ASSESSMENT OF PUPILS' PERFORMANCE IN MATHEMATICS AS A FOUNDATION SUBJECT FOR QUALITY AGRICULTURAL SCIENCE EDUCATION IN NIGER STATE, NIGERIA

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Abstract

In our match towards Agricultural Science Education in Nigeria, we need nothing short of good performance in Mathematics at primary school level. This study was conducted to assess and compare primary six pupils performance in Mathematics subject at Model Primary School and Zango Primary School, Kontagora in Kontagora Local Government Area of Niger State using regression analysis with Pearson's moment Correlation Coefficient to analyze the scores data. Questionnaires were also administered to the students in the Department of Agricultural Science Education, Niger State College of Education, Minna to collect more information on the importance of Mathematics as a foundation subject in their curriculum. The analysis of variance (ANOVA) obtained showed that there was significant difference in the performance of pupils in Mathematics between the two Primary Schools (P < 0.05). The overall average score obtained at Model Primary School was 39.20% while that of Zango Primary School was 25.73%. The scores were considered to be generally below the threshold average score of 50% recommended by the Ministry of Education. The results of Pearson's moment Correlation Coefficient (R) and R^2 obtained were 0.831 and 0.916 indicating that there is relationship between the performances of pupils in both primary schools, but the relationship is not a perfect one. The results of the sampled opinions from the students in 100, 200 and 300 Levels in the Department also revealed that 48%, 50% and 90% of the students population in the three levels of the Department agreed that Mathematics is a foundation subject in Agricultural Science education. On the basis of these findings, it was recommended that Mathematics subject should be given adequate attention at Primary School level in order to enhance the quality of Agricultural Education in tertiary institutions. This will help bring about the most desired improved agricultural production and sustainable development in the country.

Keywords: Agricultural science education, Mathematics, Performance, Foundation, Production

Introduction

Mathematics subject is a veritable tool in the teaching and learning of Agricultural Science Education all over the world. It is the science of reasoning and computations. In Nigeria, as it is in the rest part of the world, Mathematics is one of the most important subjects in the curriculum. James (2009) reported that Mathematics is the science of numbers, quantities and measurement and it is the backbone of most subjects at all levels of educational systems. It is a subject that has direct relationship with other subjects, particularly science and technology.

According to Sa'ad, Adamu & Sadiq (2014), it is a subject that cuts across primary and secondary school as a compulsory subject. The significance of Mathematics cuts across many human endeavours not only in science and technology but also in arts related careers

because specialists in one way or the other need to have some level of numeracy skill for application in their chosen fields of profession whenever the need arises. This notion perhaps explains the reason why Mathematics has been described as a language that helps us to describe ideas and relationships drawn from the environment (Kitta, 2004). Mathematics enables one to make the invisible to be visible, thereby proffering solutions to problems that would be otherwise impossible to solve.

In Nigeria, learning of Mathematics begins from primary school level of education as this is where the foundation is laid. Reys, Lindquist, Lambdin and Smith (2009) stated that Mathematics demand for students increases as they progress through schools from primary to the tertiary levels of education, and in order to function in a mathematically literate manner, students must have a strong foundation in the subject. This is because a strong foundation in Mathematics will help to improve the performance of students in agricultural science education which invariably will enhance socio-economic and technological development of the country. Tshabalala and Ncube (2013) were of the view that Mathematics is the bedrock and indispensable tool for scientific, technological and economic advancement of any nation. Davies, Hersh and Marchisotto (2012) added that Mathematics could be seen as an important subject not only from the point of view of acquiring academic qualifications at school or college, but also is a subject that prepares the students for the future as well as the life career they may choose to do.

Ontario Ministry of Education report (2004) stated that all pupils and students should be made to understand, make sense of and apply Mathematics in their academic careers; make connections between concepts and see patterns throughout the subject. Umameh (2011) also added that Mathematics is intimately connected to daily life and everybody's life-long planning. Mefor (2011) summarized it all by stating that Mathematics relates to everything in the world from the smallest to the largest. Therefore, Mathematics is a subject that education and human life cannot function effectively without.

In Nigeria education curriculum, Mathematics is a core subject that every student must study at both primary and secondary school levels before proceeding to tertiary institutions. In relation to that, the Federal Republic of Nigeria (FRN, 2013) reported in the National Policy on education that Mathematics is one of the compulsory subjects that must be passed at credit level by students before getting admission into any tertiary institution in the country. However, Iheanachor (2007) stated that there is a significant positive relationship between pupils' academic performance in Mathematics and teachers' background. Teachers who have good teaching qualifications in Mathematics have their pupils' performing better in Mathematics. Contrary to this, Sa'ad, Adamu and Sadiq (2014) and Ojimba (2012) reported that pupils' negative attitude towards Mathematics, fear of Mathematics, inadequate qualified teachers and inadequate teaching materials are some of the causes of poor academic performance in Mathematics. Developing positive behaviour, motivation and proper guidance towards Mathematics and provision of relevant learning and teaching materials could make students perform better in Mathematics.

