentration of oxygen in the E layer is largest in summer. Also the E layer is influenced by drift, solar tide motion as well as layer distortion.

**Effect of season and Rz on the critical frequency of the E layer:** It is essential to examine the effect of Rz and season on foE. Based on the latter, the seasonal variation curve, fig. 2 above was used to correct for season. Lyon (1964) found that variation of noon time $f_oE$ at Ibadan with sunspot number Rz was given by $f_oE = 3.47 (1+0.0014Rz)$.

The above equation was used to correct for Rz. The corrected diurnal variation curves are as shown in fig. 3 for the solstice and equinox.

**JiroSoMcepma)**



**H08**

**Iknahhom**

From the corrected fE curves the standard errors were obtained as shown in the example below.

(i) March equinox (Month of April)

At 0700 hours

Means foE = 2.61 MHz

If d = deviation from the mean

n = number of observations then, standard deviation 6 = $\sqrt{d^2}$

n= 0. 25MHz

Standard error 6m = 6 = 0.08MHz

Vn

Similar analysis was carried out at various time of the day. Table 4 below shows the result obtained.

Table 4 **MARCH EQUINOX (APRIL)**

| TIME | 07 | 09 | 12 | 14 | 16 | 18 |
|---|---|---|---|---|---|---|
| 6 | 0.25 | 0.08 | 0.06 | 0.09 | 0.30 | 0.89 |
| 6m | 0.08 | 0.02 | 0.03 | 0.04 | 0.15 | 0.44 |
| 36m | 0.24 | 0.06 | 0.09 | 0.12 | 0.45 | 1.32 |

**JUNE SOLSTICE (JUNE)**

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | 0.12 | 0.10 | 0.07 | 0.09 | 0.18 | 0.48 |
| 6m | 0.04 | 0.03 | 0.02 | 0.03 | 0.06 | 0.016 |
| 36m | 0.12 | 0.09 | 0.06 | 0.09 | 0.18 | 0.48 |

**Test of Significance for Diurnal Variation:** A statistical test was carried out to test the significance between the standard errors of the variation curves of $f_oE$ before and after correcting for season and Rz at 95% level of significance. The results obtained are as shown

(1) Month of April (Daytime)

1200 hours

Before = 0.03

After = 0.03

t 95% = 2.31

t = 0

t 95% > t (t = 0)

(2) Month of June (Daytime)

12 hours

Before = 0.03

After = 0.02

t 95% = 2.31

t = 0.16

Hence no significant difference at 95% level. These results above show that the day-day variation in the E-region of the ionosphere is neither due to seasonal variation nor relative sunspot number Rz.

**Discussion**

The normal behaviour of the E layer of the Ionosphere obtained in this study agrees with that developed by Chapman (1971) in the classical theory of ionized layer production. The seasonal variation of foE has two maximum points in the months of April and August. The test of significance carried out shows that the day-day variability in the E region of the ionosphere is neither due to seasonal variation nor relative sunspot number Rz.

**Conclusion**

In the E region, dynamo electrostatic fields are generated by winds. It could therefore be said that changes in some parameters such as ionospheric diffusion, winds as well as electrodynamics drift, vertical or horizontal could be responsible for the day-day variability in that region. Other causes could be solar tides and layer distortions. It is therefore suggested that these variables be investigated for the disturbed E layer so that the result established be proposed as equatorial in-put values for the development of a variability model for the international reference ionosphere.

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# DETERMINING TEACHING COMPETENCIES OF AGRICULTURAL EDUCATION PROGRAMME GRADUATES OF FCE (T) GOMBE

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***ABSTRACT***

*The purpose of this follow-up study was to evaluate the performance of Agricultural Education Graduates (AEGs) of the Federal College of Education (Technical) Gombe, from 1996 to 2003 who are teaching Agricultural Science in secondary schools in Gombe State; with a view to determining how effective they demonstrate the knowledge of vocational agriculture, the knowledge of pedagogy and the usefulness of the knowledge of general studies on their professional career. Data were collected using a researcher- developed questionnaire. The data collected were analyzed using weighted mean to answer 45 questions posed. Findings of the study revealed that; AEGs are effective in eight out of ten vocational agriculture competencies; AEGs effectively demonstrate pedagogic skills in 19 out of 20 competency statements and that the knowledge of general studies is effectively useful to AEGs' professional competency needs. It was recommended that equal and adequate attention be given to all aspect of the curriculum of agriculture by agriculture teacher trainers. Teaching and learning environment in secondary schools should be motivating and conducive for the students to develop interest in agriculture.*

## INTRODUCTION

Vocational Agriculture was introduced in Nigeria's formal education system over two decades ago consequent upon the National Policy on Education document first published in 1977 revised in 1981, 1998 and 2004. As an innovation in the agricultural education programme, Nigerian agricultural educators fashioned out vocational agriculture at the secondary school level to suit the needs of the nation. In its broad content, vocational agriculture in secondary schools is to provide learners with necessary skills and experiences to enable them become efficient producers of economic crops and animals (Abelega, 1996). Unlike vocational

agriculture, the form of agricultural science that was offered in schools prior to the introduction of the 6:3:3:4 system of education focused on the discipline and sub discipline approach to learning. Under the discipline approach to learning, learners were exposed to scientific methods and techniques in agriculture without relating them to the world of work, leading to the production of a crop of theorists who were capable of theorizing concepts, methods and techniques for farming improvement but lack psycho-productive skills required on actual jobs (Uwadiea, 1993). This obviously resulted in a conflict between what was operating and what was required. The apparent failure of the agricultural training to meet the yearnings and aspirations of the Nigerian people led to the call by some Nationalists for a total review of the curriculum of education, which invariably effected agricultural education (Fafunwa, 1974).

Ishyaku (2002:a) reported that it was the Ashby commission of 1960, Adam Skapski's report of 1966 and the curriculum conference of 1969, which provided the impetus that eventually brought vocational education (including agricultural education) to the limelight. At the secondary school level, the content of agriculture is organized into pre-vocational and vocational agriculture for the junior and senior secondary school levels respectively. At the Junior Secondary School (JSS), which is currently referred to as Senior Basic level, vocational agriculture is offered as a pre-vocational subject. The content of the curriculum for JSS provides that vocational agriculture should among other things stimulate students' interest in agriculture, enable students acquire basic knowledge in agriculture, prepare students for occupation in agriculture and prepare students for further studies in agriculture (FRN, in Abelega, 1996:81). Therefore, based on the structure, objectives and content of vocational agriculture in the National Policy on Education, it is clear that far - reaching innovative measures were introduced to correct the inadequacies that were hitherto associated with the form of agricultural science that was offered in secondary schools. The innovations introduced to Agricultural Education was however, faced with the problem of shortage of teachers, who will implement the new policy at the secondary school level. Apagu (2001) argued that teachers who are occupationally qualified and competent in the subject-matter area contribute immensely to the success of any educational programme. This is also true for vocational agriculture teachers. Competent teachers are required in adequate quantity to guide and direct learning. Abelega (1996) also agreed that the presence of competent teachers would have a direct bearing on students' performance. Therefore, quality psycho-productive skills can only be expected where there are competent teachers.

In the view of Ndubisi and Ali, (1986) the Universal Primary Education (UPE) scheme launched by the Federal Government of Nigeria in 1976, led to enrolment explosion in primary

and secondary schools. In addition, qualified and experienced teachers were in very short supply, especially at the JSS level. Agricultural education, being a component part of secondary education, will invariably be affected by shortage of competent teachers as in other subject-matter areas. It was against this background that government established of the second National Technical Teachers' College (NTTC), in Gombe in 1977, now called Federal College of Education (Technical), to complement the one at Yaba (Okoro, 1999) to train technical teachers specifically for the JSS level.

The programme leads to the award of the Nigerian Certificate in Education (NCE), Technical. FCE (T), Gombe was however affiliated to the Institute of Education Ahmadu Bello University Zaria, from its establishment in 1977 until 1992 when autonomy was granted to Colleges of Education, under the supervision of the National Commission for Colleges of Education (NCCE). The NCCE, according to Ibitoye and Daluba (2000:176) "is charged with the responsibility of preparing minimum standards for the programmes of Colleges of Education and also set out guidelines and criteria for their accreditation in accordance with the National Policy on Education." The College started training in Agricultural Education in 1987 with the first set of student teachers graduating in 1990. The objectives of NCE Agricultural Education include, producing competent teachers with the knowledge of vocational agriculture, pedagogic skills and general studies. (NCCE, 1996:1). A competent agriculture teacher according to Dormody and Torres (2002) should possess subject-matter competence, pedagogical competence, skills processes and dispositions necessary to help all students learn. It was in furtherance of the agricultural teacher competency needs that the graduation requirements for NCE agriculture teachers are categorized into; General Education Components, Technical and Professional Agricultural Components, General Studies, Teaching Practice and Students' Industrial Work Experience Scheme, (SIWES) (NCCE,1996). Buttressing teacher competency needs, Isyaku (2002:b) stressed that a viable teacher education programme should ensure that its products, apart from being masters of their subjects and of the techniques and skills of teaching - in the case of this study, vocational agriculture- must be exposed to the beneficial influences of the humanistic studies which feature in the foundations of education. It is therefore important for the agricultural educators to ensure the attainment of a fair balance through the curriculum components that constitute NCE agriculture programme. The training process for the agriculture teachers should guarantee the production of a well-nurtured individual who has a thorough knowledge of the psychological basis and techniques for identifying, integrating and using appropriate skills for communicating content to the students.

Based on the conceptualization by Finch and Crunkilton (1984) that teaching and learning are partner-processes, the programme for producing such competency-based and performance-oriented agriculture teachers must not compromise quality. Inadequacies and deficiencies, should not be allowed to exist in any curriculum components, or else the objectives of the programme become defeated, leading to a state of wastage in terms of human and material resources. Frequent evaluation is therefore required in order to avoid failure and ensure programme effectiveness.

Programme evaluation according to Okoro (2002) involves the collection of data and the use of such data to assess the effectiveness or quality of programmes. It is the process of comparing programme performance against the desired programme standards to determine if there is any discrepancy between the two. The information obtained from the study can then be used to improve the programme. Abelega (1996) wrote that in a school system, evaluation is necessary to guide instruction, improve programme effectiveness, organization and monitor students' performance. In addition to this general value of evaluation, an effective evaluation in vocational agriculture education programme is expected to serve as a pivot for producing competent, functional and production-oriented graduates who will work to achieve the objectives of the agricultural education programme they passed through. One major technique in programme evaluation is the follow-up study. A follow-up study involves contacting individuals after they have passed through a training programme in order to ascertain from them what they think of the programme they passed through (Okoro, 2002). Employer survey, according to Okoro (2002) can also form a part of a follow-up study.

Finch and McGough (1982) argue that when effort to carry out programme evaluation is being formalized, it is sometimes best to build it upon a conceptual framework. Finch and McGough view evaluation of vocational education curricula, programmes and services as being related to Initiation, Structuring and Operation of the school system. Evaluation of a school programmes are then modeled into four stages: Context Evaluation; Input Evaluation; Process Evaluation and Product Evaluation. Stufflebeam (1969) explained that Context, Input, Process and Product (CIPP) evaluation are the most useful elements of a comprehensive evaluation framework.

Context and input evaluation are most appropriate when initiation and structuring activities are to be conducted, while the process and product evaluation relate most closely to operation activities. Context and input evaluation help in making decision as to whether or not to establish a curriculum or what content should be included in a programme. Process and product evaluation, on the other hand, relate to whether or not, students have learned certain content

and the effects such content has on students, such as their ability to secure employment and how well they are performing on the job. (Finch and McGough, 1982; Okoro,1999; Okoro, 2000 and Ajala, 2002). It was therefore the crux of this study to carryout process and product analysis of the graduates of NCE agriculture programme

F.C.E. (T) Gombe was established in 1977 and has been graduating NCE agriculture teachers since 1991; most of who reside and teach in secondary schools in the State; and since the NCE agriculture programme was well conceived and currently being executed based on outstanding processes of admission, curriculum implementation and evaluation, it is hoped to be yielding expected results. The level of professional competencies of these graduates has however not been determined before now. Considering also that we are living in a dynamic society that is constantly being influence by innovations in teacher education, which requires that adequate attention be given to the process of producing such teachers. The extent to which the NCE agriculture programme of F.C.E. (T) Gombe has prepared its graduates in subject matter and pedagogic competencies and knowledge of general studies, so as to effectively teach agriculture in secondary schools was therefore the concern of this study**.**

**Purposes and Objectives**

The main purpose of this study was to evaluate the performance of Agricultural Education Graduates (AEGs) of FCE (T) Gombe currently teaching in secondary schools in Gombe State. Specifically, the objectives of the study were: -

i. To determine how effective the AEGs of FCE (T) Gombe demonstrate the knowledge of vocational agriculture during their day-to-day teaching activities.
ii. To determine how effective the AEGs of FCE (T) Gombe demonstrate the skills of teaching agriculture.
iii. To evaluate the usefulness of the knowledge of general studies to the professional needs of AEGs.

**Research Questions**

The following research questions were answered in this study:

i. How effective do AEGs demonstrate the knowledge of vocational agriculture during their day-to-day teaching activities?
ii. How effective do AEGs demonstrate the skills of teaching agriculture?
iii. How useful is the knowledge of general studies to AEGs professional needs?
iv.

**Methods and Procedures**

A survey design was adopted for the study. The design was considered suitable and appropriate for this study because it involves collection of data through questionnaire from a representative sample of the population. The population for this study consisted of 486 AEGs of FCE (T) Gombe that graduated between 1996 and 2003 who are residents in Gombe State. Agricultural Education Graduates' supervisors that made up the second population of the study were the 150 principals and 150 Heads of Department of agriculture found in the 150 secondary schools in Gombe State (Gombe State Ministry of Education, 2004). The Yaro Yamane formular for a finite population was used to determine the sample size. A sample of 219 AEGs, representing 45% of the population was considered for the study. The sampling technique adopted in the study was Simple Random Sampling.

The instrument used for data collection was a questionnaire titled Agricultural Education Graduates Follow-up Questionnaire I and II (AEGFUQ). AEGFUQ I was designed for AEGs, while AEGFUQ II was for Principals and HODs. However, they both contain the same questionnaire items except for differences in general information and mode of questioning. The AEGFUQ consisted of 45 questionnaire items in three sections, A, B and C. The questionnaire began with a preliminary section titled General Information, which was designed to collect information about the respondents' year of graduation and current place of work. Section A of the instrument contained 10 questionnaire items on the subject-matter knowledge of AEGs. Section B contained 20 questionnaire items on pedagogic knowledge of AEGs. While section C had 15 questionnaire items on general knowledge acquired by AEGs during training. All the questionnaire items were structured into five-response category. Experts validated the instrument, while reliability test yielded Cronbach alpha 0.81. Data collected in the study were analyzed using Minitab version 10 to determine the Mean (X). Grand Mean (X) was used to analyze the mean responses of the three groups of respondents in respect of each item on the questionnaire.

## RESULTS AND DISCUSSION

### Objective 1

Table 1 indicates that AEGs fairly effectively demonstrate the knowledge of vocational agriculture in eight (8) out of the ten (10) competency items. They were rated ineffective in two, that is, items 3 and 4. The highest grand mean of 3.31 is for demonstration of the knowledge to form youth clubs in schools, while the lowest grand mean of 2.72 indicate AEGs'

ineffectiveness in the knowledge of animal production and ability to maintain soil fertility in the school farm.

***Table 1***

AEGs Knowledge of Vocational Agriculture

| ITEM NO. | Vocational agriculture competencies | AEG $X_1$ N=200 | PRIN X2 N=128 | HOD X3 N=128 | GRAND MEAN | REMARKS REMARKS |
|---|---|---|---|---|---|---|
| 1. | Knowledge of basic sciences | 2.980 | 3.172 | 3.305 | 3.152 | Fairly Effective |
| 2. | Ability to conduct agriculture practical | 2.435 | 3.484 | 3.086 | 3.002 | Fairly Effective |
| 3. | Demonstration of knowledge of animal production | 2.165 | 2.781 | 3.227 | 2.724 | Ineffective |
| 4. | Ability to maintain soil fertility in the school farm | 3.040 | 2.539 | 3.414 | 2.998 | Ineffective |
| 5. | Ability to form youth clubs in the school | 3.200 | 3.227 | 3.508 | 3.311 | Fairly Effective |
| 6. | Knowledge of agricultural marketing | 3.540 | 3.250 | 3.023 | 3.271 | Fairly Effective |
| 7. | Knowledge of agro chemicals | 3.490 | 2.289 | 3.352 | 3.044 | Fairly Effective |
| 8. | Knowledge of crop husbandry | 3.880 | 2.938 | 3.070 | 3.296 | Fairly Effective |
| 9. | Knowledge of agricultural tools and implements | 4.050 | 2.906 | 2.773 | 3.243 | Fairly Effective |
| 10. | Knowledge of agricultural climatology | 3.650 | 2.594 | 2.773 | 3.006 | Fairly Effective |

Note: Xi - Mean of AEGs; $X_2$- Mean of Principals; $X_3$ - Mean of HODs

The implication of the findings in Table 1 is that there should be concerted effort to improve the strategies of teaching those aspects of the subject matter where AEGs' were rated ineffective, because Abelega (1996) and Isyaku (2002), said to effectively teach all the subject areas of agriculture and other subject matter specializations the teacher should be adequately trained to acquire the required competencies. However, the high competence level of AEGs recorded in the knowledge of vocational agriculture could be attributed to a total of 72 credit units allotted to vocational agriculture out of 130 total credit units required for graduation in NCE agriculture.

Objective 2

Table 2 reveals that out of 20 questionnaire items AEGs are ineffective in the use of instructional materials. The mean response was however close to 3.00; that is 2.98. The highest grand means obtained were 3.837, 3.757 and 3.731 respectively. These mean scores indicate effective demonstration of the skills of teaching agriculture, in the areas of rapport with students, demonstration of comportment during teaching and effective use of chalkboard.

Table 2

**AEGs Demonstration of Teaching Skills**

| **ITEM NO.** | **Pedagogic Competencies** | **AEG** **Xi** **N=200** | **PRIN** **X2** **N=120** | **HOD** **X3** | **GRAND MEAN** | REMARKS |
|---|---|---|---|---|---|---|
| 1. | Knowledge of lesson plan organization. | 4.090 | 3.273 | 3.469 | 3.611 | Effective |
| 2. | Ability to introduce lesson in a variety of ways. | 4.020 | 2.992 | 2.797 | 3.270 | Fairly Effective |
| 3. | Use of appropriate teaching methods. | 4.030 | 2.359 | 3.391 | 3.260 | Fairly Effective |
| 4. | diverse student population. | 3.645 | 2.820 | 3.508 | 3.324 | Fairly Effective |
| 5. | Use of chalkboard. Time management | 4.115 | 3.195 | 3.883 | 3.731 | Effective |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6. | ability. | 3.905 | 3.445 | 3.828 | 3.726 | Effective |
| 7. | Use of instructional materials. | 3.675 | 2.281 | 2.984 | 2.980 | Ineffective |
| 8. | Identify individual differences in students and reflect it in planning | 3.475 | 2.633 | 3.133 | 3.080 | Fairly Effective |
| 9. | Achievement of lesson objectives. Demonstrate an in charge-image | 3.730 | 3.344 | 3.281 | 3.452 | Fairly Effective |
| 10. | Ability to keep students on task. | 4.475 | 3.508 | 3.289 | 3.757 | Effective |
| 11. | Apply appropriate classroom management skills | 4.330 | 3.008 | 3.664 | 3.667 | Effective |
| 12. | Knowledge of improvisation of simple instructional materials. | 4.390 | 2.945 | 3.563 | 3.633 | Effective |
| 13. | Ability to provide career information to students. | 3.675 | 2.719 | 2.867 | 3.087 | Fairly Effective |
| 14. | Present subject matter clearly. | 3.460 | 3.203 | 3.156 | 3.273 | Fairly Effective |
| 15. | Use appropriate strategies to evaluate learning. | 3.725 | 2.570 | 2.758 | 3.018 | Fairly Effective |
| 16. | Questioning technique Demonstrate knowledge of teaching as a | 4.160 | 3.172 | 3.258 | 3.530 | Effective |
| 17. | Has rapport with the students. | 4.290 | 3.125 | 3.555 | 3.657 | Effective |
| 18. | | 4.225 | 2.172 | 3.031 | 3.143 | Fairly Effective |
| 19. | | 3.340 | 2.664 | 3.016 | 3.007 | Fairly Effective |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20. | | 4.480 | 3.641 | 3.391 | 3.837 | Effective |

**Note: Xi - Mean of AEGs; X2- Mean of Principals; X3 - Mean of HODs**

The second purpose of this study indicated that on a general note, AEGs effectively demonstrate pedagogic skills. Pedagogic knowledge is the professional education component of the agriculture teacher education programme. However, Table 2 shows that, of all the 20 questionnaire items only one aspect of the teaching skills was rated ineffective. That is, the use of instructional materials. This implies that AEGs do not effectively demonstrate the knowledge of the use instructional materials. This finding conforms with the discovery of Ogunrinde (2002), which revealed that agriculture teachers tend to concentrate on imparting cognitive knowledge to students at the detriment of the much-desired psycho-productive skills. The same result can be responsible for students declining interest in agriculture (Ogunrinde, 2002). This finding therefore will serve as, feedback to teacher educators because according to Olaitan and Ali (1997), follow-up studies provide feedback to teachers concerning the effectiveness of their teaching methods, thereby increasing their understanding of the needs of their current students.

