

EFFECT OF FURTHER MATHEMATICS CURRICULUM ON STUDENTS' PERFORMANCE IN SCIENCE-BASED SUBJECTS IN SENIOR SECONDARY CERTIFICATE EXAMINATION IN IKERE LOCAL GOVERNMENT, EKITI, NIGERIA

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Abstract

This study examined the effect of further mathematics curriculum on students' performance in science-based subjects in senior secondary certificate examination in Ikere Local Government. The study adopted ex-post-facto research design which involves collection of information from records off our selected secondary school in the study area using stratified random sampling technique. An Inventory was used for data collection and analyzed using descriptive statistics (mean and standard deviation) and inferential statistics (t-test and correlation) at 0.05 level of significance. The result showed that there was significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics, there was also a significant difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics and there was positive and significant relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects. The authors recommend that Mathematics teachers should be encouraged to teach further mathematics in the school in order to develop students' scientific skills right from secondary schools, Further Mathematics, if possible, should be made compulsory for both science and commercial students in secondary schools as majority of them will still take up a related course in further mathematics when they get to tertiary institution, government should provide enable facilities and environment that can assist teachers to teach further mathematics with ease. Facilities such as relevant textbooks, instructional materials and so on and science teachers should incorporate the knowledge of further mathematics in their teaching to compliment students' knowledge. The School authorities should invite or employ specialist for the teaching of Further Mathematics where they are not available.

Key words: Further mathematics, curriculum, Pearson product-moment correlation, ex-post-facto research design

Introduction

Mathematics is described as the queen and servant of all school subjects, since it cuts across the school curricula (Fajemidagba 2006 and Akpan, 2007). It is seen as the language used to describe the problems arising in most branches of science and technology. It is a subject that is related to other school subjects in areas like number and numeration, variation graphs, functions, logarithms and indices, algebraic process, solution of equation and also in area and volume.

Further Mathematics is a highly respected subject and is recognized for its challenging content. It is particularly popular with and provides an essential base for students wishing to continue advanced and undergraduate study in Mathematics, Science, Engineering, Economics, Business and Computer related fields. Further mathematics is relatively a new curriculum in Nigerian Educational System. Its introduction into the school curriculum was one of the recommendations of a national workshop on policies and strategies for the improvement of the teaching and learning mathematics at all levels organized by the National Mathematics Centre (NMC) Odili and Vincent, (2011). Further Mathematics affords Senior Secondary School students opportunity to be introduced to some topics in Advanced Level mathematics in order to prepare them to study mathematics or mathematics related courses in their next level of education. While all students offer mathematics, only few science students normally offer Further Mathematics. The reason for this is not farfetched.

Further Mathematics Curriculum (FMC) evaluation has two related concepts: Curriculum and Evaluation. In Maduewesi (1987), curriculum is defined as “the sum total of what the students learn at school and what the teachers do at school from the day the students are admitted to when they leave”. Beauchamp (1972) defines curriculum as a document designed to be used as point of departure for instructional planning. Thus FMC is a curriculum document, published complete with a philosophy, a set of goals, some selected mathematics contents, some pedagogical specifications and, some necessary evaluation prescriptive suggestions for its interpretation. According to Ibrahim (2004), the Further Mathematics Curriculum contains all the topics in the senior secondary general mathematics curriculum plus topics in Further Mathematics, which include pure mathematics, Mechanics and Statistics.

The trend of poor academic performance in Mathematics has created a shortfall in the number of qualified candidates required to fill the quota for mathematics and mathematics-

oriented courses in our universities, (Kabir 2005), as the low level of mathematics achievement has become an issue of great concern, and the necessity of investigating possible causes becomes more urgent. This study therefore sought to look into impact evaluation of Further Mathematics curriculum in Ikere-Ekiti Local Government Area of Ekiti state, Nigeria.

Problem of Study

Aremu (2003) stresses that academic failure is not only frustrating to the students and the parents, its effects are equally grave on the society in terms of students' loss of interest in anything that involves calculations. The benefits embedded in learning further mathematics cannot be over-emphasized. The question therefore is does further mathematics have impact on the performance of students in mathematics, Biology, and Chemistry?