The assessment of pupils' performance in Mathematics is crucial to both the learners and teachers as it is a measure of pupils' understanding in the subject and provides necessary data and information for performance evaluation. Assessment is defined as "a general term which includes pupils' knowledge, ability, understanding, attitudes and motivation towards a subject." Assessment is therefore concerned with pupils' learning or performance, and thus provides one type of information that might be used in evaluation process (Cameron, 2001; Awofala, 2012).

Applications of Mathematics in Agricultural Science Education
Mathematics in Agriculture encompasses all forms of measurements in the farm, farm forecasts, farm accounts and record keeping and all forms of business that have to do with farm products. Also in agricultural education field experimentation is another core area where Mathematics is applied. Adedayo (1999) stated that field experimentation is a systematic and logical process of comparing two or more factors on the field to identify the best in certain characteristics. It is therefore worthy to note that Mathematics is a veritable tool in the field of agriculture.

Generally, Mathematics can be applied in agricultural science education in such important areas as animal science, agricultural meteorology, soil science, crop production, agricultural research experiments, agricultural marketing, farm management, agricultural economics, farm surveying, agricultural engineering and technology, agricultural financing, farm planning, fish farming, livestock and poultry farming and agricultural extension services (Adah, Enemali, Adejoh & Edoka, 2015).

Inspite of being the core and compulsory subject and with all the importance attached to Mathematics in Nigeria's education system, students' performance in Mathematics in the country is still very poor (Sa'ad, Adamu & Sadiq, 2014; Umameh, 2011). This poor performance is one of the major reasons for decline in science and technology especially in the study of agricultural science, which is a requisite for food sufficiency in the country. Consequent upon this is the inability of the students to excel in the study of Agricultural Science education leading to the prevalence of food insecurity, thereby hindering the attainment of food sustainable development in Nigeria. Although the Federal Republic of Nigeria (2007) in the National Policy on Education (NPE) placed emphasis on ratio 60:40 in favour of science related courses in the area of getting admission into higher institutions, the students' poor performance in Mathematics has remained the bottle-neck in the realization of this laudable objective as stated in the NPE.

Despite the poor performance of pupils in Mathematics, there is still room for improvement in the subject. Many suggestions have been forwarded by teachers, students and organizations like Science Teachers Association of Nigeria (STAN) and National Mathematical Centre (NMC) on how to improve pupil performance in Mathematics. Among the ways to improve performance in Mathematics and science subjects identified by Osuafor (2008) are that government should recognize the importance of mathematics in science and technology and in other areas of human knowledge and activities; government should also provide all the needful for effective teaching and learning in terms of funding, staffing, training and retraining of teaching staff, attendance of seminars and conferences, motivations as well as general provision of enabling environment.

Statement of the Problem
Mathematics is the bedrock of all sciences. Adah et al (2015), Sa'ad, Adamu and Sadiq (2014) and Umameh (2011) reported that over the years the performance of pupils in the subject is getting lower which is affecting their performance in agricultural science and there is the need for improvement. No serious effort is made to solve this problem by all concerned authorities. This is not only affecting future performance of the pupils and students in the study of Agricultural Science Education but also leading to food insecurity and attainment of sustainable development goal in the country as some key fields in modern agriculture require high skill of numeracy.

Aim and Objective of the Study
The aim of the study is to verify the performance of pupils in Mathematics subject in the public primary school in Niger State and its importance in the field of Agricultural Science. The research is to find out reasons for low performance of pupils in Mathematics if observed, suggest solutions for improvement and to determine the significance of Mathematics in the Agricultural Science Education career in College of Education.

From the foregoing, it is evident that most research attention has been on the performance of students in Mathematics in post-primary schools and its impact on science and technology with little or no attention on the performance of primary school pupils in Mathematics where a solid should be laid for secondary and tertiary levels of education. For government to achieve the desired advancement in science and technology in the country adequate attention must be paid towards improving Mathematical skills of the pupils in the primary schools. Government must also introduce the slogan "catch them young for mathematics" at elementary level of education in the country. It is the aspect of primary school pupils' performance in Mathematics that this study seeks to address. This paper therefore focused on the assessment of pupils' performance in Mathematics as a foundation subject for quality agricultural science education in Niger State, Nigeria. The objectives of the study were to assess the performance of primary six pupils in Mathematics and to determine the relevance of Mathematics as a foundation subject in agricultural science education in tertiary institutions.