**Objective 3**

Table 3 shows that the knowledge of general studies acquired by AEGs effectively contribute to their professional teaching activities in thirteen (13) out of fifteen (15) questionnaire items. The highest grand means being 3.737 and 3.735 that measured AEGs' interpersonal relationship with other staff and team spirit respectively. Areas of ineffectiveness include ability to communicate effectively in English and knowledge of the use of library, which both have means of 2.999 and 2.370 respectively.

**Table 3**

**Usefulness of the Knowledge of General Studies to AEGs**

| ITEM NO | Usefulness of Knowledge General | AEG X1 N=200 | PRIN X2 N=128 | HOD X3 N=128 | GRAND MEAN | REMARKS |
|---|---|---|---|---|---|---|
| 1. | Ability to communicate effectively in English language | 3.560 | 2.828 | 2.609 | 2.999 | Ineffective |
| 2. | Participation in Unions and Associations | 3.645 | 3.242 | 3.266 | 3.384 | Fairly Effective |
| 3. | Interpersonal relation-ship with students. | 3.790 | 3.734 | 3.281 | 3.602 | Effective |
| 4. | Interpersonal relationship with other staff | 3.925 | 3.898 | 3.383 | 3.735 | Effective |
| 5. | Attitude to work. | 4.200 | 3.414 | 3.297 | 3.637 | Effective |
| 6. | Judgment - ability to make worthwhile decisions. | | | 3.438 | 3.710 | Effective |
| 7. | Initiative and innovation. | 4.210 | 3.492 | 3.258 | 3.614 | Effective |
| 8. | Team spirit. | 4.250 | 3.258 | 3.703 | 3.737 | Effective |
| 9. | Punctuality. | 4.250 | 3.438 | 3.453 | 3.714 | Effective |
| 10. | Cooperation with school administration. | 4.265 | 3.531 | 3.36 | 3.721 | Effective |
| 11. | Knowledge of National Issues. Writing skills. | 4.305 | 3.461 | 3.25 | 3.675 | Effective |
| 12. | Knowledge of the use of library. | 4.130 | 3.469 | 2.992 | 3.530 | Effective |
| | Community development | | | 2.633 | 2.370 | Ineffective |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13. | Recognition of rights, privileges and responsibilities as a citizen. | 2.125 | 2.352 | 3.031 | 3.228 | Fairly Effective |
| 14. | | 3.590 | 3.063 | | 3.547 | |
| 15. | | 3.625 | 3.578 | 3.438 | | Effective |

Note: Xi - Mean of AEGs; $X_2$- Mean of Principals; $X_3$ - Mean of HODs

Objective 3 diagnosed some personality traits possessed by AEGs since according to Ajala (2002) teachers need to be evaluated on several traits among which are intelligence, personality, punctuality and general relationship with both staff and students. Table 3 shows that AEGs are effective in the knowledge of general studies but their performance in the use of English language and library were rated ineffective. This finding is similar to the findings of Squire (2000), where Headmasters of Agricultural Education Graduates of Botswana College of Agriculture graduate teachers were rated low in communication skills. It therefore goes to say that the common notion by science and technology students that the knowledge of English Language is not important, is a global trend and teacher educators should make deliberate effort to improve the strategies of teaching Communication Skills in schools at all levels. Another area of AEGs ineffectiveness is in the use of library. This could also be attributed to poor library facilities in secondary schools, because adequate credit is allotted to study in the use of library in the NCCE Minimum Standards. Dormody and Torres (2002) in a study of graduates of Agricultural Education who have taught for an upward period of five years in secondary schools were found to have improved in teacher competency abilities due to experience acquired on the job. Therefore, if there were adequate library facilities in schools the knowledge of AEGs in the use of library would have improved over time.

## Conclusion

Based on the results of this study, the following conclusions were drawn:

1. The performance level of AEGs in the knowledge and demonstration of vocational agriculture is generally effective, except in the aspect of animal production and sol fertility improvement.
2. The Pedagogic skills demonstrated by AEGs are within acceptable limit but they need to improve in the use of instructional materials in teaching.
3. Knowledge of general studies contributes effectively to the satisfaction of AEGs' professional teacher requirements, but they need to improve in the use of library, communication skill and computer.

## Recommendations

The following recommendations were made based on the findings of this study

1. Agriculture teacher trainers should make sure that all aspects of agriculture are given adequate and equal attention in order to produce well balanced and competent agriculture teachers for schools.
2. Agriculture teacher training should emphasize the use of instructional aids during training and also give adequate attention to skill of improvisation.
3. School should provide adequate instructional materials for agriculture teachers to use especially practical farms where most of the items needed for effective teaching of agriculture can be found.
4. During teacher training, more attention should be given to studies in the use of library especially by adopting teaching strategies that will make student teachers develop positive attitude to the use of library.

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# EFFECT OF INTEGRATING THEORY WITH PRACTICAL ON STUDENTS' ACHIEVEMENT IN BIOLOGY

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***ABSTRACT***

*This paper examines the effect of integrating theory with practical on students' achievement in Biology. The sample consists of 400 students selected from two urban and two rural co-education secondary schools in Otukpo. A quasi-experimental design was adopted for the investigation, and intact classes were used for data for both the experimental and control groups. The instrument used for data collection was Biology Achievement Test (BAT) which was validated by experts in Science Education. The reliability coefficient was 0.37 for pre-test and 0.60 for post-test respectively. Four research questions and three hypotheses were stated. The t-test statistical tool and analysis of covariance (ANCOVA) were adopted for analysis. The findings showed that experimental group performed significantly better than the control group. The ANCOVA showed that the difference between the urban and rural schools, boys and girls is significant when Biology is taught through integrating theory with practical. Based on the findings some recommendations were made.*

## INTRODUCTION

The National Core Curriculum for Biology (Federal Ministry of Education FME; (1985:20) has the following cardinal objectives which are to prepare pupils to acquire.

- Adequate laboratory and field skills in biology
- Meaningful and relevant knowledge in biology
- Ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture.

- Reasonable and functional scientific attitudes.

In accordance with the stated objectives, the contents and contexts of the curriculum place emphasis on filed studies, guided discovery, laboratory techniques and skills coupled with conceptual thinking. This curriculum is intended to provide modern biology course as well as to meet the needs of the society through relevance and functionality in its content, method, processes and application.

It was reported that biology teachers organize practical lessons separately after the theory aspect of the topic(s) have been taught. This practice goes contrary to the stated objectives in the biology curriculum, therefore adequate acquisition of process skills such as observing, measuring, collecting data, experimenting etc, interest in the subject and conceptual thinking cannot be developed. The West African Examination Council (WAEC) Chief Examiners report (1998), identified the candidate's poor achievement in their approach to answering questions, lack of understanding of basic concepts and learning skills needed for success in biology, poor study habits and absence of well-equipped laboratories.

According to James (2000) one popular method of teaching biology at the senior secondary schools in Nigeria today is to collect plant and animal materials for observation and dissection in the laboratory in form of laboratory demonstration conventionally called practical. This instructional strategy does not allow active participation of students and it does not make learning meaningful, relevant and functional in biology. Today's science teaching and learning have become more active-oriented and more student-centered as reflected in the national core curriculum for biology and other science subjects. Problem solving is a primary characteristic and the learner does not just read about science but he "does" science. There is increased laboratory activity and the learner is encouraged to "find out" more knowledge about the "moving" universe.

To divorce practical from theory shall place the vast majority of students in a situation where they find science concepts and principles difficult to grasp. Practical work in this context is defined as the learning experiences in which there are interactions with apparatus and chemicals so as to improve the power of observation of the instances of scientific principles or concepts (Busari; 1996).

One of the purposes of integration is to enhance curiosity and development of scientific skills among those studying biology and other science subjects. When students are more interested and curious in the teaching-learning process, their performance shall also be improved. Integration here means

doing practical work alongside with the theoretical explanations of the concepts and principles. This implies that practical work forms an integral part of the lesson. This can be done in such a way that the students are simultaneously taught the concepts and skills as the lesson progresses. (Ona, 2007).

**Statement of problem.**

One major problem of teaching biology in our secondary schools is the lack of teaching strategy that would enable the students understand the concepts and principles as well as acquire the necessary process skills. The separation of theory lessons from practical activities might be the reason why students fail to relate what is learnt in the theory lesson with practical activities. It is possible that this method of teaching biology contributed to students' poor achievement in biology. The problem simply put is, how can integration of theory with practical help to improve students' achievement in biology?

**Purpose of the study**

In specific terms, the study is designed to find out:-

i. The effect of integrating theory with practical in biology on the achievement of boys and girls.

ii. Whether there could be improvement in students' achievement in biology when exposed to theory integrated with practical.

iii. The effect the location of school (urban/rural) may have on students' achievement when theory is integrated with practical in biology.

**Research questions**

1. What is the mean achievement score of biology students when they are taught biology with theory integrated into practical?

2. To what extent do boys and girls exposed to the classroom situation of integrating theory with practical differ in their achievement in biology?

3. How does the location of the school (urban/rural) affect students' achievement is biology when theory is integrated with practical?

**Hypothesis**

The following null hypothesis were formulated and tested at the 0.05 level of significance.

$H_{01}$. There will be no significant difference in the mean achievement score of students taught biology through integrating theory with practical and their counterparts taught biology without theory integrated with practical.

H02. The location of the school will have no influence in the achievement score of students taught biology through integrating theory with practical.

H03. There will no significant difference in the mean achievement score of boys and girls taught biology through integrating theory with practical.

**Population**

All senior secondary school year one (SSS1) students in 98 secondary schools in zone C of Benue State Nigeria, constitute the population for the research study.

**Sample of the study**

A total of 400 students were randomly selected from four schools comprising two schools from urban and two schools from rural areas. The subjects of the study were made up of senior secondary school year one (SSS1) who offered biology. Simple random sampling technique was used in selecting the subjects in their intact classes. One school each from the urban and rural areas were assigned experimental group and control group.

**Validation of the instrument.**

The test items were based on the concepts and skills which the students learnt during the lesson. And to ensure the content validity of the instrument, a table of specification was used for its construction. The instrument was given to experts in the test development for their comments.

**Reliability of the instrument**

The instrument for this research consisted of a testing instrument, Biology Achievement Test (BAT). BAT was short answer questions on practical achievement test which was used for both pre-

test and post-test. The reliability coefficient using the Kuder- Richardson formula 21 was 0.37 and 0.60 for the pre-test and post-test respectively.

**Research design**

The study adopted the pre-test/post-test design. Quasi-experimental design whereby intact class, which constitute naturally arranged groups of students were used. Specifically, the non-equivalent control group design was used. In this design, intact classes was adopted. Two schools each from urban area and the rural area constituted the control and experimental groups respectively. These are Government Model Secondary School Otukpo, St. Francis College Otukpo, G.S.S Atilo and Federal Government College Otobi.

**Instrument for data collection**

The instrument used for this research was the teacher-made Biology Achievement Test (BAT). The test covered both the theoretical and practical aspects of the topics treated. The topics treated were cell structure, photosynthesis and animal nutrition. The test was made up of section A comprising short-answer questions and section B, alternative to practical questions. On the whole, there were 20 items of the questions. The items of the test were designed to assess students in three cognitive levels of Bloom's (1956) taxonomy of educational objectives namely, knowledge, comprehension and application.

**Table 1: Table of specification for construction of test items**

| **Content** | **Cognitive levels** |
|---|---|

| | Knowledge | Comp. | Appl. | Total |
|---|---|---|---|---|
| The cell structure | 2 | 3 | 1 | 6 |
| Photosynthesis | 4 | 3 | 2 | 9 |
| Animal nutrition | 3 | 1 | 1 | 5 |
| **Total** | 9 | 7 | 4 | 20 |

**Experimental procedure**

A pre-test was administered to the sampled subjects in their intact classes. This lasted for 1 hour. To achieve the objective of the study, the subjects were subjected to some form of formal instruction that lasted for two months. Graduate teachers of long experience with specialization in biology were used as instructors or research assistants. The researcher provided written lesson notes as a guide to the instructors to be used for the experimental class and another for the control class. The study was designed in such a way that the instructors or research assistants taught all the topics in the experimental and control classes.

The method of teaching in the experimental group was the inquiry method whereby the concepts were simultaneously taught with practical activities. There was no separate theory and practical lessons in the experimental group. In the control group, the method of teaching was the expository type and practical activities were separated from the theory. The questions that were administered as pre-test were also given as post-test after the formal instruction in the class. To avoid the transfer effect from pre-test to post-test, the question numbers were altered and the colour of the paper was changed.

**Methods of data Analysis**

The pre-test and post-test scores obtained from the administration of the teacher made biology achievement test (BAT) instrument was analyzed using mean to answer research questions. T-test of independent mean was used to test hypothesis 1. The analysis of covariance (ANCOVA) was used to analyze hypothesis 2 and 3.

**Presentation and Analysis of Data**

**Research question 1:** What is the mean achievement score of biology students when they are taught biology with the theory integrated with practical?

**Table 2:** The pre-test and post-test mean scores of the experimental and control groups.

| | N | Experimental group | | Control group | |
|---|---|---|---|---|---|
| Type of test | | Mean | Standard deviation | Mean | Standard deviation |
| Pre-test | 20 | 51.54 | 9.65 | 46.60 | 6.86 |
| Post-test | 20 | 72.60 | 15.42 | 53.85 | 9.90 |
| **Total** | **40** | | | | |

Table 2 shows that the experimental group taught biology with theory integrated with practical using the inquiry method had mean achievement score of 72.60, while the control group taught biology with theory separated from practical using conventional method had a lesser mean score of 53.85. It can be observed that the experimental group performed better than the control group.

**Research question 2:** To what extent do boys and girls exposed to the classroom situation of integrating theory with practical differ in their achievement in biology?

**Table 3:** comparison of the mean achievement score of boys and girls taught biology through theory integrated with practical.

| **Sex** | **N** | **Mean** | **Standard deviation** |
|---|---|---|---|
| Boys | 15 | 59.7 | 11.73 |
| Girls | 15 | 54.9 | 9.97 |

Results in table 3 above shows that the boy's performance in biology was better than that of the girls. One of the reasons for this difference between boys' and girls' performance could be that the boys were more active and dominating than the girls in practical lessons.

**Research question 3:** How does the location of the school (urban/rural) affect students' achievement in biology when theory is integrated with practical?

**Table 4:** Distribution of the mean achievement scores of urban and rural students.

| | Urban students | Rural students |
|---|---|---|
| Mean score | 62.84 | 53.46 |

**Table 4** above revealed that students in the urban schools performed better than the students in rural schools. The reasons could be that urban schools had more qualified staff, laboratory facilities etc than the rural schools.

H01. There is no significant difference in the mean achievement scores of students taught through integrating theory with practical and their counterparts taught biology without theory integrated with practical.

**Table 5:** T-test of difference between the post mean scores of experimental and control groups.

| Group | N | Post-test mean of expt. and Control groups | Standard deviation | Df | t.cal | t-able |
|---|---|---|---|---|---|---|
| Expt. Group | 20 | 72.60 | 10.62 | 38 | 5.77 | 1.684 |
| Control group | 20 | 53.85 | 9.89 | | | |

The result of the analysis shown on table 5 reveals that the calculated t-value of 5.77 is greater than the t-table value of 1.684. This means that there is a significant difference between students taught biology through integrating theory with practical.

H02. The location of the school will have no influence in the achievement score of students taught biology through integrating theory with practical.

H03. There will be no significant difference in the mean achievement score of boys and girls taught biology through integrating theory with practical.

**Table 6:** Summary of the analysis of covariance (ANCOVA) for comparing data obtained from urban and rural school, and boys and girls on integrating theory with practical in biology.

| Sources of variation | Sum of squares | Df | Mean squares | f.cal | f-crit. | Remark |
|---|---|---|---|---|---|---|
| Method | 23.22 | 16 | 7.74 | 7.27 | 3.10 | HO Rejected |
| Location | 25.17 | 13 | 8.26 | 6.34 | 4.29 | Ho Rejected |
| Sex | 20.45 | 12 | 6.30 | 3.68 | 2.23 | Ho. Rejected |
| Method & location | 45.42 | 17 | 14.56 | 5.96 | 3.67 | |
| Residual | 23.42 | 16 | 5.74 | | | |
| **Total** | 135.89 | 82 | | | | |

From the above result, it showed that t-calculated values at 0.05 level of significance are greater than the critical values, therefore the null hypothesis is rejected. Therefore, there is a significant difference in the mean achievement scores of urban and rural students and between boys and girls when biology is taught through integrating theory with practical.

**Result and discussion**

The result of research question one revealed that integrating theory with practical in biology had a high positive effect on students' performance. The high mean score in the post-test result of the experimental group was because the students participated meaningfully well, and were actively involved in the lesson. Because the students were simultaneously taught the concepts and skills while performing practical activities, their performance was found to be better than their counterparts taught biology without integrating theory with practical. The findings of this study support earlier findings of Escalade and Zollman (1996) and Mercy (1997) that practical experiences that utilize hands-on inquiry have been considered as one of the most effective methods of learning science.

In research question two, the result on greater effect shows that boys performed better than the girls when biology was taught through integrating theory with practical. This finding may be attributed to the higher chances of participation of boys in the lesson than the girls. The

result supports the finding of Anyaeze (1996) which identified some factors that contributed to differential valuation of the male and female as due to peer- group, parental, society and culture.

The findings in respect of hypothesis three (H03) tables 6, shows that a significant difference exist in the performance of boys and girls when theory was integrated with practical in biology. The findings of this study agreed with Onyegegbu (2004) that there was a clear disparity between participation lesson in interaction of gender in senior secondary school science. It was found that boys had higher chances of participation than the girls. The boys were more active and dominating in the lesson than the girls.

Result in table 4 shows that students in urban schools performed better than their counterparts in rural schools when theory was integrated with practical. The mean achievement scores of students in urban schools was found to be higher than the mean score of students in rural; schools. This observation could be as a result of availability of adequate qualified staff and facilities which were found more in urban schools than in rural schools. The result of this study agrees with the findings of Ndu (1991), Obodo and Onoh (2001) that some of the problems of teaching and learning science in the rural environments are inadequate of science laboratories, equipment, insufficient number of science teachers, inadequate facilities for students to study science and lack of electricity.

**Recommendations & conclusion**

The following recommendations have been proffered based on the findings of the study.

1. Practical activities in biology should not be separated from theory lessons so as to help the students related the concepts learnt with the skills for better understanding. The teachers can do this by teaching the concepts and skills simultaneously in order to yield better results in students' achievement.

2. School laboratories, materials and equipment should be provided and made functional in order to enable the staff and students be actively involved in biology lesson when theory is integrated with practical. Government and non-governmental organizations (NGO's) can do this by showing more commitment and political will in making science education functional for scientific and

technological breakthrough.

3. Efforts should be made by the teachers and the school authority to raise the creativity of the learner by encouraging creativity and inventiveness. This can be achieved by providing the opportunity for the students to be actively involved in the lesson and manipulate objects with their hands.

From the findings of this study it was observed that significant differences existed between the mean achievement score of students taught biology through integrating theory with practical and their counterparts taught biology without theory integrated with practical. Similarly, significant differences existed between the mean achievement score of students taught biology through integrating theory with practical in urban and rural schools and between boys and girls. Results from this study showed that the mean achievement score of students increased when biology was taught through integrating theory with practical. The students understood the lesson better, learnt the necessary process skills and concepts and could apply the knowledge learnt in solving everyday problems.

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# DEVELOPMENT OF TIME SERIES MODELS TO FORCAST THE RETAIL PRICES OF FOOD ITEMS IN GOMBE STATE,NIGERIA

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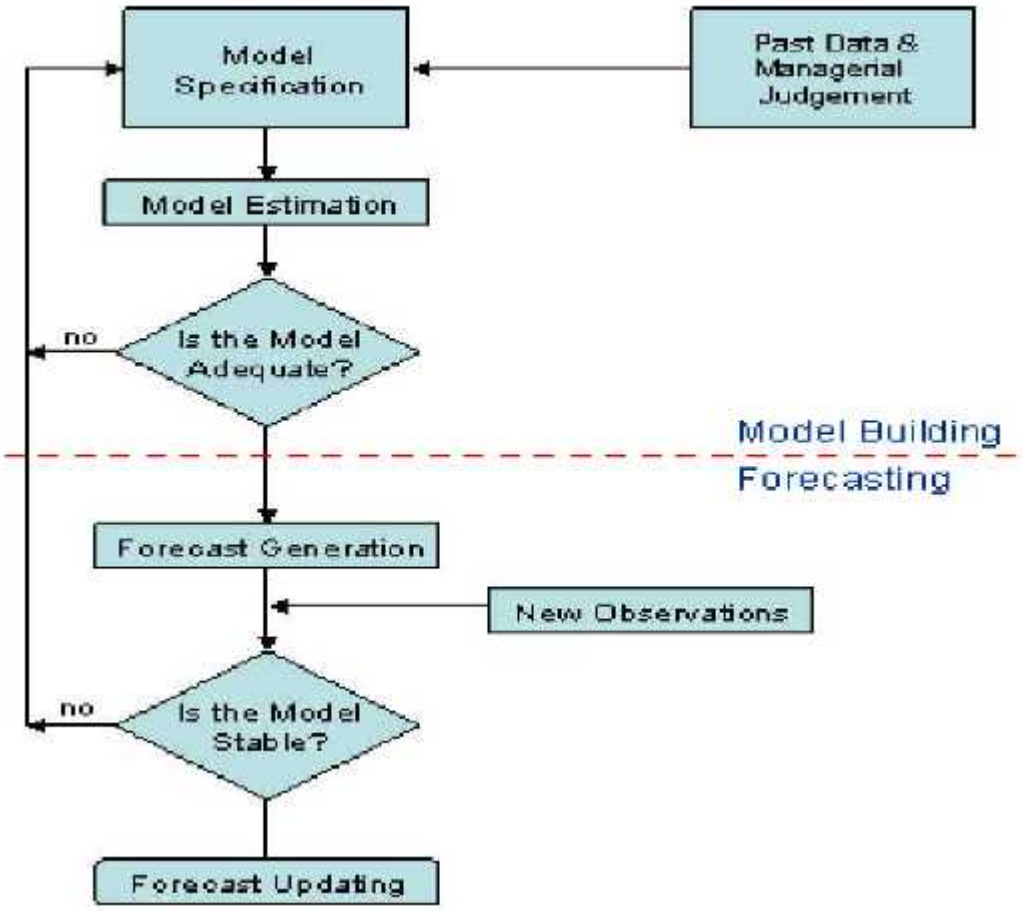
***ABSTRACT***

*Models for both linear and quadratic trends for food items in Gombe state have been obtained. Correlogram and Partial autocorrelation of the time series data are plotted in which the correlogram decays rapidly to zero, indicating that the series is stationary. Also, the partial autocorrelation cuts off after lag 1 suggesting an autoregressive (AR) model of order 2. The models obtained were used in making the forecast. It has been observed that the quadratic trend is a much superior than the linear one. Recommendations are made which include; the Government should ensure the accurate generation of data, storage of same, retrieval and use for proper planning.*

## INTRODUCTION

The selection and implementation of proper forecast methodology has always been an important planning and control issue for most firms and agencies. Therefore, forecasting is a necessary input to planning whether in business, or government. According to Okafor (2003), forecasting can be defined as a way of making prediction from passed observations using an appropriate time series models. Forecasting can only be achieved using time series data. However, time series can be viewed as a set of observations made sequentially in time (Apinpo, 1991). A time series may be discrete or continuous depending on whether observations were made continuously in time or were made at specific points in time, usually equally spaced. Continuous time series; where we have an observation at every

instant of time, e.g. lie detectors, electrocardiograms. We denote this using observation X at time t, X(t). On the other hand, discrete time series is a situation where we have an observation at (usually regularly) spaced intervals. We denote this as Xt. The following flowchart highlights the systematic development of the forecast.




**Forecasting System:**
**The Model-Building and The Forecasting Phases**

Fig. 1 **Source** : Box and Jenkins (1976)

The above modeling process is useful to:

- understand the underlying mechanism generating the time series. This includes describing and explaining any variations, seasonality, trend, etc.
- predict the future under "business as usual" condition.
- control the system, which is to perform the "what-if" scenarios.

According to Musa (2004), there are two main approaches to forecasting. Either the estimate of future value is based on an analysis of factors which are believed to influence future values, i.e., the explanatory method, or else the prediction is based on an inferred study of past general data behavior over time (the extrapolation method). For example, the belief that the sale of doll clothing will increase from current levels because of a recent advertising blitz rather than proximity to Sallah/Christmas illustrates the difference between the two philosophies. It is possible that both approaches will lead to the creation of accurate and useful forecasts, but it must be remembered that, even for a modest degree of desired accuracy, the former method is often more difficult to implement and validate than the latter approach. Effort will be made to apply appropriate models on Consumer price index.

## CONSUMER PRICE INDEX

Consumer price index (CPI) is designed to measure changes in the level of retail prices paid by consumers (Hawkins,2006). The Bureau for Statistics of Nigeria (BSN) used to compute the composite consumer price index which measures average changes in the level of retail prices of goods and services consumed by households living in all parts of the country. This provided expenditure data from which items weights were derived for urban and rural indices. The changing consumption pattern of households is mirrored in the result of BSN taken at regular intervals which give rise to new market baskets and constitute items weights (Yeye, 2004). With each successive BSN, the CPI usually selects the year in which survey is carried out as the base year for the index based there on. Therefore, consumer price indices are continually being updated and be given new base year.

## STATEMENT OF THE PROBLEM

The continuous increase in the price of food items has been a serious problem to the government and a threat to the survival of the common man in Nigeria. Many could not afford three square meal and has no any hope. Government has no base to make any plan so as to alleviate the suffering of its citizens. This study intends to provide time series models for both linear and quadratic from the available data for use to forecast. This will go a long way in providing base for planning in respect of food items.

## OBJECTIVEE OF THE STUDY

This study focused on achieving the following objectives:

i) To examine the consumer price indices for the period January, 2003 to December, 2006.

ii) To fit time series models to the consumer price index for food.

iii) To forecast the consumer price index for food.

## SCOPE AND SOURCE OF DATA

The data used for this study was collected from the Bureau for Statistics, Gombe, Gombe state. The data covered Gombe Urban centers for a period of four years. The limitation to urban centers is because majority of the consumers were in the urban areas.

## TIME PLOT

The observation (price of food items) was plotted against time. The purpose was to bring to light the components of time series models; namely: Trend, Seasonal variations, cyclical variations and Irregular variations.

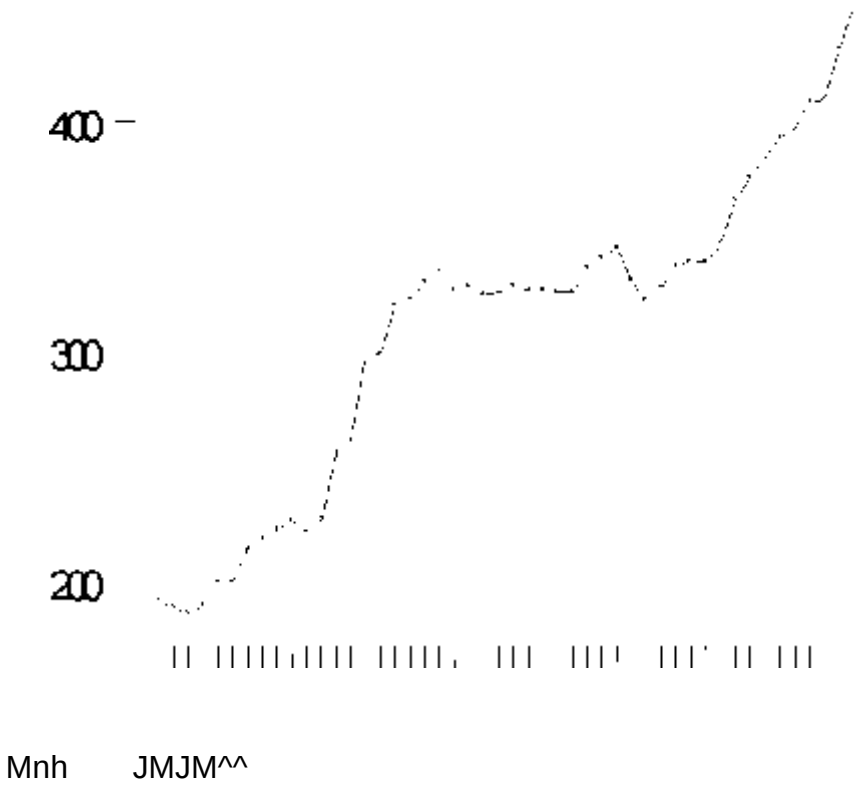



Fig. 2

The series started with minimum value of 191.2 in January 2003 and thereafter shows an upward movement up to September 2004 when the series become stable until in May 2005. From that point it showed another upward movement to attain the maximum value of 449.4 in December 2006.

**FORCAST USING TREND ANALYSIS**

i) LINEAR

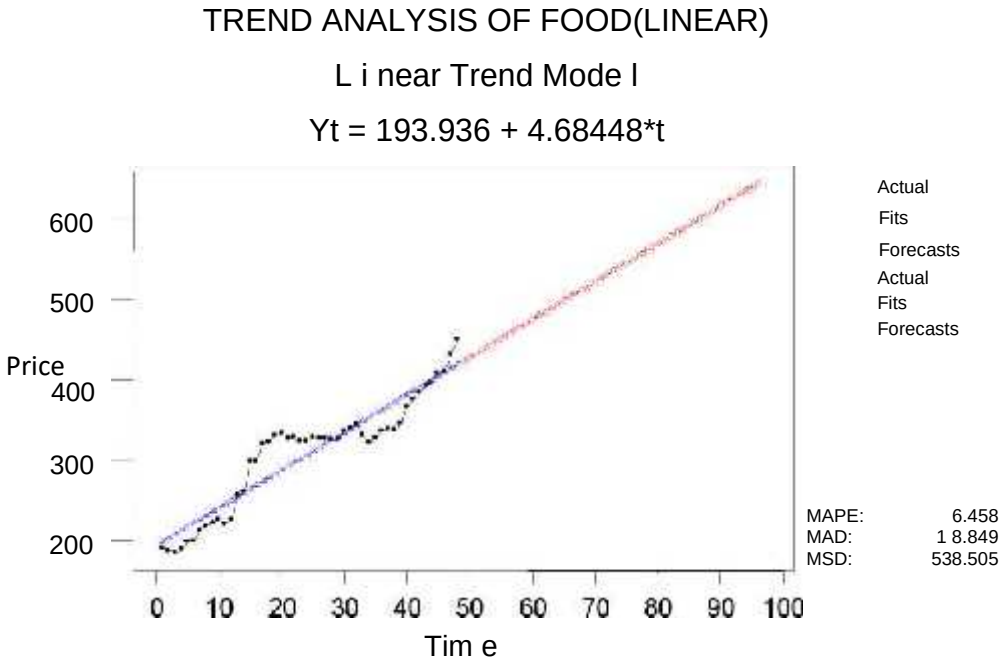
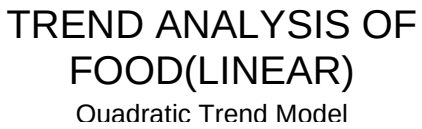



Fig. 3

ii)QUADRATIC



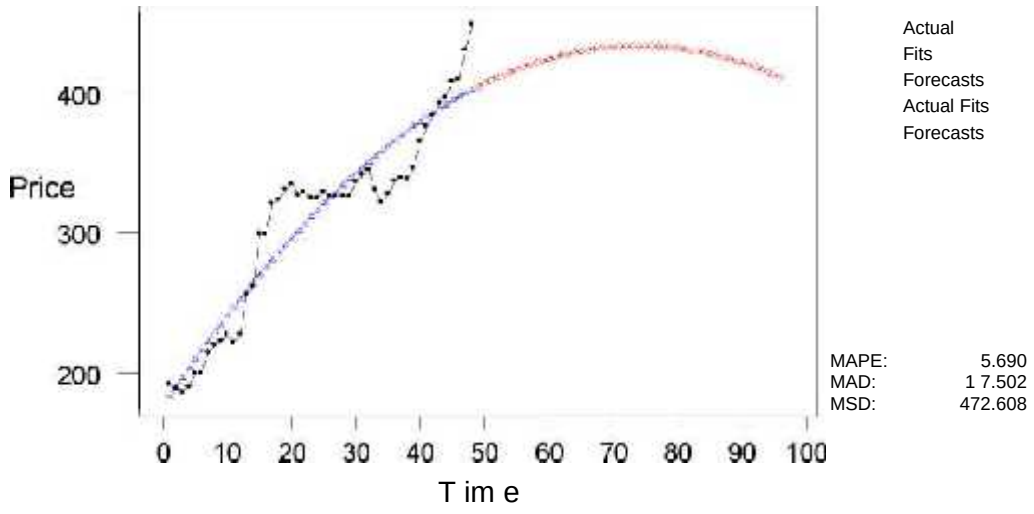



Fig. 4

**RESULTS OF THE FORCAST USING TREND ANALYSIS**

After obtaining stationarity from the data, the following models were obtained for both linear and quadratic are given below:

i) Yt = 193.936 + 4.6845t ----------Linear

ii) Yt = 174.613 + 7.0033t - 4.73E02 * t **2 ---------- Quadratic

Predicted values using both linear and the quadratic trends are presented in appendix I. The results of the forecasts are obtained for the next 48 months (i.e 4 years). Comparing the predicted values of the two models with the actual data indicates that the quadratic trend is a much superior fit than the linear one.

FITTING TIME SERIES MODELS

It has to be established whether the underlying stochastic process that generated the series can be assumed to be invariant with respect to time (if the process are stationary). To find out the stationary of the process. we should examine the correlogram and plot of partial autocorrelation.

C O R R E LO G RAM F O R F O O D

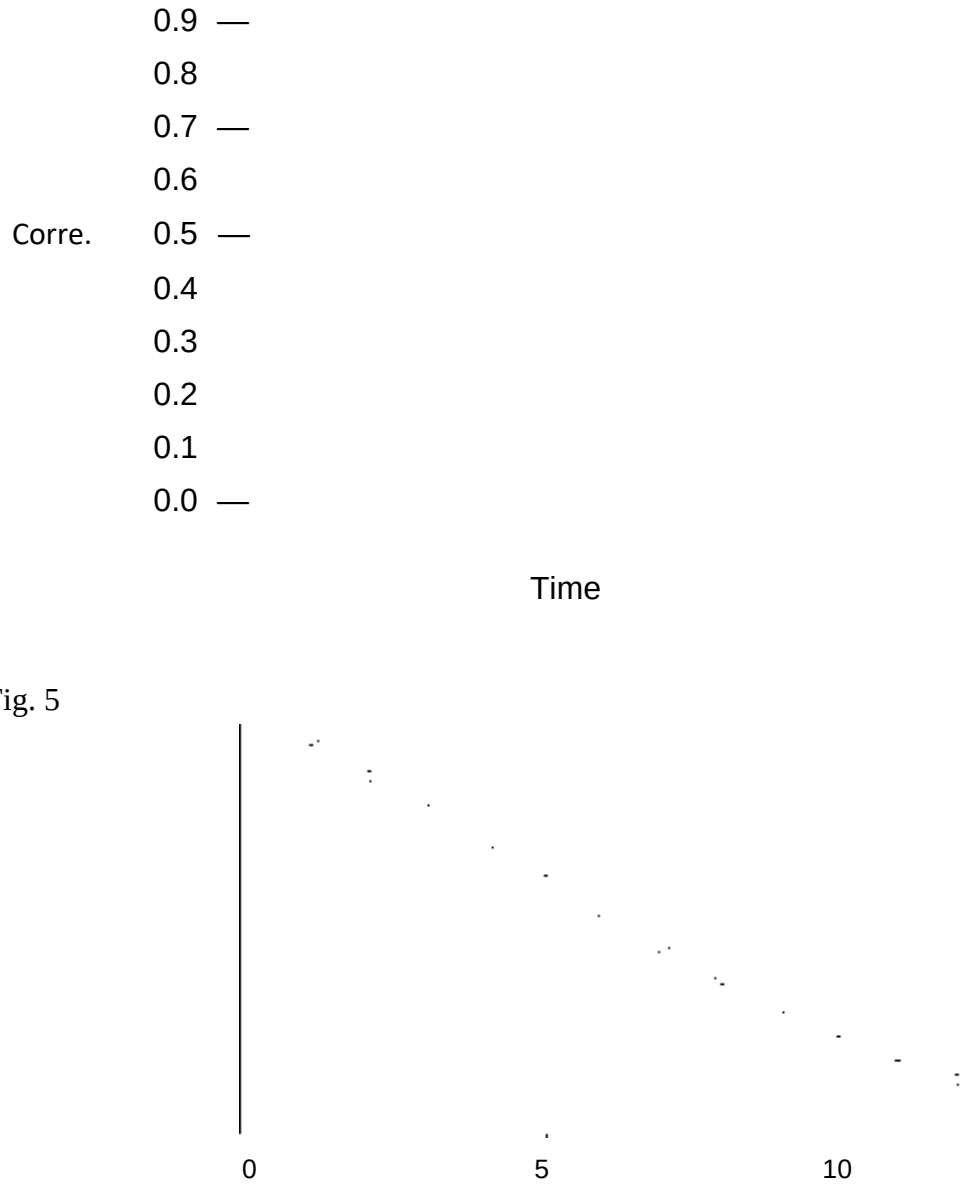



Fig. 5

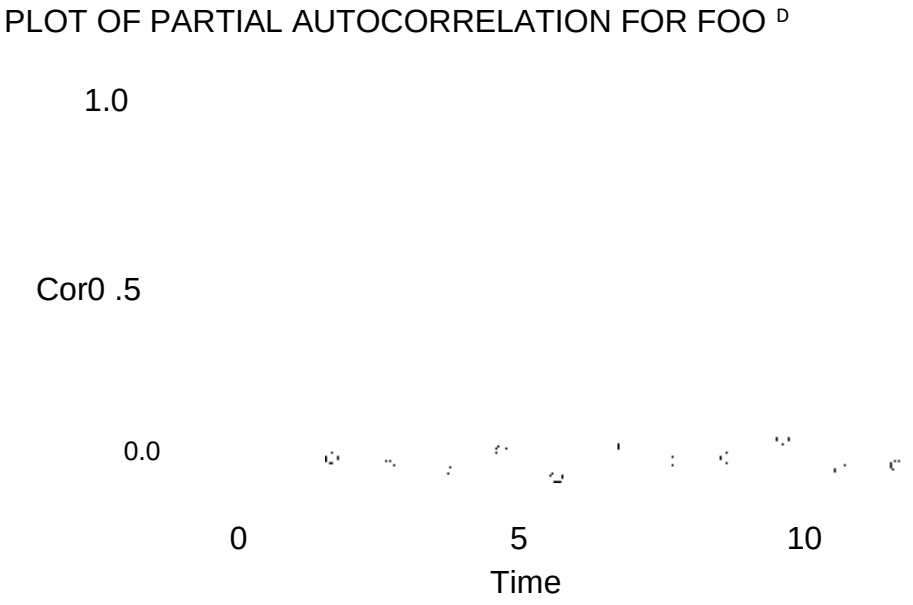



Fig. 6

**ANALYSIS OF THE SERIES**

The correlogram decays rapidly to zero, indicating that the series is stationary. Also, the partial autocorrelation cuts off after lag 1 suggesting an AR model of order 2. Therefore, the model is used to generate forecast for the next 48 months which is given on appendix 1.

**CONCLUSION**

Models for both linear and quadratic trends for food have been obtained. Predicted values have also been obtained using both linear and the quadratic trends. The results of the forecasts are obtained for the next 48 months (i.e 4 years). It has been observed that the quadratic trend is a much superior fit than the linear one.

The correlogram decays rapidly to zero, indicating that the series is stationary. Finally, the partial autocorrelation cuts off after lag 1 suggesting an AR model of order 2.

**RECOMMEMDATIONS**

The following recommendations were made

i) Before fitting any model, stationarity has to be established

ii) Government should ensure accurate generation of data, storage of same, retrieval and

use for proper planning.

iii) Modern silos have to be constructed for food reservation.

iv) Other time series models should be employed to generate forecast.

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APPENDIX I

| MONTHS | ACTUALb DATA | LINEAR FORECAST | QUADRATIC FORECAST |
|---|---|---|---|
| 1 | 191.2 | 423.476 | 404.153 |
| 2 | 188.1 | 428.161 | 406.471 |
| 3 | 185.3 | 432.845 | 408.695 |
| 4 | 189.4 | 437.529 | 410.824 |
| 5 | 199.2 | 442.214 | 412.859 |
| 6 | 199.8 | 446.898 | 414.799 |
| 7 | 214 | 451.583 | 416.644 |
| 8 | 218.7 | 456.267 | 418.394 |
| 9 | 222.4 | 460.952 | 420.050 |
| 10 | 226.4 | 465.636 | 421.611 |
| 11 | 220.9 | 470.321 | 423.078 |

| | | | | |
|---|---|---|---|---|
| 12 | 226.6 | 475.005 | | 424.45 |
| 13 | 255.9 | 479.690 | 7 | 425.72 |
| 14 | 261.5 | 484.374 | 0 | 426.91 |
| 15 | 299.4 | 489.059 | 8 | 427.99 |
| 16 | 298.3 | 493.743 | 1 | 428.99 |
| 17 | 320.5 | 498.428 | 0 | 429.89 |
| 18 | 323.3 | 503.112 | 4 | 430.69 |
| 19 | 330.3 | 507.797 | 4 | 431.40 |
| 20 | 334.7 | 512.481 | 8 | 432.01 |
| 21 | 326.6 | 517.166 | 9 | 432.53 |
| 22 | 328.9 | 521.850 | 4 | 432.96 |
| 23 | 324.6 | 526.535 | 5 | 433.29 |
| 24 | 324.9 | 531.219 | 1 | 433.53 |
| 25 | 328.8 | 535.904 | 3 | 433.67 |
| 26 | 326.3 | 540.588 | 0 | 433.72 |
| 27 | 326.2 | 545.273 | 2 | 433.67 |
| 28 | 326 | 549.957 | 0 | 433.53 |
| 29 | 325.9 | 554.642 | 3 | 433.29 |
| 30 | 336.1 | 559.326 | 1 | 432.96 |
| 31 | 340.8 | 564.010 | 5 | 432.53 |
| 32 | 345 | 568.695 | 4 | 432.01 |
| 33 | 330.4 | 573.380 | 8 | 431.39 |
| 34 | 321.4 | 578.064 | 8 | 430.68 |
| 35 | 327.7 | 582.748 | 3 | 429.88 |
| 36 | 336.8 | 587.433 | 4 | 428.98 |
| 37 | 338.8 | 592.117 | 0 | 427.99 |
| 38 | 338.3 | 596.802 | 1 | 426.90 |
| 39 | 345.9 | 601.486 | | 425.71 |

| | | | |
|---|---|---|---|
| 40 | 365.4 | 606.171 | 424.44 |
| 41 | 375.9 | 610.855 | 423.06 |
| 42 | 383.8 | 615.540 | 421.60 |
| 43 | 392.8 | 620.224 | 420.03 |
| 44 | 396.4 | 624.909 | 418.38 |
| 45 | 408.3 | 629.593 | 416.63 |
| 46 | 409.6 | 634.278 | 414.78 |
| 47 | 431 | 638.962 | 412.84 |
| 48 | 449.4 | 643.647 | 410.80 |

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# THE ECONOMIC ADVANTAGES OF SPRAY PESTICIDES ON COWPEAS *(Vigna unguiculata L. Walp)* PRODUCTION IN GOMBE LOCAL GOVERNMENT AREA, GOMBE STATE, NIGERIA.