Research Questions
The following research questions were raised to guide the study:
(i)   Does Mathematics affect the student performance in the study of Agricultural Science Education?
(ii)   Does this low performance in the study of Agricultural Science Education affect agricultural production, food security and sustainable development in Nigeria?

Research Hypotheses
The following hypotheses were tested at 0.05 level of significance:
Ho_1:   Mathematics does not have significant effect on the performance of agricultural science education students.
Ho_2:   Mathematics has significant effect on the performance of agricultural science
`   education students.

Methodology

Area of the Study
The study was conducted at Model Primary School and Zango Primary School. The two primary schools are located in Kontagora town in Kontagora Local Government Area of Niger State. The study also covered the Department of Agricultural Science Education, Niger State College of Education, Minna.

Population and Sample
The target populations for the study consisted of 120 primary six pupils in the two selected primary schools in Kontagora town and 486 students in the Department of Agricultural Science Education, Niger State College of Education. For the two primary schools, the sample was made up of 60 pupils with 30 pupils representing each of the schools. The pupils were randomly selected as representative sample for the entire primary six pupils' population. The primary six pupils' populations in the two Primary Schools were tabulated in Table 1a and 1b.

Table 1(a): Primary six pupils population in Model and Zango primary schools

Class	Model Primary School	Zango Primary School
Primary 6A	30	28
Primary 6B	30	32
Total	60	60

Source: Muhammad, Isah and Oladipo (2017)

In Niger State College of Education, the sample drawn was made up of 150 students out of which 50 students represented each of the selected levels of the Department. The student populations in the three levels of agricultural science education department were tabulated below.

Table 1(b): Students population in the Department of Agricultural Science Education

Departmental Level	Students Population
100L	201
200L	135
300L	150
Total	486

Source: Muhammad, Isah and Oladipo (2017)

The representative pupils' performance records were randomly sampled from the populations. The basis for adopting random sampling technique was to avoid introducing bias in the exercise. The choice of the schools used was to assess the performance of pupils in Mathematics in the public institutions in part of the state.

Data Sampling
The relevant data on primary six pupils' performance in Mathematics was collected using purposive sampling method in which the performance scores of the pupils were collected from the school academic records. Also relevant data and information were collected using questionnaire from the students of different levels in Agricultural Science education Department in Niger State College of Education, Minna. It was based on 5-point responses which included:
(1)   Yes, Mathematics is a foundation subject
(2)   No, Mathematics is not a foundation subject
(3)   May be required
(4)   Not necessary
(5)   Not sure
The questionnaire was administered to the students and respondents were asked to tick (√) only one option.

Data Analysis
For primary six pupils' performance in Mathematics, simple regression analysis with Pearson's moment Correlation Coefficient determination was used to analyze the data. The data was analyzed with the use of Statistical Package for Social Sciences (SPSS) version 19 computer soft ware while simple percentage was used to analyze the data and information from respondents on the relevance of Mathematics as a foundation subject for agricultural science education course in College of Education.

Results
The percentage scores of the pupils' performance in Mathematics are shown in Table 2. From the findings, the performance of pupils in Mathematics was not the same in the two primary schools. The total and average percentage scores in Model Primary School were 1,176 and 39.20% while those of Zango Primary School were 772 and 25.73%. Although pupils' performance in Mathematics in Model Primary School was better than the performance of pupils in Zango Primary School, the performance was not satisfactory because the performance was below average threshold percentage score of 50% in the National Policy on Education of the Federal Republic of Nigeria (2013). However, the pupils' performance in the subject was better in Model Primary School.

The Analysis of Variance (ANOVA) presented in Table 3 and the result of regression and Correlation Coefficient in Table 4 revealed that the difference between the performances of the pupils in Mathematics in the two schools was significant, although the average scores obtained were below the threshold average score of 50% recommended in the Nigeria education curriculum. The Correlation Coefficient (R) and R^2 values of 0.813 and 0.916 obtained also showed that there was relationship in the performance of pupils in the subject between the two schools, but the relationship was not a perfect one. The regression model established for the study was $Y = -7.98 + 0.86X + \varepsilon$
in which Y = dependent variable representing performance

        -7.98 = Y-intercept
        0.86 = regression coefficient representing slope
        X = independent variable representing percent score in Mathematics by pupils
        ε = error term

Table 2: Percent scores of primary six pupils' performance in Mathematics subject in Model and Zango primary schools, Kontagora