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**And**
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***ABSTRACT***

*The research focused on the economic advantages of spray pesticides on cowpeas production in Gombe local government area of Gombe state. The research used both primary and secondary data, obtained via pre-tested questionnaires by interview method. The study employed descriptive statistics. Gross margin analysis established the economic effect of pesticides application on cowpea production. Also, ordinary least square regression analysis was adopted to isolate the variables affecting cowpea output in the area. The study revealed that factors dictating the output of cowpea are; quantity of seeds sown, man-labor supplied and expenditure on insecticides applied in the area. It also confirmed the fact that economic profitability in the production of cowpea is the function of the adoption of spray pesticides application. The study recommended that farmers should embrace the use of insecticides since it is accompanied by more economic gains in terms of output and cash returns to the farmers and well-articulated extension services of storages, market and loans facilities be provided to the farmers.*

## INTRODUCTION

Cowpea originated in Africa and it is widely grown in Africa, Latin America, South-east and in the southern part of the United States (Davis, 1999). The crop is an important source of cheap and available plant protein in Nigeria. Its popularity stems from variety of dishes that are made from it. Cowpea production is mostly found in the savannah ecological zone where it is traditionally grown as sole crop or intercropped with cereals such as millet, maize and sorghum (Adewuyi and Okunmadewa, 2005). Cowpea was mostly cultivated by small size

farmers in the last decades, but now the crop is cultivated in a relatively larger farm size. With adoption of technology in cowpea pest control, the crop is presently witnessing higher yields. (Mohammed, 1989). Okike, Kristjamson and Singh (2007) also stressed that there is a significant increase in cowpea production with the adoption of spray pesticides by farmers in northern Nigeria. Singh, Asante, Ajeibe and Mohammed (1996) stressed that cowpea is an important crop to the livelihood of millions of relatively poor people in Nigeria. From the crop, rural families derive food, animal feeds, cash as well as spill over benefits to their farm lands. It is a cheap source of plan protein to many who cannot afford enough of the expensive animal protein. Gongula and Garjila (2005) stated that the crop yield is generally low as a result of insect pest and diseases, draught, excessive mixture, weeds and mixed cropping. According to him, yield on farmers' plot are usually less than 1000kg $ha^{-1}$. However, pest and diseases were considered to be the major problem to cowpea yield (Robert 2004). It is in this regard that International institute for tropical agriculture (1994) urged entomologist at national and international research centers to develop ecological sustainable pest control strategies that are affordable and accessible to small scale farmers. The economic benefits of pesticides application in cowpea is not popular among the farmers because of inadequate records to portray the profitability of pesticides application in the study area (Noma 2006).

This study was designed to assess whether it is worthwhile using pesticides in cowpea.

## OBJECTIVES OF THE STUDY

i. To determine the economic advantages of spray pesticides on cowpea production in Gombe local government area of Gombe state, Nigeria.
ii. To determine the socio-economic profile of cowpea farmers in the area.
iii. To determine the yield of cowpea using spray pesticides as pest control measures during the production period and profitability of using pesticide application in cowpea production in the area of study.

## MATERIALS AND METHODS

### Study area.

The study area was Gombe local government area of Gombe state, the capital city of the state and the commercial nerve center of the state. The local government is composed of business men and women in all endeavours. And about 70% of its residents are potential farmers. Gombe state has a population of approximately 2.4 million people (2006 census) and lies between

latitude 9030’ and 12030’ north and longitude 8045’and 11045’ east. The area shares common boundary with Borno, Yobe, Taraba, Bauchi and Adamawa states. The climate of the area consists of both dry and rainy seasons. Gombe temperature is between170c minimum and 300C maximum. The vegetation is mainly guinea savannah grassland with concentration of woodland in the southeast and southwest.

**Sampling technique.**

The study was carried out in 2007 and 2008 cropping season with a total of 120 respondents who are all seasoned farmers residing in different areas of the town. Both primary and secondary data were used for the study. The primary data were collected based on 2007 cropping season through the use of well-structured pre-tested questionnaires and oral interview schedules. The secondary data were obtained from the publications of the Gombe state agricultural development programme and state ministry of Agriculture. Descriptive statistics was employed to analyze the data obtained from the field which includes; percentages, means ranking and budgetary techniques (Bernard,1995). The budgetary technique used was adopted from Ibrahim and Telson (2007) for the gross margin analysis that forms the basis for costs and returns analysis. Ordinary test of least square regression analysis was used to get the functional dependence that best fit cowpea production.

The model adapted was implicit form as follows:

Y1 = f (x, X2 X3)

$Y = a+b_1x_1 +b_2x_2 +b_3x_3+e$

Where,

$Y_1$ = output of cowpea in kg $ha^{-1}$

X! = quantity of seeds sown in kg $ha^{-1}$

$X_2$ = labor in money $ha^{-1}$

$X_3$ = expenditure on pesticide application in naira $ha^{-1}$ e = stochastic error term

**RESULTS AND DISCUSSION**

Table 1 shows that majority of the interviewed farmers are within the age of 15-50 years. This suggest that they are strong, capable of making good productive decision and have potential for greater productivity. Hence, they are likely to be more efficient in agricultural production

than older and younger ones (Algahli, 2006).

**Table 1: Socio-economic characteristics of respondents.**

| Variables | NO. of respondents | Percentage |
|---|---|---|
| **Age** | | |
| 15-26 | 8 | 6.6 |
| 27-34 | 8 | 6.6 |
| 35-46 | 84 | 70 |
| >46 | 20 | 16.7 |
| **Total** | 120 | 100 |
| **Gender** | | |
| Male | 109 | 90.8 |
| Female | 11 | 9.16 |
| **Total** | 120 | 120 |
| **Education qualification** | | |
| Non- formal education | 35 | 29.2 |
| Primary school leaver | 17 | 14.1 |
| Secondary school leaver | 28 | 23.3 |
| Tertiary school graduate | 7 | 6.0 |
| Adult education | 33 | 27.8 |

| | | |
|---|---|---|
| **Total** | 120 | 100 |
| **Family size** | | |
| **<5** | 4 | 3.0 |
| 5-10 | 60 | 50. |
| 11-15 | 38 | 32. |
| >15 | 18 | 15. |
| **Total** | 120 | 100 |
| **Income level** | | |
| <N50,000.00 | 36 | 30. |
| N50,000.00-N100,000.00 | 76 | 63. |
| N100,000.00-N200,000.00 | 3 | 2.5 |
| >N200,000.00 | 5 | 4.1 |
| **Total** | 120 | 100 |

Majority of the respondents were males constituting about 90.8%, in other words, males engaged in cowpea production more than females in the study area. Most of the farmers were educated (65%) and any increase in agricultural productivity by farmers of non-formal education could be as a result of accumulated experiences in farming (Ibrahim et.al.2007). On family size, most of the families are relatively large and extended in nature which provided read/steady labor for timely execution of farming activities. The income profile of the farmers per annum is very low. This revealed that most of the farmers are within income link of N50, 000.00 to N100, 000.00.

**Table 2: Farmers gross margin analysis per hectare.**

| Treatments | GR (N) | TVC (N) | GM (N) | GM (%) |
|---|---|---|---|---|
| Cowpea with pesticides | 34,056.00 | 11,291.00 | 12,613.38 | 54.32 |
| Cowpea without pesticides | 13,000.00 | 6,333.66 | 4,132.00 | 45.68 |
| Total | 47,056.00 | 17,624.66 | 16,745.38 | 100.00 |

**Table 3: Regression estimates of coefficient of inputs in cowpea production of double log function.**

| Variables | Coefficient | t-value |
|---|---|---|
| Seed | 0.21 | 2.05* |
| Labor | 0.413 | 1.811* |
| Pesticides | 0.107 | 9.13** |

1Significant at 1% level.

Table 2 shows the gross margin of N12, 613.38 and N4, 132.30 of individual farmer per hectare for cowpea with pesticides application and without pesticides application respectively. This reflects the fact that cowpea production with pesticides application is very much more profitable about (74.32% per hectare) revealing a high profitability over cowpea production without pesticide application. This finding conformed to that of Alghali (2006) who recorded that yields and income levels increase with the adoption of pesticides in cowpea production. From the multiple regression analysis as contained in table 3, the double log function was selected as the best fit based on the magnitude of the coefficient of determination ($R^2$) and statistics significance of the estimated regression values. The $R^2$ indicated that 96.90% variation in yield was explained by the specified independent variables. This is confirmed by Analysis of variance (ANOVA), the F-ratio calculated; 1198.77 is greater than the tabulated F-ratio of 3.95, while in the test of statistical significant, the calculated t* ratio 2.05, 1.81 and 9.13 for quantity of seeds sown, labour and expenditure on pesticides applied respectively are greater than the t-value of 1.684 at 1.0% level of significant. This indicated that the output of cowpea is principally dictated by the variables; seeds(2.05), labour (1.81) and expenditure(9.13). This result tallies with Ibrahim Baba et-al (2007) The coefficients of the independent variables indicates that seeds (0.211), labour (0.413), and pesticides (0.107) are positively and significantly different from zero at 1% level i.e., a 1% increase in the amount of seeds planted, labour supply to the production and pesticides applied per hectare under cowpea production will raise cowpea output by 0.211 and 0.107 respectively.

## CONCLUSIONS AND RECOMMENDATIONS

This research work revealed that cowpea production without pesticides application is not economically profitable like that with pesticides application (Morgan 2006). It also Showed that the determinants of cowpea output are the quarterly seeds sown, amount of labour supplied and expenditure on pesticides. Pesticides are generally available in different capacities in the markets but the affordability defends on the income of the farmer. Low earned farmer may find it difficult to practice which always affect their yield. The application techniques of the substance also defend on experience and knowledge. Farmers who are illiterates will find the application difficult to practice and expensive which could result in excessive usage of the chemical leading to poor yield and harm to their lives. This research work therefore recommends that subsidized pesticides be provided by the Government in order to alleviate the suffering of the poor farmers to have access to the modern pesticides at a very low if not free pesticides. The Government should also provide specialists to train farmers on the use of pesticide sprays and its hazardous nature. Also storage, markets and loan facilities be made available to the small scale farmers to strengthen the production base of the small scale farmers.

R2-0.9690

R-0.9682

F-1198.77

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# EFFECTS OF STAND DENSITY AND SOWING DATE ON THE GROWTH OF ROSELLE *(Hibiscus sabdariffa L.)*

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***ABSTRACT***

*Field experiment were conducted during the wet seasons in 2005 and 2006 at Samuru in the Northern Guinea Savanna to study the effect of varying number of plant per stand using 1,2,3,4 and 5 plants per stand and four sowing dates (30th July, and 14th July and August) on the growth of Roselle. Factorial combinations of the treatments were laid out in a Randomized Complete Bock Design and replicated three times. The highest stand density of 5 plants per stand significantly produces tallest plants, lowest number of leaves and branches. One plant per stand generally improved the growth of the crop. Similarly, sowing Roselle in June also resulted in good growth of the crop.*

## INTRODUCTION

Roselle or sorrel (Hibiscus sabdariffa L.) belongs to the family Malvaceae and is native of India and Malaysia, where were commonly cultivated. From there, cultivation of the crop spread to other parts of Africa. (Lakshmi et.al, 1994). The crop is an herbaceous upright plant growing up to 2-3m in height (Rice et.al; 1993 Messiaen, 1993). The leaves vary in size and shape; the flowers are yellow or red sometimes with dark red centers. The edible calyx is bright red, some yellow or brown and swells to become fleshy. The fruit are up to 2.5cm in length and seed contains 17% oil (Rice et.al., 1993). Roselle grows best in tropical and subtropical regions from sea level up to 900m. India, it requires a rainfall of about 1500-2000mm during its growing season (Gupta, 1989). Where rainfall is adequate, irrigation can be used as supplement. The crops grow on a deep sandy loam soil. It cultivated throughout West Africa, especially in Sierra

Leone, where is being intercropped with over vegetables (Kirby, 1993). In Nigeria, it is customary to grow it in mixture with other crops, such cereals, tree crops and on the boarders or edges of fields devoted to other crops. Roselle is usually propagated by seed, but grows readily from cuttings which result in shorter plants preferred in India for inter-planting with tree crops though the yield of calyx obtain from this type of inter-cropping is relatively low (Gupta, 1989). Seedlings may also be raised in beds and transplanted when it is 7.5 to 10cm high, but seeds are commonly planted directly in the field.

Roselle is a short - day plant. Chemical fertilizer may not be required, however, basal dose phosphorous at the rate of 30kg /ha and 50kg N/ha of nitrogen in two split doses may be applied for better yield (Aliyu, 2005). Commercial NPK fertilizer has also proved satisfactory (mansur et,al. 1995). Weeding is necessary and can be done manually at the initial stage though at 45 to 60cm height, weeds are shaded out. Harvesting of Roselle is timed according to which part is desired. For herbage purposes, the plant may be cut off 6 weeks after transplanting depending on the variety (Sarma, 1967). As the fruits of rosella ripen progressively tiers of the last of the fruits are allowed to mature. At this time the plants are cut down, stacked for a few days and then threshed. The yied in Roselle like other corps depends on proper agronomic practices and variety. Taller varieties that have more leaves yield better (Aliyu, 2005). However, calyx yield under favourable condition may range between 3 to 3.5 t/ha.

In Nigeria the leaves are normally cooked either fresh or dried and mixed with groundnut cale for eating while the dried calyx can be boiled to make juice (Zobo drink). The seeds are somehow better but are roasted as a substitute for coffee (El-Adawy and Khali, 1994). The seeds contain 17% oil (Rice et al, 1993)> nutritionally, 100g of the fresh calyx contains 1.5g protein, 2.61g fat, 12.0g ash, 126mg calcium, 273.2 phosphorous, 8.98mg iron, 0.029mg carotene, 0.117mg thiamine, 0.277mg riboflavin, 3.76mg nniacin, 6.7mg ascorbix acids and 9.2g moisture including all the essential amino acids in reasonable quantities (Rahman et al., 1991). Both the fresh leaves and seed contains reasonable amount of protein fat and carbohydrate. The seeds are excellent feed for chicken, the residue after oil extraction is valued as cattle feed. The leaves or calyxes are used as diuretic to decrease blood viscosity and stimulate intestinal peristalsis in Africa and elsewhere. The Roselle extract reduces blood pressure. Calyx infusion called sudan te' is taken to relieve cough in East Africa. The voiled leaves are applied to cracks in the feet, on boils and ulcers for medication. A lotion made from the leaves is used on sores and wounds.

## OBJECTIVES OF THE STUDY

The objectives of this study are to investigate:

1. the effect of stand density on the growth of Roselle
2. the effect of sowing date on the growth of Roselle
3. the interaction of stand density and sowing date on the growth of Roselle.
4.

## MATERIALS AND METHODS

### Experimental site:

Fields experiment were conducted during the 2005 and 2006 wet seasons at the research farm of the institute for Agricultural Research (IAR), Samaru (11°11'N, 7°38'E) in the Northern Guinea Savanna ecological zone of Nigeria.

## TREATMENT AND EXPERIMENTAL DESIGN

The treatment consisted of four different sowing dates at intervals of two weeks each, starting from 30$^{th}$ June to 11$^{th}$ August, 2005 (end of June, middle of July, end of July and middle of August) and five stand densities viz: 1,2,3,4 and 5 plants/hole (26,666,53,332,79,998,106,664 and 133,330 plants/hectare, respectively) that were factorily combined and laid out in randomized complete block design. The treatments were replicated three times.

## CULTURAL PRACTICES

The land was ploughed, harrowed, ridged and marked out into plots. The gross plot size was 11.3m$^2$ (3x3.75m) involving four rows while the net plot size was 9 m$^2$ The plants were sown as per the sowing date treatment in both years. The plant/stand were spaced at 75x50cm using seed rate in accordance with the standard population for each treatment. Local variety (Samaru 1882) of Roselle was used. Hoe weeding was carried out at intervals of three to keep the plots weed free. A total of four hoe weeding were carried out beginning from three weeks after sowing (WAS) Nitrogen fertilizer at the rate of 50kgN/hectare was applied in two split doses at 3 and 6 WAS at the rate of 25kgN/ha each using urea fertilizer. However, there was a basal application of 30kg$P_2O_5$/hectare at planting using single super phosphate fertilizer.

## DATA COLLECTION.

Recording of observations were done at 4,6,8 and 10 WAS on the following growth parameters.

**Plant Height:** Four plants were randomly tagged/plot. The heights of the tagged plants were measured in centimeters from the ground level of tip of the plants using a meter rule. Mean height per plants was later determined.

**Number of Leaves/Plants:** This was taken by counting the total number of leaves from the tagged plants and the mean was later calculated.

**Number of Branches/Plants:** This was taken by counting the total number of branches from the tagged plants and later the mean determined.

## RESULTS AND DISCUSSION

### EFFECT OF STAND DENSITY AND SOWING DATE ON PLANT HEIGHT.

Table 1 shows the effect of varying stand densities and sowing dates on plant height of Roselle at 4,6,8 and 10 weeks after sowing (WAS). Highest stand density of 5 plants/stand significantly produced the tallest plants in both years when compared with lowest density which had the shortest plant. Showing on 30$^{th}$ June at all sampling periods except at WAS of 2006 significantly resulted in taller plants in both years. Sowing on 14$^{th}$ July produced tallest plants at 4 WAS in 2006, each delay in sowing resulted in significantly shorter plants as 8 and 10 WAS in both seasons.

Table 2 shows the interaction between stand density and sowing date of Roselle on height at 8 WAS in 2005. When different sowing dates were compared at the sane density, it was observed that at 8 WAS in 2005 wet seasons, 2 plants/stand produced tallest plants while 3,4 and 5 plants per stand were statistically at par but taller than 1 plant/stand.

### NUMBER OF LEAVES/PLANT

Table 3 shows the effect of stand density and sowing date on the number of leaves of Roselle/plant at different sampling periods of the two year trials. One plant/stand significantly had more leaves per plant compared with other densities in both years. Similarly, sowing on 30$^{th}$ June significantly resulted in higher number of leaves/plant in both years. However, there were no significant differences in leaves produced by plants sown on 30$^{th}$ June and 28$^{th}$ July and also between 30$^{th}$ June and 14$^{th}$ July at 4 and 6 WAS respectively in 2005.

**NUMBER OF BRANCHES/PLANTS**

Table 4 shows the effect density and sowing date on the number of Roselle branches/plant at different periods of sampling. One plant/stand had significantly recorded higher number of branches/plant between 6 - 10 WAS in both years. The difference in number of branches/plant between 1 and 2 plants/stands at 4 WAS in 2005 and in all the densities at 4 WAS in 2006 was no significant. Sowing on 14$^{th}$ July significantly result in higher number of branches/plants compared to those sown on 30$^{th}$ June at 4 WAS in 2006 was not significant. Each delay in sowing significant interaction between stand densities and sowing date of Roselle on the number of branches/plant at 10 WAS (Table 5) in both years. In the table when 2 and 3 plants/stand were used, each delay in sowing resulted in significant reduction in number of branches/plant.

**CONCLUSION**

From the study, it can be concluded that early planting of Roselle using 1 plant/stand improved both number of leaves and branches but decreased plant height.

**RECOMMENDATION**

Farmers in the Northern Guinea Savanna should plant Roselle earlier (in June) and use fewer stand density (1 plant/stand)

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Table 1: height of Roselle as affected by stand density and sowing date during 2005 and 2006 wet seasons at Samaru

Plants height (cm)

| Treatment | 2005 | | | | 2006 | |
|---|---|---|---|---|---|---|
| Stand Density (P) | 4 WAS | 6 WAS | 8 WAS | 10 WAS | 4 WAS | 6 WAS |
| | 8 WAS | 10 WAS | | | | |
| 1. plants/stand | 13.61c | 22.70c | 31.4d | 38.37b | 13.37b | 19.47b |
| | 25.76c | 38.09d | | | | |
| 2. plants/stand | 13.43c | 24.72c | 34.89c | 42.05d | | |
| | 13.48ab | 19.48b | 27.25bc | 41.58d | | |
| 3. plants/stand | 13.89bc | 27.62b | 37.94c | 50.22c | | |
| | 14.29ab | 19.49b | 29.63b | 49.20c | | |
| 4. plants/stand | 15.09b | 28.89b | 41.98b | 57.55b | | |
| | 14.45ab | 21.73ab | 29.24b | 60.54b | | |
| 5. plants/stand | 17.59a | 33.33a | 46.65a | 62.84a | 15.03a | 23.35a |
| | 36.85a | 80.21a | | | | |
| SE ± | 0.486 | 0.937 | 1.099 | 1.214 | 0.509 | 0.749 |
| | 1.030 | 1.984 | | | | |
| Sowing Data (D) | | | | | | |
| 30th June | | | 55.40a | 63.58a | 15.26b | 28.11a |
| | 17.48a | 32.38a | | | | |
| | 33.23a | 62.93a | | | | |
| 14th July | 15.01b | 32.28a | 45.70b | 53.64b | 18.33a | 24.82b |
| | 31.97a | 42.04c | | | | |
| 28th July | 13.87b | 23.90b | 28.16c | 25.74d | 11.24c | 14.15c |
| | 25.09c | 55.53b | | | | |
| 11th August | 12.52c | 20.37c | 25.08d | 47.95c | 11.65c | 15.73c |
| | 28.69b | 55.12b | | | | |
| SE ± | 0.434 | 0.838 | 0.983 | 1.086 | 0.455 | 0.670 |
| | 0.922 | 1.775 | | | | |
| Interaction | | | | | | |
| P X D | NS | NS | ** | NS | NS | NS |
| | NS | NS | | | | |

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT **= Significant at 1% level NS = Not significant

Table 2: interaction between stand density and sowing date on plant height (cm) at 8 WAS during 2005 wet at samaru

Treatment sowing Date (D)

| Stand Density (P) | 30th June | 14th July | 28th July | 11th August |
|---|---|---|---|---|
| 1. | 49.60c | 34.44e | 23.30f | 18.50g |
| 2. | 58.29ab | 35.66e | 22.87f | 22.74f |
| 3. | 56.37b | 42.85c | 28.90f | 23.61f |
| 4. | 56.09b | 53.26b | 30.13e | 28.44f |
| 5. | 56.64b | 62.30a | 35.59e | 32.08e |
| SE ± | 2.197 | | | |

Interaction means followed by different letter (s) are significantly at 1% level of significance using DMRT.

Table 3: Number of leave/plant of Roselle as affected by stand density and sowing date during 2005 and 2006 wet season of Samaru

**Number of Leaves/Plant**

| Treatment | 2005 | | | | | 2006 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Stand Density (P) | 4 WAS | 6 WAS | 8 WAS | 10 WAS | | 4 WAS | 6 WAS | 8 WAS | 10 WAS | |
| 1. plants/stand | 14.25a | 28.56a | 38.56a | 52.02a | | 6.06a | 12.60a | 26.25a | 34.08a | |
| 2. plants/stand | 11.60b | 22.07b | 31.04b | 44.60b | | 5.24b | 10.40b | 15.64b | 19.99b | |
| 3. plants/stand | 10.33bc | 21.12b | 27.29c | 37.13c | | 5.00b | 8.76c | 13.51bc | 18.53b | |
| 4. plants/stand | 10.20bc | 21.35b | 27.36c | 33.07cd | | 5.00b | 8.52cd | 11.32c | 17.92b | |
| 5. plants/stand | 9.38c | 20.31b | 25.61c | 29.73d | | 4.73b | 7.97d | 12.42bc | 15.38b | |
| SE ± | 0.577 | 0.718 | 1.154 | 1.674 | | 0.272 | 0.255 | 1.292 | 2.100 | |
| Sowing Date (D) | | | | | | | | | | |
| 30th June | 14.67a | 30.76a | 32.30a | 37.32a | 52.42a | 60.91a | 7.99a | 18.34a | | |
| 14th July | 11.32b | 13.80b | 30.93a | 15.11b | 34.92b | 39.62a | 5.14b | 7.50b | | |
| 28th July | 13.35a | 9.36c | 19.24b | 18.78b | 22.08c | 26.69c | 4.41c | 6.66c | | |
| 11th August | 5.27c | 9.39c | 8.25c | 13.51b | 10.46d | 30.02c | 3.29d | 6.11c | | |
| SE ± | 0.516 | 1.156 | 0.642 | 1.876 | 1.032 | 1.497 | 0.244 | 0.228 | | |
| Interaction | | | | | | | | | | |
| P X D | NS | NS | NS | NS | NS | NS | NS | NS | | |

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT

NS = Not significant

Table 4: Number of branches/plant of Roselle as affected by stand density and sowing date during 2005 and 2006 wet season of Samaru

Number of branches/Plant

| Treatment | 2005 | | | | 2006 | |
|---|---|---|---|---|---|---|
| Stand Density (P) | 4 WAS | 6 WAS | 8 WAS | 10 WAS | 4 WAS | 6 WAS |
| | 8 WAS | 10 WAS | | | | |
| 1. plants/stand | 3.60a | 9.31a | 12.15a | 18.79a | 2.10 | 6.13a |
| | 12.52a | 15.50a | | | | |
| 2. plants/stand | 3.57a | 5.92b | 10.32b | 14.25b | 1.87 | 4.76b |
| | 6.61b | 8.62c | | | | |
| 3. plants/stand | 3.09a | 5.56b | 8.37c | 10.68a | 1.99 | 4.37b |
| | 6.51bc | 18.53b | | | | |
| 4. plants/stand | 2.50b | 4.97b | 6.00d | 8.65d | 1.81 | 4.30bc |
| | 6.75b | 8.32c | | | | |
| 5. plants/stand | 1.94c | 3.37c | 3.86e | 5.47e | 1.88 | 3.62c |
| | 5.92b | 7.23c | | | | |
| SE ± | 0.577 | 0.718 | 1.154 | 1.674 | 0.272 | 0.255 |
| | 1.292 | 2.100 | | | | |
| Sowing Date (D) | | | | | | |
| 30th June | 4.05a | 8.02a | 13.04a | 19.33a | 1.65b | 7.75a |
| | 12.10a | 15.09a | | | | |
| 14th July | 2.69b | 7.58a | 9.53b | 11.69b | 3.39a | 5.71b |
| | 8.05b | 95.0b | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 28th July | | 3.68a | 5.15b | 7.12c | 8.75c | 1.45bc |
| | 3.05c | 7.33b | 9.37b | | | |
| 11th August | | 1.34c | 2.56c | 2.86d | 6.50d | 1.22c |
| | 2.02d | 4.41c | 6.63c | | | |
| SE ± | | 0.159 | 0.326 | 0.305 | 0.561 | 0.009 |
| | 0.222 | 0.618 | 0.520 | | | |
| Interaction | | | | | | |
| P X D | NS | NS | NS | NS | NS | |
| | NS | NS | NS | | | |

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT

** Significant of 1% and 5% levels respectively

NS = Not significant

Table 5: Interaction between stand density and showing date on the number of branches/plant at 10 WAS during 2005 and 2006 wet season as samaru

Number of branches/plant at 10 WAS

Treatment 2005 2006

Stand Density (P) Sowing Data (D)

Sowing Data (D)

| | 30th June, | 14th July, | 28th July, | 11th August | 30th June, |
|---|---|---|---|---|---|
| | 14th July, | 28th July | 11th August | | |
| 1. | 30.67a | 22.08c | 13.17d | 9.25ef | 23.92a |
| | 14.50b | 16.08b | 7.50 | | |
| 2. | 26.06b | 13.21d | 9.54e | 8.17e | 14.83b |
| | 11.87c | 10.34c | 7.21 | | |
| 3. | 19.72c | 10.50d | 7.70e | 4.80f | 14.36b |
| | 7.02d | 7.97d | 5.14 | | |
| 4. | 12.72d | 8.08e | 8.82e | 5.54f | 12.56c |
| | 6.63d | 7.31d | 6.79 | | |
| 5. | 8.05e | 4.60f | 4.50f | 4.73f | 9.77c |
| | 7.48d | 5.13d | 6.53 | | |

SE ± 1.254

Interaction means in the year followed by different letter (s) are significantly at 1% level of significance using DMRT

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# MATERNAL MORTALITY: THE CHALLENGE NIGERIA MDGs 2015 TARGET FACE

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***ABSTRACT***

*Nigeria is one of the 147 signatories during the United Nations Millennium summit in September 2000. The study examined maternal mortality as serious challenge MDGs 2015 face in Nigeria. Nigeria is still facing a high rate of maternal mortality. Thus, making the attainment of the goals seem unlikely. There are many factors that could lead to maternal mortality. This paper focused on poor health facilities, poverty, socio-economic, illiteracy, unhealthy cultural believes and values and to a lesser extend malaria. The paper proffer suggestions and recommendation on how best to improve on maternal mortality*

## INTRODUCTION

Maternal Mortality death is defined by the World Health Organization (WHO, 1979) as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the size of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. The rights of woman to control their own fertility, receive care in pregnancy and enjoy successful birth is still denied to millions of women. This is reflected in the number of women who die at child birth or who are severally injured in the process. In developing world like ours (Nigeria) childbirth remains one of the leading causes of death in females between the ages of 14-45 World Health Organization (WHO, 1989). The WHO estimates that there are 500, 000 maternal mortality death worldwide each year. WHO (1986) stated that 95% maternal death occurs in developing countries, of which 65% is in sub-Saharan Africa. The maternal death rate collected from hospitals records from various countries revealed that Nigeria has the highest rate. This tragedy is not only confined to the death of women and mothers but immediately affects the survival

and quality of life of the babies and children left behind. There is also a long term effect on the woman's family and community with the less of her economic productivity, and possibly the disintegration of her family. Until recently this strategy was largely ignored by the people who determine national and international health policies and it was the United Nation Decade for Woman (1976-1985) that put the focus on women's issue. The decade changed the emphasis as the issues of quality and human rights so that the topic of women's health was finally recognized as a central developmental issue. It is seeming very unlikely to attain the MDGs Goals in the face of such high rate of maternal mortality. These unnecessary deaths are all preventable. Unicef (2004) statistic shows that maternal mortality ranging from 730 or more per 100, 000 child birth, it was meaningless in the face of such losses due to maternal deaths, and the devastating fact that most of these deaths and suffering could have been prevented.

**CONCEPT OF MILLENNIUM DEVELOPMENT GOALS (MDGS)**.

The United Nations (UN) millennium declaration was adopted in September, 2000 at the largest ever gathering of heads of states (Igbuzor 2006). Development, according to Oxford advanced learner's Dictionary 1999 is the gradual growth of economic and technology so that it becomes more advanced, strong. The issue of development has worried the attention of politicians, national and international organizations, scholars' workers and significant others with an increased tempo particularly in the last decade. There is a general consensus world-wide that development will bring about good change, manifest in increase capacity of people to have materials assets, food, shelter, cloth, employment gender equality, peace, education, health, politic, and economic independence. This is why people have argued that development is to improve people's quality of lives by expanding their choice freedom and dignity (Igbuzor 2006).

The eight goals of the MDGs are:

- Eradicate extreme poverty and hunger.
- Achieve universal basic education.
- Promote gender equality
- Reduce child mortality
- Improve maternal health
- Combat AIDs, Malaria, and other diseases
- Encourage environmental sustainability.
- Develop a global partnership for development.

The 189 nations that adopted the millennium declaration in September 2000, have agreed

to put a stock on maternal mortality so as to ensure MDGs 2015 a dream come true.

## CONCEPT AND CAUSES OF MATERNAL MORTALITY

Maternal mortality, the death of a woman while pregnant or within forty-two (42) days of termination of pregnant irrespective of the duration, and size of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or accidental causes. Woman constituted the second largest future resource of any nation. All the committed nations of the world accepted that woman resource is the basic tool for the MDGs. This is so because maternal health as a key-sine-qua non. Health and well-being of mothers have a standing influence on and fundamental to MDGs 2015 target. The rate of maternal mortality will debilitate and will weaken the acceleration of the MDGs 2015 target.

## POVERTY

In spite of the appreciable oil price in the last decade, the over whelming majority of the people remained poor, illiterate and diseased. More than 65% of Nigerians live survive on less than one U.S dollar per day. With specific reference to maternal mortality rates of 750 deaths per 100, 000 child birth which is a bad indices of progress, the major causes, however continue to reflect poverty. UNICEF (2009) report revealed that at the peak of oil appreciate-able period maternal mortality profile ratio raised from 704 per 100, 000 child birth to 750 per 100, 000 childbirth of the same country thought to be brimming with affluence. Most of this and other health problems which engulf Nigerians are due to conditions which are easily preventable. Nigerian elites have generally sought political power as a means of advancing their interest. They have used state power to gain access to a share of profitable opportunities and the finance necessary to establish themselves as the bourgeoisie. Championing the cause of and the support of the underclass (woman) must therefore, go beyond the incorporation of neither political populist slogan, nor does the acclaimed support for women welfare hold much substance. The traditional methods of safe delivery have been under attack not only because of its unscientific, unhygienic, unskillful and primitive, it is very exploitative. Undoubtedly these continue to reflect poverty. The vast majority of expectant mothers in our community today live below the poverty line and cannot afford settling medical bills nor eat balanced diet that will improve their immunity and health status (Mallum 2003). This may lead to many complications-absence of medical care, poor maternal nutrition, poor health, poor obstetrical supervision, poor foetus developments, which also elevate maternal mortality. This trend if not checked will be a big obstacle for the 2015 MDGs target especially in Nigeria.

## MEDICAL FACILITIES

In developed countries like China, England, U.S.A., France, Germany, Japan to mention but a few, good investment capacity to provide well equipped medical facilities were well positioned. In Nigeria medical facilities were grossly inadequate and poorly equipped. The services provided are focused on ante-natal and maternal child care. Like the hospitals, maternal centers too tend to be poorly equipped and staffed (Obesike, 2006). From big teaching hospitals or general hospital, with poor facilities and poor services very often well-pointed hospitals are put up just for political leverage where actually there is no effective service behind the facades (Lucas 1999).

The maternity home doesn't commensurate with its environment population. Weak referral linkage, poor services, endemic drug shortage are common features of our medical houses (Danga, 2006). With the present population, with uncertain medical houses to meet the yawning and aspiration of our teaming population, the feature of women in this country remains uncertain. The Nigeria's, health care delivery system recently come under heavy attack, as has been identified as one of the worst in the world, since it has the highest number of infant and maternal death, which are still increasing (Rabiu, 2009). The ministry of health lacks the necessary expertise. The Nigerian Medical Association (NMA) (2006) stated that this is not adequately provided for and which according to them, is responsible for brain drain in the country. According to Gilles, (1999) a basic maternal health service is referred to as being simple, effective, integrated, comprehensive, available and readily accessible at reduced price or free of charge at a vast majority. The primary health care (PHC) is a global movement rather than a concrete strategy thus, it has little impact in uplifting the health of the people.

## IMPORTANCE OF ANTENATAL CLINIC

- Easy detection of complications and handled quickly and promptly.
- Giving of necessary drugs and good supplement.
- Enlightening the expectant mothers on how best to care for herself and the unborn baby e.g. suitable diet, good personal hygiene, and moderate exercise.
- Educate the parent on the right attitude towards labour.

This implies that good health is an acquirable goal for mothers. To stay well is better than to be well.

## SOCIO-CULTURAL VALUES

There are some cultural practice and values, which make child-bearing risky and expose women

to the danger of death. Traditional and cultural values place a high premium on marriage. It is common to find girls who marry at age of 11-12 years in some community. Girls who marry between 12-19years bear more children than those who marry later, and they and their children face higher death rates (Rosenfield, 1989). Under such category, usually they may have contracted pelvis, which is too small to allow vaginal delivery. In the absence of surgical intervention, the results is either death of the baby or both or the mother.

In some society girls are often forced to marry young and in some culture the father husband has complete authority over the women so that even if she becomes ill no one else will take the decision to get help if the man is away (Maher, 1987; Safe Motherhood 1989; Grant 1991). There is a taboo that restricted nutritious food during pregnancy, contributes to a women's poor nutritional status thus leading to anemia during and after her pregnancy. In a situation where socio-cultural values are poor, the environmental condition are harsh (Rural area, Urban Slums) women are disadvantaged, discriminate against through neglect, repression and ignorance (Jeffery et al 1989; Momsen 1981).

Undesirable factors during the parental and even postnatal period may affect and even obstruct the subsequent state of health of the mother (Kwast, 1991). Mothers or women generally need to be cared for even if they are not pregnant for the purpose of improving and maintaining normal health that may pave way for achieving the MDGs. Safe motherhood is affected by shyness. Under shyness, it is a thing of pride for a girl to deliver alone her first pregnancy in her parents, home. Issues relating to sex and child bearing are considered as taboos to be discussed, the vast majority of our Traditional Birth Attendants (TBAs) depend on the skill passed down from generation to generation, sometimes, practicing under unsanitary conditions which expose their clients to infection e.g. puerperal sepsis.

**ILLITERACY/IGNORANCE**

There is no tool for development more effective than the education of girls' future mothers (Annan, 2004). The old adage said that "ignorance is a disease" many women especially in rural areas deformed themselves or died through ignorance. There is high level of illiteracy among women. There are cultural practices which encourages male education more than female. Educating a man, is to educate an individual but educating a woman, is to educate a nation.

Ignorance on maternal pre-natal care has led to several maternal mortalities. This is no small measure affect the MDGs adversely. The expectant mother and her relatives know very little on maternal issues and where to direct their problems. Several of them believed in destiny which is of which there is no option. Education and promotion of gender equality empowerment

women are critical to improving maternal health.

**MALARIA**

According to Sola (1989) pregnant women are more prone to malaria i.e. pregnant woman attract more mosquitoes. Available evidence in health research show an un-abating trend in maternal mortality due to malaria. About 65% of Nigerians populations are victims of malaria attack each year most vulnerable of which are pregnant women (WHO 2003). The roll back malaria, Federal Government strategy to flush out malaria out of the country doesn't hold substances. The statistic given by the Health Ministry revealed that malaria is responsible for every one in four deaths among children under five (5) and 1 in 10 deaths among pregnant women (Rabiu, 2009). According to (Ajayi, 1980) mosquito's saliva contains sporozoite. The sporozoite having penetrated into human body are taken up by blood stream and carried to the liver. The infected liver cells then rupture and the parasites are liberated. The effect of malaria on pregnancy according to Ajayi (1980), Coid (1977) and Anderson (1981) are hype prexia which may lead to abortion, intra-uterine death of foetus and premature labour, anaemia, general debility, and transplacental infection may lead to death. Scourge of malaria is severe and devastating. This will inevitably have its adverse effect on the attainment of MDGs 2015 target.

**THE CHALLENGE**

It is recognized that the health of mothers contributes immensely to the MDGs 2015 target. That is why goal No.5 hinges on improving maternal health. For the MDGs to succeed human resource must be focused by the duty-bearer hence improving maternal health policy must be pursue with determination. Researchers in the field of early childhood education view the parents as an integral part of the early childhood education process. If a young child doesn't receive sufficient parental interaction and stimulus during this crucial period, the child may be left with a developmental deficit that hampers his or her success in life (Peralta, 2004). A child who lost her mother in maternal death, may eventually lack parental educational support. This will frivolously affect the MDGs. Though Government initiated a number of policy frame work directed at reducing maternal death by three-quarter by 2015, much of our dismay maternal deaths was refused to come down, from the ever riding graph (UNICEF, 2009). If one considers the impact of maternal deaths on the Nigeria MDGs 2015 target, maternal death represent one of the tragedy exerting high obstacle on the MDGs target. Maternal death has become a problem to be tackled by all and sundry. As quoted above, maternal deaths are responsible for 500, 000

mothers worldwide. Of this number 65% in sub-Saharan African. This trend will no doubt hamper the attainment of the MDGs target. In order to overcome this problem, a strong emphasis on health education to create awareness among women and take informal decision about their health and strong political will and sustained effort as suggested by the MDGs 2005 report, must be pursued with vigor. Government should implement the 15% of its annual budget on health sectors. This will help setting up comprehensive health centers, well equipped, where drugs will be available and affordable. Medical officers should be more motivated to perform their duties diligently and effectively. One will be surprised to hear that there are 17.5m orphans in Nigeria of which maternal deaths is one of the strong factors. These orphans are exposed to neglect, violence, exploitation and all forms of abuse. If human faces are needed in MDGs 2015 target with this trend the MDGs target is at stake.

## CONCLUSION

The problem of development is a global issue and the MDGs is a response by world leaders. The leaders provide a platform to engage the process. In Nigeria the situation is a challenge perhaps owing to a poor political responsiveness. In order to achieve the MDGs goals Nigeria should formulate and implement vigorously policies that will meet the 2015 target.

## RECOMMENDATIONS

The following recommendations are made:

- Government pranksters should be stooped
- The basic maternal health care be made available in all communities free of charge
- Funds be made available for health sector which should be judiciously spent on health matters only.
- Government should use all its available means to enlighten the general public on the dangers of early marriage. Traditional, religions, politicians must be involved in the crusade.
- NGO should assist government in donating fund, drugs etc. to maternal houses.
- Free education for girls from primary-secondary level be provided.
  Free medication for all pregnant mothers should be implemented.

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# UTILIZATION OF METAL SCRAPS FOR THE CONSTRUCTION OF A PROTO-TYPE POTTERS' WHEEL

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***ABSTRACT***

*This paper is concerned with the utilization of metal scraps for the construction of a proto-type potter's wheel. The significance of this study is that through this locally constructed ceramic kick-wheel; learning will be made simple for students while teaching made simple for teachers. Various metal scraps were welded together with the guide of a product design in its given dimensions. The study employed experimental research method, which includes seeking alternative medium from the imported and highly priced kick-wheel. Based on the result obtained for this study, it is conclusive that following the product proto-type design given in its accurate dimensions that the production of ceramic kick-wheel using metal craps is achievable.*

## INTRODUCTION

Technology is growth; it is the quest for every nation. The technical know-how of the developed world started from what could be described as "the known to unknown" The use of the locally available metal scraps for the construction of a functional potters' wheel is an experimental research product for cottage ceramic industries/institution of higher learning. This would help to alleviate problem of importation of potter's wheel which is too expensive and furthermore *be* a leap towards the much desired technological growth. The choice of metal scraps (or kick-wheel construction is best informed by the fact that there are abundant metal scraps all over the country which we do not take much cognizance of, this is evident when one visits junk-yards of metal scraps especially in most commercial centers. Despite the heap of such piles, little advantage of it is used to the advancement of technology. It is therefore not an over statement to say that Nigeria

is blessed with abundant metal scraps, but lack technical know-how to effectively manage this scarps. An engineering manager at Fuji Xerox as quoted by Stuart (1996) states that "Western man is very good at turning unknown into known. Eastern man is very good at turning knows into commercial success". The great question here is how about an African man. What is the focus? especially now that Africa is said to be developing. Since development is synonymous, with growth the need to encourage the spirit of creativity through the use of “waste materials" if the ingenuity in individual must be developed. Stuart (1996) further contended that both objectives and either turning "unknown to known into commercial success" are achievable, but to achieve the full cycle, he believes in the adoption of new innovation. And those products do not have to be highly innovative, as long as they do the Job properly. He believes that too often we go for high technology products that do not perform. Design can be defined as the presentation of a good conceptual idea on the surface for effective onward utility. Ekeada (1988) sees design as that which needs to do with solid form.