Pupil	Model Primary School (% Score)	Zango Primary School (% Score)
1	50	48
2	41	24
3	33	21
4	71	50
5	20	11
6	35	33
7	20	6
8	40	27
9	60	49
10	36	30
11	31	28
12	55	46
13	45	29
14	40	25
15	34	16
16	42	22
17	29	3
18	58	14
19	38	22
20	21	10
21	47	15
22	41	32
23	49	40
24	46	35
25	58	45
26	17	15
27	10	2
28	65	60
29	18	5
30	26	9
	1,176	**772**

Source: Muhammad, Isah & Oladipo (2017)

Table 3: Analysis of Variance (ANOVA) of the Pupils' performance in Mathematics subject

Model (Sources of Variation)	df	Sum of Squares	Mean Sum of Squares	F-value	p-value
Regression	1	24,144.42	24,144.42	304.62[**]	0.00
Residual	28	2,219.38	79.26		
Total	29	26,363.80			

** = Highly significant   (P < 0.05)
Source: Muhammad, Isah & Oladipo (2017)

Table 4: Result of regression and Pearson's moment correlation coefficient analysis of pupils' performance in Mathematics

Regression Model	F-Value	P-Value	R^2	Adjusted R^2	R	Standard Error of the Estimate
Y = -7.98 + 0. 86X	304.62**	0.00	0.916	0.913	0.831	8.903

Source: Muhammad, Isah and Oladipo (2017)

Table 5 (a): Result of Respondents of 100 Level students of Agricultural Science Education Department

S/No.	Sampled opinion parameters	Number of respondents	Average Scores of respondents (%)
1	Yes, Mathematics is a foundation subject	24	48
2	No, Mathematics is not a foundation subject	13	26
3	May be required	4	8
4	Not necessary	5	10
5	Not sure	4	8

Source: Muhammad, Isah and Oladipo (2017)

At 100 Level, 48% of the respondents agreed that Mathematics is a requisite and foundation subject in their Agricultural Science Education curriculum.

Table 5 (b): Result of Respondents of 200 Level of Agricultural Science Education Department

S/No.	Sampled opinion parameters	Number of respondents	Average Scores of respondents (%)
1	Yes, Mathematics is a foundation subject	25	50
2	No, Mathematics is not a foundation subject	5	10
3	May be required	10	20
4	Not necessary	8	16
5	Not sure	2	4

Source: Muhammad, Isah & Oladipo (2017)

The result in Table 5(b) shows that 50% of the respondents in 300 Level of the Department agreed that Mathematics is a foundation subject and it is required in Agricultural Science.

Table 5 (c): Result of Respondents of 300 Level students of Agricultural Science Education Department

S/No.	Sampled opinion parameters	Number of respondents	Average Scores of respondents (%)
1	Yes, Mathematics is a foundation subject	45	90
2	No, Mathematics is not a foundation subject	0	0
3	May be required	3	6
4	Not necessary	0	0
5	Not sure	2	4

Source: Muhammad, Isah & Oladipo (2017)

The result in Table 5 (c) indicates that 90% of the respondents in 300 Level of the Department accepted that Mathematics is a key foundation subject for a better performance in Agricultural Science Education.

The results of students sampled opinions on the relevance of Mathematics in Agricultural Science Education Department obtained from the administered student questionnaire showed that only 48%, 50% and 90% of the student populations in the three levels of the department agreed that Mathematics is the foundation and bedrock for a good performance in their chosen field of learning. The results of respondents in Tables 5 (a), 5 (b) and 5 (c) above further showed that for students in the Department of Agricultural Science Education to be able to make a better performance in their chosen field of studies, they must have a good background in Mathematics subject.

Conclusion

The regression model obtained in this study was Y = -7.98 + 0. 86X which indicated an imbalance and a poor performance in Mathematics by the pupils in the two primary schools. The model further showed that although there was relationship in the pupils' performance in mathematics subject, the relationship was not a perfect relationship. The performance of most of the pupils was also below the average threshold performance score of 50% recommended in the Nigeria education curriculum. Mathematics subject at primary school level of education must therefore be given a priority attention by the government to improve the standard. The results also showed that in agricultural science education studies Mathematics subject is important and is the bedrock for a better performance in this field of endeavour.

Recommendations

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

(i)   Priority attention should be given to all aspects of teaching and learning of Mathematics subject in primary school.

(ii)   Government's intervention in raising the performance of pupils in Mathematics is important and should include employment of qualified Mathematics teachers in primary schools, provision of Mathematics teaching and learning materials and organization of Mathematics competitions amongst primary schools in the state.

(iii) Incentives should be created for any outstanding pupil's performance in Mathematics; this may be in the form of scholarships and prizes. Such incentives will encourage the pupils to develop more interest in the learning of Mathematics in primary school and consequently increase their performance.

(iv)   This therefore suggests that for Nigeria to attain a sustainable development in agricultural science education, a solid foundation must be laid by the government for Mathematics   subject at primary school level.

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