**Statement of Problem**

The inadequate teaching equipment especially potter’s wheel among others, confronting various tertiary institutions of learning offering ceramic as a course constitute a problem. Therefore, the situation calls for the utilization of locally available metal scraps for the construction of a prototype potter’s wheel.

**Basic Assumption**

It is Assumed:- That the production of locally constructed kick-wheel will help if fully developed on a large scale to meet the demand of the contemporary ceramic industries/tertiary institutions of learning. That the already existing contemporary ceramic industries that were forced to close down due to lack of technical know-how on ceramic related equipment would re-open having the fore knowledge of the way out to solving ceramic related equipment problem such as kick wheel.

**Significance of the Study**

Most institutions of higher learning in Nigeria have no kick-wheels due to high cost of importation, but through the locally constructed, kick-wheel, learning will be made simple for students and teaching made simple for teachers. This will help to open more contemporary ceramic cottage-industries, thus reducing unemployment.

**Scope:-** Metal scraps for this research was sourced from cities like Kano, Kaduna and Katsina since all the components required for this research were not available in a particular city.

**Limitation:-** The research was limited to adequate property testing, such as ware resistance and durability.

**Research Design :-** Adetoro (1986), slates that the method of any research depends on the nature of the problem intended to be tackled by the researcher. In this study therefore, the research methodology adopted was basically product development.

**Data collection :-** Visits were conducted at various junkyards of commercial cities such as Kano, Zaria, Kaduna and Katsina, since not all the components required were available in a given place. Even in a given junk-yard, care must be taken in order to select the best component for effective performance.

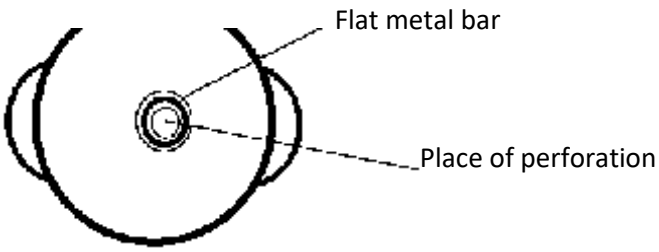
**Component Requirements :-** Component requirement comprised of scrap metals such *as*, shaft from a car, Boris, flying wheel, angular iron, bolts of various sizes, metal sheets, ball joints, head pan, gloss paint, sand paper, brushes, grease (lubricant).

**Beneficiation of Materials :-** Naturally, any metal scrap is very rough due to its corrosion. The metal scraps were sandpapered where necessary to allow for smooth painting.

**Product Design :-** Two types of design were carried out on paper by the researcher as experimental sketches (see figure la -b). Figure, la is specially designed for sit and kick-wheel approach while (figure 1b) is design for stand and kick-wheel approach. The stand and kick wheel was eventually developed.

**Method of Production :-** Etuokwu, (2007) believes that a collection of scraps materials from the scrap market around us can be assembled to give just exactly what is needed in the ceramics studio. Construction was therefore carried out using scrap metals and welding approach following the specifications as indicated in the cross section view of the product design (see fig 2), The placement of the shaft was rightly done to ensure straightness, which will disallow wobbling at the center.

The procedures for the constructions are as follows:

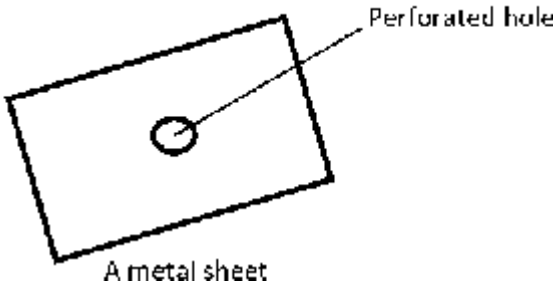



A perforated head pan

a. **Head Pan :-** The head pan of 47cm in diameter was chosen. At the bottom centre of the head pan, a perforation was done using electrode to open up to allow for allowance of the shaft that would pass through as in the diagramme below. A flat metal bar was also used to weld round the perforated place to disallow water used during throwing to spill all over places.

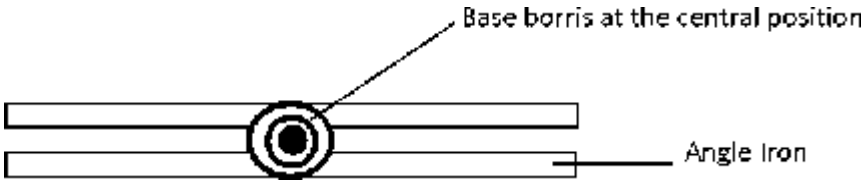
**Metal Sheet**

A metal sheet of 50cm x 47cm was cut to the size of the frames to further holds the frames top as well as to protect the beneath borris from water contact. The metal sheet was also perforated at the centre allow for to the free passage of shaft.




**Angle Iron**

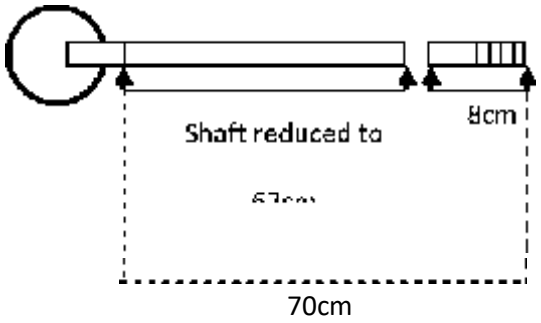
Two angular iron 46'Acm x 46'Acm were cut and welded to side frames to house the base borries.




**Shaft**

There are different sizes of shaft available. Any of these sizes will do, but it has to go along with the right size of a borris (fitted borris), as well as chosen the right length. If a particular shaft is too long it can be cut to the required size.

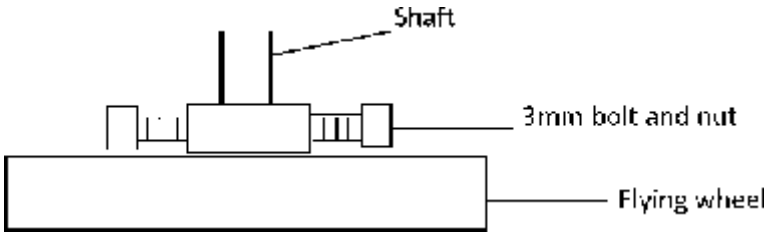
It should be noted at this juncture that no shaft comes with treaded head. Treading of shaft head can however be done using a machine or on the alternative big treaded bolt and nut be bought and welded to the shaft.



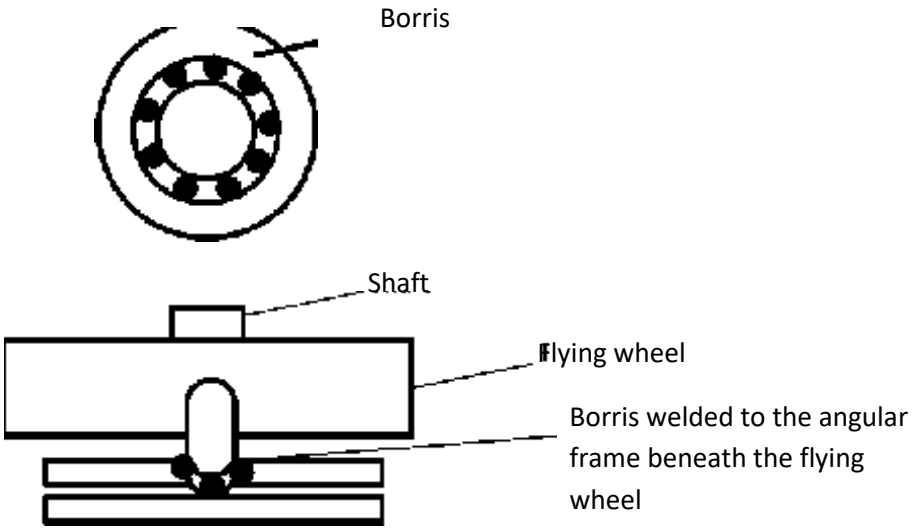

**Flying wheel**

The flying wheel is a source of weight and a pulling force required for the wheel to work. One or two flying wheels put together could do the job depending on their weights. Bigger flying wheels can be used alone. Some flying wheels are largely perforated at the centre that would call for one to find a small perforated metal thick enough that would allow for the passage of the shaft. Here a flat metal bare could be welded to the flying wheel with 3mm bolt and nut to further hold the flying wheel and the shaft together.

**Borris**

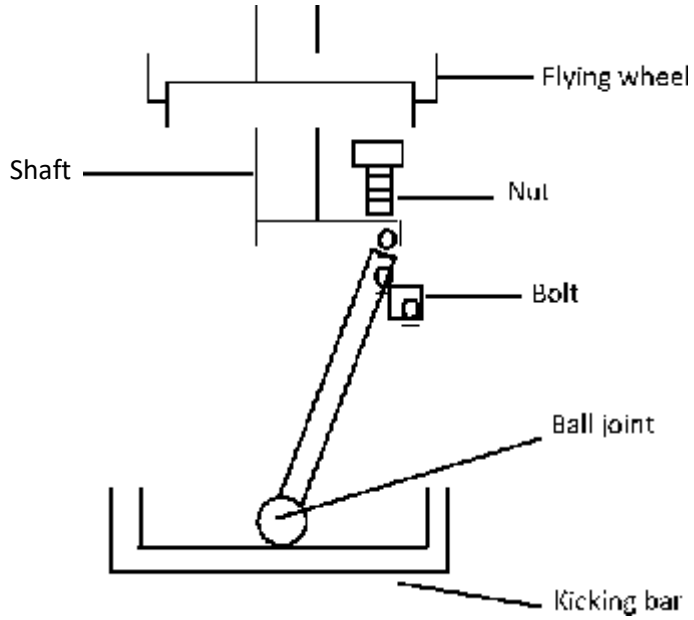



The function of this is to assist the shaft to turn effectively during kicking or working on the wheel. Good borris must be purchased for this purpose and lubricated with oil grease. The borris to be bought must be the type that will fit in to the shaft to be used. Note that there are two borris to be used one beneath the head pan and the other beneath the flying wheel. The same central position the top borries assumes is the same with that beneath the flying wheel.



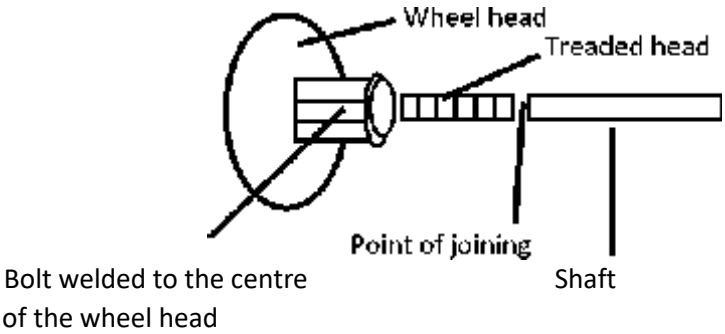

**Ball Joint**

This is joint that helps to rotate the wheel when kicked. It is a moveable ball inside a socket, welded to the metal the leg is placed to kick. It should also be lubricated with lubricant (grease).




**Wheel Head**

This could be fabricated. It could also be sourced from the metal junk yard. Any relatively round and strong metal plate could serve. What to further look for is a big treaded nut (bolt and nut) that is relatively big in diameter as the shaft to be used. Weld the nut to the centre point of your flat wheel head. While the tread be welded to the shaft.




**Pilot Study**

Pilot study according to Afolabi (1996), can be regarded as a small-scale approach of the envisage study or investigation, whereby a proto-type of the main body is developed. Consequently, this approach serves as a means to reduce, to a -large extent, the number of treatment and errors that would have been identified in the pilot study stage. At this stage errors noted were rightly corrected

and finally developed to a full proto-type using the right materials for the stand and kick-wheel approach see (table 1.1)

**Material and sources**

Table 1.1

| **S/No** | **Raw Material** | **Source** |
|---|---|---|
| 1 | Head pan | Locally Katsina |
| 2 | Boris | “ “ |
| 3 | Shaft | “ “ |
| 4 | Lubricant (grease) | “ “ |
| 5 | Iron rod | “ “ |
| 6 | Gloss paint | “ “ |
| 7 | Bolts and nuts | “ “ |
| 8 | Angular Iron | “ “ |
| 9 | Metal sheet | “ “ |
| 10 | Ball joint | “ Zaria |
| 11 | Flying wheel | “ Kaduna |

| | | |
|---|---|---|
| 12 | Wheel head | Kano |

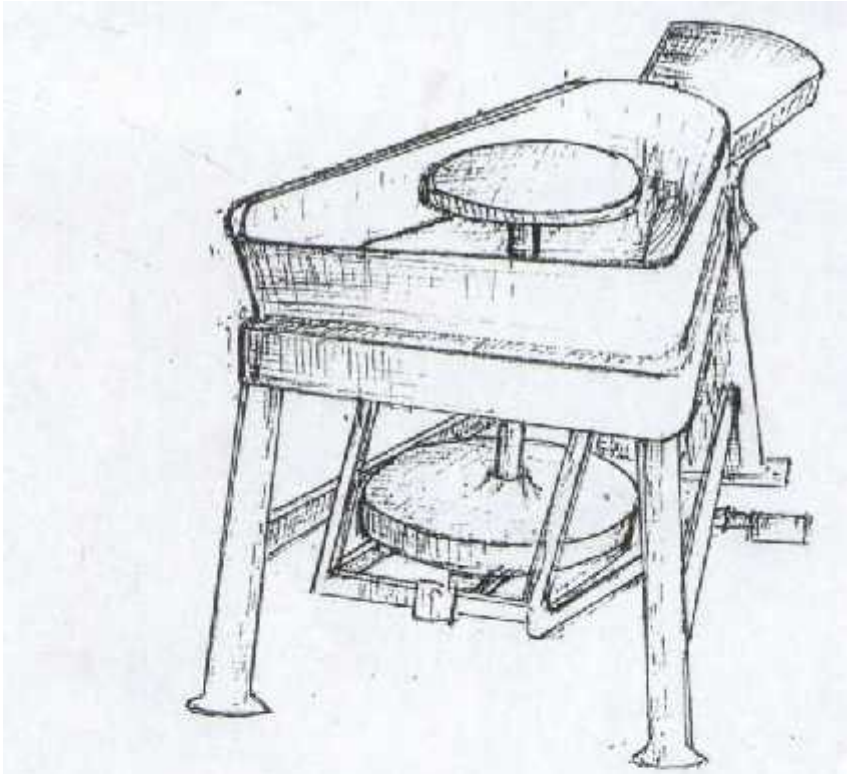
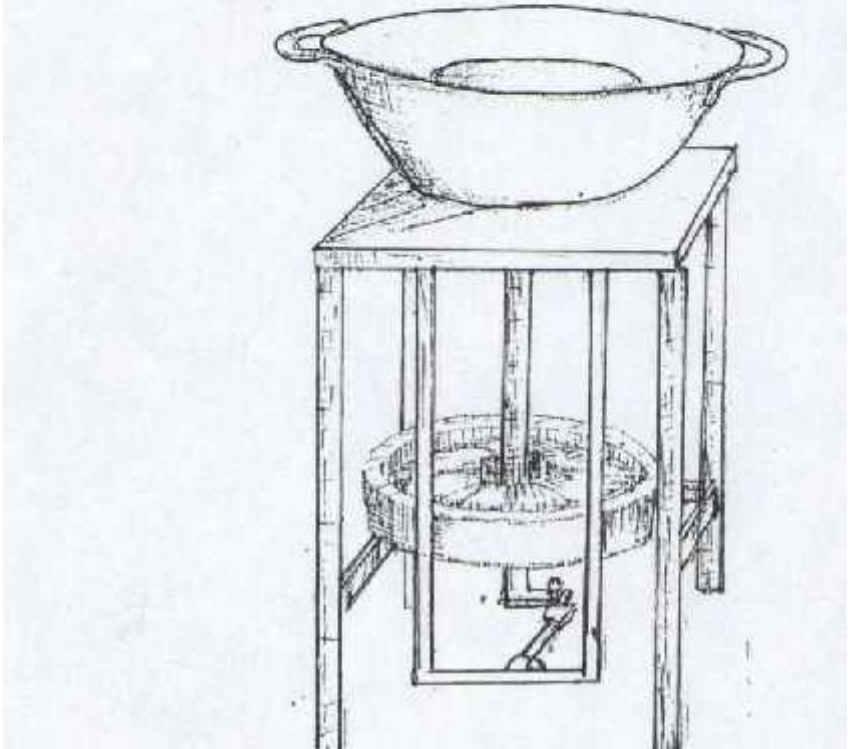


Figure 1 (a) Sit and kick-wheel product design



**Head pan**

**Wheel Head**

**Treaded head**

**metal sheet**

**Borris**

**Shaft**

**Flying wheel**

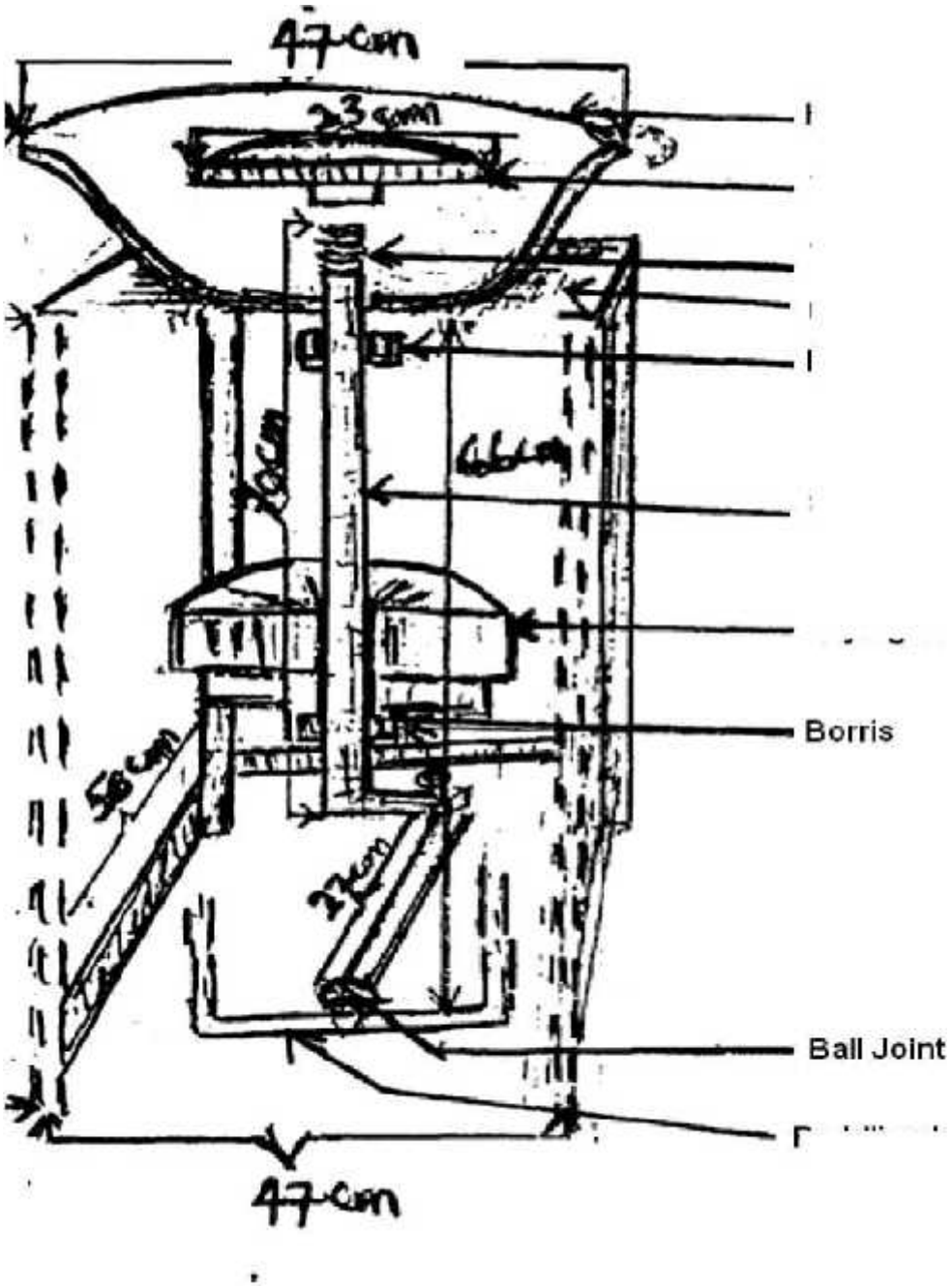



Figure 2 A cross section view of stand and kick-wheel product design

**Analysis of Result and Finding**

**Result of Head Pan :-** The head pan used provides convenience when arms are placed upon it as an aid to centering clay.

**Result of Shaft** :- The shaft placement at an appropriate centre gave effective rotation without much wobbling, which is usually characterized by locally constructed, sit and kick-wheel.

**Result of Boris :-** The two Boris used also proved good after much lubricant applied, they were able to rotate with ease.

**Result of Angular Iron Bar :-** The angular iron bar gave further reinforcement to the structure for the construction. It further holds the shaft and the flywheel into position.

**Result of the Fly Wheel :-** The flywheel is that which gave the required weight and that which determines the extent of rotation during throwing. It balances the wheel top for effective centering on the wheel.

**Result of Joint Socket :-** The Joint socket serves as an avenue for effective movement of the flywheel. It equally allows for free rotation of both borris and the flywheel.

The rotation was effective with the aid of lubricant.

**Result of the Final Design :-** On assemblage, the kick-wheel was tested and it did throw fine. The extent of warpage did not in any way hinder its effectiveness in throwing. See (plate 1).

**Result of the Tested Throwing :-** The kick-wheel throws effectively. Products such as cups, open bowls, flower vases were effectively thrown. Sec (plate,2).

**Discussion**

Certain issues that required discussions emanated when some throwing samples were carried out. The resultant wobbling of the wheel head was as a result of the improper positioning or the treaded head to the shaft during joining or as a result of a little tilt in the shaft itself. The stand and kick-wheel design was to deviate entirely from the conventional design of sit and kick approach.

**Findings**

It was discovered that small amount of clay weight of about 1kg throws faster and centre better than 5kg weight of clay. In spite of the standing design approach, the wheel throws fine and also very convenient to use. It was further discovered that the effectiveness of the flywheel during

kicking in terms of the adequate weight needed during throwing to make clay centering and pulling effective was achieved.

All the throwing carried out were excellent, and successful.

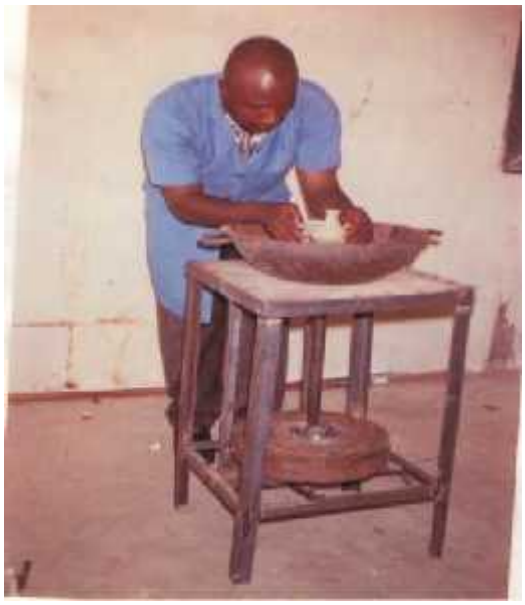


**Plate 1: Final construction of a stand and kick-wheel**

**Plate 2: Sample of the throwing pieces of works**

## Conclusion

Various components needed for the construction of the kick wheel were cut into specifications required and welded accordingly. Thus the end result of a good design coupled with good finishing resulted into a well-finished and functional proto-type kick-wheel. All the throwing carried out were successful. On the basis of the construction carried out the following conclusion were drawn.

(a) That the scraps and component used in the production of a proto-type kick-wheel if carried
out in the precise dimensions as stated by this study will give consistent result.

(b) That the wobbling of the wheel head can further be reduced if adequate care is taking to properly position the treaded head to the shaft during welding.

(c) That there exist in abundance scraps needed for the production of some proto-type kick wheel.

**Recommendations**

The following are recommended for further endeavours in the proto-type kick-wheel production

(a) There is need to future study how to overcome completely the wobbling wheel head usually characterized by locally fabricated products.

(b) Adequate fund be provided for a research of this nature for a better result by the ETF (Education Trust Fund) for researches in all tertiary institutions of learning.

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# QUALITY TEACHER PRODUCTION AND PREPARATION FOR EFFECTIVE TEACHER EDUCATION REFORMS

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***ABSTRACT***

*This paper focuses on quality teacher production and preparation. The paper discussed on status of teacher education, reforming teacher production education and emphasis on teacher quality. However, it recommends that the entry requirement, re-train and instructional materials are to be adequately prepared for effective teacher education reforms.*

## INTRODUCTION

Education is a means to solving problems, preventing problems and advancement of individual and the society. The notion: 'No education system can rise above the quality of the teacher is universally held. Thus, good teachers are requisite for better education. Teacher education on the other hand, is that education tailored towards professional training of those in the business of teaching. This involves the teacher education programme in preparing competent teachers who are knowledgeable in all fields of knowledge and professional practices. A good teacher education programme must seek to assist the individual teacher to grow and develop a person to provide him with the necessary skills to become not only on effective teacher, but also an enviable community leader. For a teacher to be educated, it involves being exposed to academic and professional knowledge which will better place him to impart such knowledge in the areas of skills, attitude and cognition. This paper therefore, discuss issues involved in teacher production and preparation in terms of their status, problems encountered and why emphasis was put on teacher quality.

## STATUS OF TEACHER EDUCATION

A number of factors had been militating against a clear - cut policy for the preparation and production of qualified teachers within the educational system in this country. One source of concern in this area was that teachers were often weak in knowledge. There is a worldwide increasing demand for a more academic approach to the content of teacher education than obtains at present, partly in the belief that the teacher should have a grasp of a subject matter and partly because many believe that teaching is an art that can be learnt on the job and which, therefore, need not occupy too much time during initial training. But one can also quickly add that in a world of rapid turnover in information, academic content keeps getting updated, thus requiring constant mental alertness and close reading. Basically, teachers must, at least, know everything in the school syllabus that they intend to teach and much more. They must continue to grow in learning throughout their career well beyond the few years they spend in initial training programme. Adaralagbe (1982) who noted that, "our major problem is the difficulty in our teacher education programmes relevant at the level for which they are design. We tend to concentrate on teaching a million bits and pieces of information as a coherent whole. Our approach to student seems to put the freeze on individuality and autonomy, inquiry and creativity".

The belief that, merely recruiting a large number of NCE and graduates into the primary schools tantamount to injecting quality into the schools, even where their subject specializations bear very limited relevance and appropriateness to the primary school curriculum. For example, Adeyanju (2004) cited that, some findings challenge our belief that if an NCE graduate read Hausa and Islamic studies or took a double major in technical education, home - economics, or any such subjects, we are happy to count him/her as having possessed the "minimum standard" for teaching the several subjects in the primary school curriculum. Unfortunately, you may found these NCE graduates very ill -prepared and therefore weak in many respects. Many schools are filled with such teachers. It is perhaps time to re-examine this mindless preoccupation with broad paper qualification and to scrutinize the appropriateness of the content of teacher preparation as well as the placement of those we deem qualified to teach what we prepare them to teach. According to Jibril (2005) Teacher education goes beyond ordinary teacher preparation and training. Although it is the concern of teacher education to prepare, train and groom would - be teacher in designated setting for teacher education yet those routinely expectations of teacher education which are taken for granted do not often satisfy the need for commitments and devotion to duty of the teachers. The quality of teacher

education products is certainly a serious question. Quality teacher education is a great challenge nation and the production of quality teachers would solve the problem if necessary attention would be given. Thus, every administration in this country is rightly guided, as to the policy for recruiting teachers into the various levels of the school system. Recruitment pre - supposes that there is a pool of individuals from which qualified applicants can be sourced and selected. The over - crowded classrooms, particularly in the rural areas without teachers, implies that any responsible and responsive government should recruit all available hands with minimum academic qualification to "teach" these children. Whether they actually **teach or cheat** is another problem entirely. Ohanado (1997) observes that "majority of teachers in our educational systems are not motivated. They are not efficient if we use student performance in both public and private examination as the yard stick for measuring efficiency." There is need therefore to focus the basis in teacher education; i.e teacher preparation, teacher production which should greatly enhance better result and excellent performance. A basic truth is accepted widely that the quality of education largely depends on the quality of the teacher. Lack of commitment among teachers is the bane of quality teacher education today. For instance, primary education has been reduced to mere school attendance and fake certification in the sense that examinations are largely written for pupils by teachers nowadays instead of adequately preparing pupils to write exams by themselves. This malaise is everywhere at the primary or secondary school system today. This further calls for the need to consolidate teacher preparation and teacher production in order to have an effective reform in teacher education, since it is obvious no adequate training can take place without competent teachers to handle the training programme, teacher education programmes must of necessity be on the priority list of the ministry of education. The services of the teacher are indispensable to any nation and he, more than any other existing professional influences in the lives of the nation's youth and nation's future. According to Fafunwa (1969) "if the Africa teacher is to cope adequately with the monumental task that lies ahead of him, he has to be well trained for his job"

**Reforming Teacher Production Education.**

The importance of teachers and teacher quality is universally acknowledged, though quality is hardly ever rewarded commensurately. Consider the following grandiose claims, for example.

"Only the teacher can lay a solid foundation for national development, economic growth, and political stability alike depend on how well he does his work. He is Nigeria's ambassador to the

future, and he deserves full rights and privileges from his country men" (Eric Ashby. 1960).

"Teachers are the key to the effectiveness of any school ---------- Their development is a top priority in any move to change schools". (Ford Foundation, 1985).

The above are only a sample of very many such flattering acknowledgment of the teachers central role in national development. Among other things, outstanding teachers possess high intelligence, knowledge, commitment, multiple approaches to problem solving, and a contagious enthusiasm about books and learning, as well as sharing knowledge. Experts on teacher education know that no initial teacher education programme can guarantee these attributes. Besides the static qualities of intelligence and personality, others (dynamic qualities) must be systematically nurtured. In the United States, for example, fresh products of teacher education are not thereby considered well - formed but are allowed two or more years of teaching in a school under a senior school - based mentor for ultimate assessment for certification.(see Holland, 2003, Newman, 1988, Izumi and Evers, 2002).The objectives as stated in the Nigerian constitution of (1989) and the second National development plan (1970 - 74) are still being pursued till date and these are still appropriate for the future. As teacher education programme are guided by the National policy on education, the purposes are clearly stated namely:-

a) To produce highly motivated, conscientious and efficient classroom teacher.
b) To encourage a spirit of enquiring, creativity in teachers.
c) To help teachers to fit into the social life of the community and society at large to enhance their commitments to the national objectives.
d) To provides teachers with the intellectual and professional background adequate for their assignments to make them adaptable to changing situations
e) To enhance teacher's commitment to the teaching profession

Though statements of objectives have invariably served to structure educational systems and processes, they are sometimes so idealistic that they become incongruous with what goes on in practice. For instance, disjunctions occur not only between different categories of professional teachers but also within the levels at which they were trained and the levels within which they teach. Some experts believe that other ways of ensuring quality performance in teachers are to raise the entry requirements into teacher education programme, cut class size, teach efficient time utilization,

reduce teaching load, provide adequate and appropriate instructional materials, promote efficient interactive, collaborative supervision and appropriate monitoring etc. In Nigeria much emphasis is placed on workshops, conference attendance, inducements of various forms, e.g promotion, recognition, and enhanced salary scale etc rather than the former. Teacher education is the foundation of quality in the schools. To bring about desirable educational reforms in teacher education, requires adequate preparation of the teaching personnel. For the education and training of teachers to be effective and property oriented, there is need for a sound knowledge of the trends and changes in the practices and process of organized education. Teacher education cannot be viewed in isolation because the changes taking place in every aspect of the business of organised education have also necessitated changes in teacher education. There are changes in the aims and objectives of education, changes in organizational patterns, changes in the contents of education, changes in methods and techniques of teaching. These changes have invariably necessitated corresponding changes in the programmes and processes of teacher education and training all the world over. Qualitative teaching is a goal of teacher education, and one of the qualities of the good teacher is the ability to administer qualitative teaching to the students. Qualitative teaching takes place into consideration the availability of various resources for teaching and an effective application of these resources in the classroom. Consequently, teachers of today have to be properly and adequately prepared in order to meet effectively the challenges of the times. If teachers are the hub of any educational system, then there is need to examine various aspects of teacher education with a view of suggesting solutions to the general problems facing the education and training of teachers. To achieve these, the concepts are first examined. The concepts of research, teacher education and teacher effectiveness. Some research efforts in teacher education in Nigeria in the following areas; teacher effectiveness, teaching practice, methods of teaching, teaching training programme and duration of teacher training.

**Why emphasize on teacher quality?**

The rationale behind emphasizing teacher quality is that wherever any wrong is to be adequately and effectively righted it would be important to go to the basis and remove every impediment that forms the foundation for such wrong. Therefore, to have a quality in teachers, reforms of teacher production must be carried out. Teacher's to be employed in our schools must be the right caliber of teachers that can deliver. They must be able to raise the younger learners at that level to be thoroughly knowledgeable and develop properly to face life challenges.

Oyeyinka and Adeniyi (2006). Suggested resuscitation of grade II teachers training programme as a requisite for effective teacher education in order to have effective and quality teacher education. They mention further the need for a better academic and professional demand that will keep teachers sharp and on their toes. They maintain that teachers should be well remunerated, treated well and paid relevant allowances like rural and training allowances to motivate them. Harry (1991:109 - 110) observes that "the crucial and must difficult task involved in teacher education is to generate a supply of teachers that will match - in - quality, and type the need of the schools. Such matching is particularly difficult and from an analytical point of view, especially interesting at a time of rapid change in the ideologies and practice of schooling.

**RECOMMENDATIONS**

1 The entry requirements for entrants into teacher education should not be lowered to suggest that teacher education is for the academically in capable.
2 The entrants must be those interested and willing to do the job, and not those whose hearts are elsewhere.
3 The scrapped grade II teachers training colleges and pivotal should be resuscitated as the base for teacher education, as the first level of training to qualifies the entry into (N.C.E) programme.
4 The teacher needs more than ever to re - train in order to keep abreast with the current innovations in his or her discipline and the teaching profession.
5 Teacher education programmes should place more premium on instructional materials production, group dynamics and techniques, diverse learning activities, and demonstrable teacher resource fullness.

Conclusively, if teachers are to be adequately prepared to work effectively in the classrooms and schools envisioned by reformers, policy makers must establish a coherent and more effective approach to professional development. Teachers and policy makers must abandon long held conventions about continuing education for teachers and begin to understand professional development as an essential and integral part of teachers' work.

To buttress this equipment, section 58 on teacher education in the National Policy on education acclaims that "all teachers in our educational institutions shall be professionally trained" section 56 (b) also specifies that "the minimum qualification for entry into the teaching profession shall be the

Nigeria certificate of education (NCE). Section 59 - 65 also specifies other good packages for the teacher for example:-

6 Exposure of teachers to innovation
7 Recognition of teaching as a legal profession
8 Appointment of professionally and academically qualified personnel as head teachers.
9 Provisions of promotional opportunities
10 Transfer of teachers from state to state
11 In - services training of teachers
12 The implementation of some of these sections however are yet to see the light of the day.

## CONCLUSION

This paper has briefly shown what teacher education is. It has highlighted status of our teacher education, inserting some of the problems involved in both the teacher production and teacher preparation. The paper analized and review some findings of some educationist, on how reforms should be carried out on teacher education programme to enhance on effective and qualitative teacher production; for quality teacher education is a great challenge to the nation. Recommendations towards having a good impact on teacher education were preferred.

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# A STUDY OF THE EFFECT OF BORIC ACID AS A FLAME RETARDANT IN WHITE ENAMEL PAINT

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***ABSTRACT***

*Flammability characteristics of enamel white paint were altered with different concentrations of boric acid crystals to determine its effects as a flame retardant in paints. A control and four different concentrations of Boric acid solutions were used. The characteristics investigated were: Flame Velocity, Add-on %. After Glow Time. Cellulose Burnt %. Flame Velocity % and the length of the timber completely burnt. From this research work it was found that Boric acid is a good flame retardant in paints with enhanced effect at increased concentrations. Therefore, boric acid can be used to reduce the devastating effect of fire incidence.*

## INTRODUCTION

The pioneering works of Wyld in 1735 and Lussac in 1812 revealed how flammability of materials could be controlled and what makes them burn. Estimation shows that, in Africa, over 70% (Nigeria as a case study) of the population are provided with shelte3r by rural housing including furniture and other wooden. This means that about 30% of Nigerian population are living in the urban areas where the use of paints decorations, especially on wooden such as furniture in houses is very common, hence to the high flammability of paints when ignited since most organic substances are combustible i.e. inflame if heated strong enough (Garba and Eboatu 1990). Building codes, specifications and other standards in use throughout united states and many other developed countries set limits of acceptability for the surface flammability of combustible materials used for purposes where protection of life from fire must be considered. One of the largest areas so regulated is the interior finishes including walls and ceiling surface used for houses sand other buildings (Garba and Eboatu, 1990). Paints, often referred to as organic coating can be defined as a fluid with viscosity, drying time, and flowing

properties dictated by formulation normally consisting of a vehicle or binder, a pigment, a solvent or thinner, and a drier which may be applied in relatively thin layers and which changes to a solid in time. The change may not be reversible, and may occur by evaporation of the solvent, by chemical reaction (Oxidation or Polymerization) or by combination of the two processes

(Eboatu et al., 1992). A flame retardant (F.R.) can be defined as a compound or mixture of compounds which when added to a polymer, as colccu cellulose, substantially depresses the ease of ignition and/or flame proportion (Garba and Eboatu, 1990).

**Qualities of Ideal Flame Retardant**

These include the following:

1. Good penetrating power,
2. Substantial stability
3. Positive in action
4. Readily available
5. Not dangerous to the user
6. Colourless
7. Relatively Cheap
8. Odourless

**Mechanism of Flame Retardency**

The heat of balance at the surface of the burning polymer is of importance as far as the understanding of the role of various flame formulations in use are concerned.

Basically, surfaces of the polymer receive heat from the following sources:

i. An external source (Qe) and
ii. Re-directed heat from the burning mass (Qd)

Likewise, there are two ways through which heat is released, and these are:

i. Classification of the polymer (Qg) and

ii. By the other usual methods of conduction, convention and radiation (Qf).

Qe + Qd must be greater than Qg + Qf in a self-sustained combustion, but when a fire retardant is added, this relationship is reversed. This reversing of the above relationship brought about interfering with combustion at one stage or the other.

**Means of Imparting Fire Resistance**

In general, all naturally occurring polymers or those produced from them like timbers, textiles, papers etc., can be imparted well and easily with fire retardants by the commonest paddry approach. A solution of slurry of the flame retardant finishing is made and padded or sprayed on to the materials. This is dried, followed by a short time cure at the appropriate temperature in some cases the materials are immersed in a solution of the dope, during which it absorbs the mixture. In the same way, Eboatu (1992) reported reduction in flammability (increased the ignition time) of a local thatch *Andropogon gayyamus* (known-locally as Gamba); whereas the untreated and fertilizer treated materials respectively. It was reported (Garba et al, 1998) that there was reduction in the flammability of four Nigerian timbers when soaked in alum solution for 24 hours. The timbers were: *Chloronphora exesa, Nucea duderichili, Nucea Ceiba, and termmalia superba* locally known as Iroko, Opepe, Ceiba and Afara. Flame retardants area also classified in relation to their durability of fastness to laudry, height, heat chemicals etc. Durability or fastness of fire retardant depends on whether they react chemical or simply from cellular mixture with the materials. On this basis the following is the classification:

i. Non-durable/finishes
ii. Semi-durable finishes
iii. Durable finishes

**Experimental**

Material: The timber splints were obtained from Sokoto timber market popularly called Kara market. It was found to have moisture content of 30%

Method: All weighted reagents were added into constant gram of while enamel paint brushed on the timber splints using the same method, two timber splints were treated with untreated enamel paints as controls. All were dried in an even at 1030C for 15 minutes. The timber splints were painted up to about two third of their lengths. Some two untreated solutions were used as reference. Add-on (90)% of each sample was calculated using the expression.

Add-on (5) = W2 - Wi x 100

~W

Where: W1 = weight before treatment

W2 = weight after treatment

ii. After glow time: Timed as duration between flameout and visually perceptible glow, and recorded in seconds.

iii. Flame velocity for flame propagation rate: The sample was clamped vertically, ignited with a cigarette lighter and allowed to burn for 60 seconds, after which the flame was set out and the distance traversed by, the char-front was measured. Flame velocity was then calculated as distance covered by the flame (as measured over 60s, the number of seconds allowed for burning, thus flame velocity is recorded in cm/s.

iv. Callulose burnt (%) this was calculated by sing the expression.

Cellulose Burnt (%) = $\frac{W4 - W_5 x}{Wi}$ 100

Where: W4 = weight of the treated sample being burnt in grams

$W_5$ = weight of paint dope applied on the sample in grams

v. Length of the timber being completely burnt. This is the distance covered from the tip of the sample exposed to flame for given time - 60 seconds

vi. Flame velocity change (%): this is calculated by using the

expression FVD (%) = $\frac{Rvu - FVt}{FVu}$ x 100

Where:

FVD (%) = Flame velocity change percent

Fvu (Cm/s) = Flame velocity of the untreated sample

FVt (Cm/s) = Flame velocity of the treated sample

**Result and Discussion**

Result: The result is summarized in table shown below:

| S/NO | Conc. Of Boric Acid (g/dm3) | 0.0 | 12.5 | 25.0 | 50.0 | 75.0 |
|---|---|---|---|---|---|---|
| 1 | Add-ib (%) | 1.9 | 3.0 | 4.0 | 5.2 | 5.6 |
| 2 | After Glow Time (sec) | 3 | 4 | 5 | 7 | 10 |
| 3 | Flame Velocity (cm/s) | 0.12 | 0.045 | 0.031 | 0.018 | 0.014 |
| 4 | Flame Velocity change (%) | 0 | 62.5 | 74.17 | 85.0 | 88.33 |
| 5 | Cellulose Burnt (%) | 35.0 | 32.0 | 28.0 | 23.0 | 18.0 |
| 6 | Length of Timer Burnt (cm) | 3.28 | 1.5 | 1.1 | 0.6 | 0.1 |

**Discussion**

Add-on % as could be seen from the given table and accompanied graph increases with increase in concentration of the fire retardant (Boric acid). In the same vein, after glow time is shown to be directly proportional to the concentration of the retardant. Flame velocity, as inclicated by this finding increases with an increase in the concentration of this fire retardant likewise its change (flame velocity change %). Both the cellulose burnt (%) and length of the painted timber burnt were found to decrease with increase in the concentration of the fire retardant on analysis i.e. Boric acid.

**Conclusion**

From the experimental data arrived at after the course of this project, it can be concluded that Boric acid is a good flame retardant in paints. Therefore, Boric acid could be advocated as an additive in paints in our effort to protect both life and properties from very serious challenges of fire out breaks in our homes, offices, institutions and their likes.

**Recommendations**

The paper recommends as follows:

1. More research work in the area of Flame Retardants Substances so that deep

Knowledge could be driven and used for protection of both human and material resources against fire damages

2. The use of Boric Acid as an additive in the paint Industries.

3. Government provides enable law compelling Paint Manufacturers to use Flame Retardants, such as Boric acid, as Additives in their production.Governments, Non-Governmental Organisations and Professional bodies such as Chemical Society of Nigeria (CSN), Institute of Chartered Chemists of Nigeria (ICCON), Standard Organisation of Nigeria (SON) and so on should rise up to enlightened all people on this new scientific development and its benefits.

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# A COMPARATIVE STUDY OF TWO METHODS OF TEACHING THE MOLE CONCEPT.

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***ABSTRACT***

*The research work attempted to compare lecture and guided discovery methods in teaching the mole concept to secondary school students. The research aimed at finding the effect of the two methods of teaching mole concept to students and if either of the two methods is capable of enhancing the interest of males or females above the other. To achieve the objectives two hypotheses formulated in the null form were tested and analyzed a = 0.05. The study was experimental. The mole concept was taught to the experimental group using guided discovery method while the control group was taught using the lecture method for one week. Both groups were pre- and post-tested using Quantitative Item Test (QIT) instrument to collect data. The findings from the study shows that guided-discovery teaching method is a more effective method in teaching mole concept and the method enhanced the interest of male and female students equally. Recommendation was made that teachers should be trained in the skill of designing and administering creative guided discovery method for the teaching the concept to students.*

## *Introduction*

The mole concept is a prerequisite fundamental knowledge in chemistry. It is used as the practical unit of quantity or measurement (Mills et al, 1993) and it is the key to mass relationships in a chemical change. That the mole concept is so fundamental in chemistry is succinctly captured by Kolb (1978) in Furio et al., (2002).

> *"there is probably no concept in the entire first year chemistry course more important for students to understand than the mole and one of the main reasons the mole concept is so essential in the study of chemistry is stoichiometry".*

The importance of this concept is further underscored by the avalanche of literature on the problems of its teaching and learning (Johnstone et al, 1971, Cervellati et al., 1982, Nelson, 1991, Furio et al., 2002, Longo, 2007). In an excellent review of literature, Furio et al., (2002) showed that students have great difficulty in handling mole concept owing mainly to the abstract and theoretical nature of the concept (Larson 1997). The difficulty this concept poses to learners is widely acclaimed both nationally and internationally (Ingle and Shayer, 1971, Khang and Sai, 1987, Njoku, 2003). Hence many studies have been focused on how to tackle the problem of teaching this concept. In a study at Singapore on secondary school students, Khang et al (1987) posited that teachers should make use of every opportunity to train students to "think in mole or number of particles". In the US, Krishnan and Howe (1994) found the misconceptions and incomplete understanding of the mole concept among second year secondary education and first year university students. In Nigeria, Njoku (2003), Adesoji and Babatunde (2005) in their own work on the subject matter of mole concept, recommended creative approach and use of expressive teaching behavior to teach the concept respectively. A comparative study of teacher centered traditional method and conceptual change method carried out in Istanbull, Turkey, Uce (2009) advocated the use of the conceptual change method to teaching the concept. Other studies include Longo (2007) who suggested using a Socratic dialogue to teach mole concept to adult learners and Yalcinalp (1995) extolled Computer-Assisted Supplementary Instruction to facility teaching of the concept. Eniayeju (1990) however suggested that the mole concept be taught with all necessary practical activities. Given the key position mole concept occupy in chemistry and the universal difficulty it is posing to both teachers and students, the search for ways to simplifying the concept and enhance learners thorough grasp of it is imperative. This study is part of such effort. In this study the comparative approach to teaching the concept using the inquiry and lecture method are explored.

**Statement of the problem**

Strong proponents of the effective teaching of science argue that students should experience science as a process of extending understanding. This implies that how science is communicated from teacher to learner is important if the expected outcomes are to be achieved. Research findings show that children exposed to different levels and types of teaching methods perform differently (Ajewole, 1990, Otuka, 1991). Therefore, establishing an effective teaching method for any particular concept will enhance the desired learning outcome.

**Hypotheses**:

The following hypotheses are formulated in the null form.

HOI: There is no significant difference in performance between groups taught the mole concept using the lecture method and guided discovery method.

HOII: There is no significant gender difference in the performance of students taught mole concept using guided discovery or lecture method.

**Research Design**

The design for the study was a pre-test- posttest experimental design using intact groups (Van-Dalen, 1973, Morgan and Krejcie, 1970). After assigning the experimental and control groups a pre-test was administered. The groups were assigned by tossing a coin. The experimental group (H) was instructed using the guided-discovery teaching method while the control group (T) was instructed using the lecture method. The topic, mole concept was taught for one week to the two groups respectively. The pre and post tests for the two groups were the same. After one week of teaching the post-test was administered to both groups.

**Population, Sample and Sampling Technique**

Out of a population of one hundred and fifty-five students, one hundred and twenty-one students were sampled (Morgan and Krejcie, 1970) using stratified random sampling technique. This technique was adopted to ensure the sample is representative of the various level of ability of the students (Ali, 2006). The study involved two co-educational schools, randomly chosen from Zaria. The students mean age is 14 years and they are all SS1 students, since the mole concept is an SS1 curricular.

**Instrumentation**

The instrument for the study was a quantitative test items (QTI) drawn from mole concept. The quantitative question was chosen because it is capable of testing several abilities (Abdullahi 1982). The content of the pre and post-test are the same and the examination lasted for one hour. The test items were validated by experts in science education in the Faculty of Education, Ahmadu Bello University, Zaria. The purpose of validating the test items was to ensure that the instrument was capable of measuring what it was intended to measure. The reliability of the instrument ($r = 0.78$) was determined using Pearson Product Moment Correlation Coefficients Statistic. Sambo (2005) stated that reliability value from 0.55 is accepted for achievement test instrument. The researcher personally taught the mole concept and

administered the tests in the two schools. The teaching of the topic and administering the test items by the researcher could have removed any possible bias or difference arising from using different teachers. The scores of the test items provided the data for this research.

**Results and Analysis**

The t-test statistics was used to analyze the data at a significance level a =0.05 this level was used as the basis for acceptance or rejection of each hypothesis.

**Table 4.0 Pre-test performance of the group**

| | **N** | **Mean** | **Std.dev** | **t** | **a** | **df** |
|---|---|---|---|---|---|---|
| Experimental | 54 | 3.00 | 2.56 | 0.041 | 0.05 | 52 |
| Control | 67 | 2.96 | 2.23 | | | |
| | | | | $^{t}$critical 1.97 | | |

From the result obtained, there was no significant difference in the performance of the group. This implies that the students in both schools were equivalent with respect to their initial knowledge of mole concept.

**Hypothesis 1**

To test for hypothesis 1, scores from the post-test for the two schools were analyzed ( Table 4.1).

**Table 4.1. A t-test analysis to compare the performance of experimental and control groups in post-test.**

| | **N** | **Mean** | **Std.dev** | **$^{t}$ratio** | **a** | |
|---|---|---|---|---|---|---|
| Experimental | 54 | 11.19 | 8.78 | | | df=52 |
| | | | | 2.82 | 0.05 | |
| Control | 67 | 7.07 | 7.28 | | | |
| | | | | tcal. = 2.82<br>$^{t}$critical = $^{1}$.97 | | |

The result in table 4.1 shows that the students in the experimental groups taught with the guided discovery method ‘performed’ better than those in the control group. The t-statistics analysis shows that, at a = 0.05 significance level, there is significant difference between guided discovery and lecture methods of teaching mole concept.

**Hypothesis II**

To test hypothesis II, the post test scores of males and females in the experimental group were analyzed, the results are presented in table 4.2.

**Table 4.2: Comparison of post-test performance of males and females in the experimental group.**

| Gender | N | Mean | Std dev. | t | a | df= 52 |
|---|---|---|---|---|---|---|
| Male | 38 | 10.18 | 8.39 | | | |
| | | | | 1.297 | 0.05 | |
| Female | 16 | 13.56 | 9.57 | | | |
| Total | 54 | tcritical = 2.00 | | | | |

The mean scores obtained from the post-test for males and females in table 4.2 are 10.18 and 13.56 respectively. The value of $t_{cal}$. is 1.297 while the critical value of t is 2.00, it is not significant at a = 0.05 level. It shows that the performance of the students is not influenced by gender.

**Discussion:**

The result of the pre-test in Table 4.0 shows that the students were at the same level in knowledge before the treatment was administered. This means that no group had prior advantage in terms of knowledge of mole concept before they were treated to the two methods of teaching. It shows that the two groups for the treatment were drawn from the same population. The posttest result in Table 4.1 shows that significant difference exists in the performances of the experimental group and control group. The experimental group, taught by the guided discovery method was observed to perform better than the control group who was taught by the lecture method. From the result of the pre-test treatment coupled with the fact that the researcher personally taught the students in the two groups suggest that the observed difference in performance of the two groups could be due to the method of teaching. The activities employed in the guided discovery could have helped the students gained better understanding of the lesson. This result shows that the guided discovery method might be a better tool for teaching mole concept. This finding agrees with Eniayeju (1990) who suggested that the mole concept be taught with all necessary practical activities, guided discovery method provides a means for the needed activities. In a related work Adesoji and Babatunde (2005) reported that students exposed to expressive teaching behavior performed better than their counterparts exposed to conventional teaching behavior. The greater involvement /interaction

(students-students, students-teacher) provided for by the guided- discovery teaching method will to a great extent help students employ processes of science, construct meaning and link current information with already existing one. The method is very useful in enhancing the understanding of mole concept. A method that fosters conducive class room environment and positive class room interaction and participation is known to enhance achievement in chemistry (Babalola, 2002; Smith, 1995).

The t-test analysis of the result obtained in table 4.2 ($t_{cal}$ = 1.297, $t_{critical}$ = 2.00) showed no significant difference in achievement between the male and female exposed to guided discovery method of teaching. This finding agrees with Adesoji and Babatunde (2005), Inyang and Jegede (1991), Shaw and Doan (1990) and Balogun (1994) who asserted that gender had no effect on students' achievement in science. The observed lack of significant difference in achievement between males and females exposed to guided-discovery method of teaching mole concepts shows that given equal opportunities higher attainment in mole concept is not gender bias, provided both gender possess equivalent subsume upon which higher learning should build. The result from this study implies that guided-discovery approach to teaching can promote meaningful grasp of mole concept to both male and female students.

**Conclusion and recommendation**

This paper has presented and discussed the results of the comparative study of lecture and guided discovery methods in teaching mole concept. From the finding it can be concluded that the use of guided inquiry greatly helped in improving the quality of instruction as demonstrated in higher achievement in the experimental group. The method too did not promote gender difference in achievement. Therefore, the use of this method is recommended for teaching mole concept to secondary school students. For teachers to be effective in using this method it is recommended that they are trained and retrained in designing/administering inquiry based learning activities so that mole concept can be taught with a lot of activities. Further similar studies should be replicated on a wider scale to compare finding.

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# VOCATIONAL -TECHNICAL EDUCATION AND ENTREPRENEURSHIP PROGRAMME IN NIGERIA

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***ABSTRACT***

*To train Nigerians with identified entrepreneurial skills and in particular students in Vocational-Technical Education (VTE) courses. This can be done by including foundation business courses in the VTE curricula. Graduate would go into business more profitably than is currently practice. Poverty will be reduced and employment opportunities increase. This paper shows how Vocational-Technical Education (VTE) prepares a man ahead for a leaving after words.*

## Introduction

Vocational education can be described to be a form of education meant to provide man with the necessary skills in his chosen carrier, whilst Technical Education refers to an after school trainings which exposes man to the practical aspect of his chosen carrier/job. However, Vocational and Technical Education (VTE) can be defined as the preparation of a man well ahead in the practical aspects/areas of his chosen profession.

Vocational and Technical Education (VTE) is that form of education emphasizing the development of occupational skills, need in preparation for a profession. Okoro (1993), in his own opinion, viewed Vocational and Technical Education (VTE) as the kind of education that provides the necessary skills, knowledge and attitude essential for effectiveness in specific occupations. While Uwameiye (1998) regards Vocational and Technical Education (VTE) as a medium of providing youths with employment in industries, commerce and other enterprises by exposing them to experiences that provide the manipulative, cognitive and attitudinal skills that makes them qualify for a job or career.

A more sustainable approach would be train Nigerians with identified entrepreneurial skills and in

particular, students and trainees in science, science related and technology courses because the disciplines have natural business potentials. This can be done by including foundation business courses in the science and technology curricula. Well educated and properly motivated graduate would go into private business or run public business organizations more profitably that currently the practice. In both cases, poverty will be reduced as employment opportunity increase while more goods and services are also produced to improve the supply side of economy.

**The VTE Idea**

The Vocational and Technical Education (VTE) as an instrument of experiences for man to improve, nevertheless, develops man's natural gift of skills in a specialized profession. Thus Vocational and Technical Education (VTE) was developed to an extent that there is no area in Nigeria today wherein Craftsmen and Artisans are not indispensably sought after. Most especially when the whole essence of Education is not only to liberate but also to equip its recipients with the needed skills to prepare him/her to become useful elements within the society. Therefore, Vocational and Technical Education (VTE) is no doubt a very vital factor in any nation, especially the Nigeria of today.

**Entrepreneurship Education**

According to Oranu (1998), a universally accepted objective of education is that of self-reliance. The National Policy on Education (FRN, 1981) also emphasizes this. Business education can best do this. Business education in the opinion of Nannasy (1978) in Esene (1997) is that aspect of education which provides the knowledge, skills, understanding and attitudes which learners require for effective performance in the business world.

Entrepreneurship education as an aspect of business education involves the identification of persons with entrepreneurial skills and developing such in them. Entrepreneurs have special characteristics, including innovativeness (Amaewhule and Eni, 1994), risk taking (Paul, Sculokis, J. C. & Levistky, J. 1989) and the profit drive (Encyclopedia Americana, 1995). Such persons can be identified at the various strata of the society and developed accordingly.

There is an urgent need therefore, to reform the curricula in Nigeria towards making graduates of schools and colleges to be self-reliant. This is more pressing in the case of scientists, technologists and engineers because apart from the fact that their disciplines are most adaptable to business development, Nigeria depends to a large extent on scientists, technologists and engineers for proper

participation in the 21st century.

The present dwindling economic situation in Nigeria and the resultant measure of unemployment have emphasized the need for every Nigerian to be self-reliant through self-employment. This calls for entrepreneurship education as its major aim as to encourage and train university, polytechnic and secondary school graduates to take up self-employment. Motivation is also central to entrepreneurship. Shaperso (1975) observed that the characteristics common to entrepreneurship include: the desire to create a new business, the freedom to determine one's own destiny, the need for independence and the willingness to meet challenges.

It is against this background that this paper reappraises the nature of education and makes a case for entrepreneurial education in our curriculum.

What is Entrepreneurship?

In economics, all human resources involved in paid employment for the production of goods and services, are generally referred to as "labour". There is however, a form of human input which because of its special significance ranks differently and in superiority to labours. This is entrepreneurial ability found in an entrepreneur usually with the following characteristics.

1. The entrepreneurs take the initiative in combining the resources of land, capital and labour in the production of goods or services.
2. The entrepreneur has the choice of making basic business policy decisions, that is, those - routine decisions which is the course for a business enterprise.
3. The entrepreneur is obviously a risk bearer. The reward for his or her time, efforts, and abilities may be attractive profits, or loss and eventual bankruptcy. In short, the entrepreneur risk not only time, effort and business reputation but his invested funds and those of his associate or stockholders.

Nwaokolo (1977) defined entrepreneurship as the ability to set up a business enterprise as different from being employed. This should be acquired and should differ in some respects from the abilities acquired to enable a person obtain paid employment. It involves the acquisition of skills, ideas and managerial abilities necessary for personal self-reliance. Self-reliance on an individual relates to what Ikoki on Odozi (1991) opined as the "right and ability to set one's own goals realizing them as much as possible through one's efforts, using one's factors".

**The Nature of Entrepreneurship Education in Vocational-Technical Education**

Vocational-Technical education is that vocational aspect of education that deals with the knowledge, skills competencies and aptitude that fits one wholly and entirely for work or business. A good Vocational-Technical education program should aim at the following -

1. Training present and prospect students for proficiency in a specific occupation.
2. Making students to acquire special skills that can make them to be self - reliant.

In every program of vocational-technical education, especially at the post-primary and post-secondary levels, a three credit course which may be titled "Entrepreneurship", should be introduced and made compulsory for all vocational-technical education students. This course, which may run for one semester during the second year of an NCE Program, or the final year of an OND Program, or the final year of a degree programme

The following are important for entrepreneurship education in vocational-technical education to be successful.

1. Introduction of entrepreneurship education at various levels of education. Students in secondary schools, colleges of education, polytechnic and universities should be given opportunities for educating and training for self-employment. At the primary level the concept of owning and operating a small business should be introduced in career education programmes. This paper recommends a three credit unit load on "entrepreneurship" in all our school system.
2. Need for qualified educationist and instructors: These have to be reflected in both pre-service and in service training programmes of the teachers. Since people cannot teach what they do not know, these educators require in service training in entrepreneurial knowledge, skills and attitudes to make their trading more effective and efficient.
3. Provision of resource materials development and utilization. It has become exceedingly clear that the nation is not now in a position to build laboratories in all secondary schools and equip them with relevant machines. But the effective implementation of entrepreneurship education programmes calls for development and effective utilisation of necessary instructional materials, including text books. It is, therefore, necessary for text books and relevant instructional materials for effective instruction in entrepreneurship education within the vocational-technical education program.

   The establishment of vocational centres in Nigeria as a way of solving the problem of lack of vocational workshops and machines. This means that within a geographical area,

say a local government area, a properly equipped area vocational centre should be established to serve different secondary schools located in that area. Whenever this idea is being implemented, there may be transport implications but usually the local government authority acquires a bus or two for the purpose of moving the students on rotational and school basis to the vocational centres.

4. Employing successful small business entrepreneurs. Local successful small business owners can be employed to help teach students on how to start and succeed in business. Various methods to capitalize on the practical business experiences of these individual and on pedagogic strengths of the educators must be developed. It is also necessary to develop ways of working with other agencies, institutions and organizations which are attempting to provide training and assistance to small business, such as the National Directorate of Employment.
5. Ensuring that students participate in industrial work experience scheme. It is important that colleges should take the issue of Students Industrial Work Experience Scheme (SIWES) seriously. Colleges should ensure that students participate and are adequately supervised. Colleges should work closely with the industries and the Industrial Training Fund (ITF) to ensure that students are posted to establishments where they can sufficiently be exposed to the necessary skills in real work situation prior to graduation.
6. Adequate funding of the entrepreneurship education: Central to these issues of enhancing entrepreneurship education in business education programmes is adequate funding. Since business education is capital - intensive, a deliberate intervention policy must be made into funding vocational-technical education programmes. One would except that a reasonable sum is allocated by the government annually to business education. When operational, the Education Tax Fund must also spend a good proportion of its earnings on technological education of which business education is a subset, since it is rightly believed that technological development is crucial for the survival and development of the nation.

**Culture of Good Entrepreneurship Programme**

A culture of good entrepreneurship for sustainable poverty alleviation is very essential and can only be achieved if the following are properly addressed by the management/business education economic planner's policy makers.

- Education - tertiary institutions, professional bodies and other agencies responsible should help in the development of entrepreneurship in Nigeria. Emphasis should not only be on education for business, but also about business. The post-primary schools should be encouraged in this direction too.
- The National Directorate of Employment (NDE), Federal and States' agencies for poverty alleviation should seek the assistance of business educators to inculcate a culture of good entrepreneurship in the beneficiaries of their facilities.
- Management and business education should de-emphasis those western world's theories that are found not very relevant to our situation and bring to focus those that are very relevant to our peculiar situation.
- Private initiative - government should also as a way of promoting culture of good entrepreneurship, promote private initiative thereby enhancing the efficient working of the market forces.
- Provision of adequate infrastructural facilities will greatly enhance the development of a culture of good entrepreneurship, thereby assisting in the eradicating of the syndromes of poverty.

**Summary and Conclusion**

A more sustained approach would be to make citizens to be self - reliance after a formal education, which grooms an individual into putting the skills acquired in earning a living. One way of achieving this is through entrepreneurial education which is an aspect of business education. Such is recommended for scientists, technologies and engineers because their disciplines more easily lend themselves to business development. Through VTE poverty will be reduced in the country, as it prepares man ahead regarding the future survival.

It is the suggestion of this paper that for our students to benefit from the educational system, the following are important:

b. The curriculum should be diversified so as to cater for differences in talents and to anticipate the variety of opportunities open to the students after completing the course.

c. The curriculum should be designed to equip the students to live effectively in this modern age of science and technology.

The objectives of this paper are therefore to:

a. Show how the curriculum could be designed to make students self-employed after graduation.
b. Show how entrepreneurship education in business can help to solve the problem of unemployment in our country.
c. Show the nature of entrepreneurship education in business education.
d. Show strategies for enhancing entrepreneurship education in business education.

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