Purpose of study

The purpose of this study is to investigate the impact evaluation of Further Mathematics curriculum in Ikere-Ekiti Local Government Area of Ekiti state, Nigeria. Specifically, the study was designed to find out:

1. Whether there would be difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics.
2. If there exists difference between further mathematics and Non-Further Mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics.
3. Whether there is any relationship in performance achievement between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects?

Research Questions

This study attempted to answer the following research questions:

1. Is there any significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics?
2. Is there any significant difference between further mathematics and Non-Further Mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics?

3. What is the relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects?

Research Hypotheses

On the basis of the research questions, the following null hypotheses were formulated and tested.

H₀₁: There no difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics.

H₀₂: There is no difference between further mathematics and Non-Further Mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics.

H₀₃: There is no positive relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects.

Research Design

The research design for this study is ex-post facto design. This is because the researcher will not be able to manipulate the variables for the simple reason that they have already occurred. Also, the research is not intended to manipulate the independent variables (students' result).

Population of the Study

The study population comprised secondary school students in Ikere local government, Ekiti state. They were mathematics students in senior secondary class three (SS3) which were selected from both private and public secondary schools in Ikere Local Government Area of Ekiti.

Research Instrument

The instrument used in collecting data for this study was the results of the students from the four selected secondary schools.

Data Analysis

Data collected from the respondents were analyzed using t-test statistics to compare means of two groups. Pearson product-moment correlation was used to find relationships among the science subjects. The pattern of analysis is indicated below.

Results and Discussion

Descriptive Analysis

Question 1: Is there any difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics?

Table 1: Mean Scores of further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics

S/N	Items	Further Mathematics		Non-Further Mathematics	
		Mean	Standard Deviation	Mean	Standard Deviation
1.	Mathematics	73.60	9.50	52.25	7.72
2.	Biology	58.40	8.50	43.25	6.72
3.	Chemistry	53.50	8.11	43.33	6.74
4.	Physics	63.30	6.47	43.16	7.69
Grand Mean Score		62.2	8.15	45.5	7.22

The result presented in table 1 revealed the mean and standard deviation score of further mathematics and non-further mathematics students in core science subjects (Mathematics, Biology, Chemistry and Physics). The grand mean score of further mathematics students (62.2) in these subjects (Mathematics, Biology, Chemistry and Physics) is greater than the grand mean score of non-further mathematics students (45.5). This implies that there is difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics in favour of further mathematics students.

Question 2: Is there any difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics?

Table 2: Mean Scores of further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics

Items	Further Mathematics				Non-Further Mathematics			
	A1-B3	C4-C6	D7-F9	Mean	A1-B3	C4-C6	D7-F9	Mean
Mathematics	15	22	2	2.33	0	34	24	1.50
Biology	32	7	0	2.82	1	19	19	1.54
Chemistry	37	2	0	2.95	0	10	26	1.27
Physics	35	4	0	2.89	1	12	30	1.32

The result presented in Table 2 revealed that there is difference between Mathematics, Biology, Chemistry and Physics achievement of students taught further mathematics (2.33,

2.82, 2.95 and 2.89 respectively) and non-further mathematics (1.50, 1.54, 1.27 and 1.32 respectively). This implies that students overall achievement taught further mathematics is better than their counterparts in non-further mathematics.

Test of Hypotheses

H_{01} : There is no significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics?

Table 3: t-test Statistics for further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics

Variables	N	Mean	Standard Deviation	Df	t-cal	t-tab	Decision
Further Mathematics	39	62.2	8.15	98	6.39	1.96	Sig.
Non Further Mathematics	61	45.5	7.22				

$P < 0.05$

The result presented in table 3 revealed that t-calculated (6.39) was greater than t-table (1.96) at 0.05 level of significance. This led to the rejection of hypothesis one. Hence, there is significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics. The mean scores of further mathematics students (62.2) was greater than the mean score of non-further mathematics students (45.5). This implies that further mathematics students performed better than their counterparts in non-further mathematics group.

H_{02} : There is no significant difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics.

Table 4: t-test Statistics for further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics

Variables	N	Mean	Standard Deviation	Df	t-cal	t-tab	Decision
Further Mathematics	39	2.75	0.70	98	3.12	1.96	Sig.
Non Further Mathematics	61	1.41	0.68				

The result presented in table 3 revealed that t-calculated (3.12) is greater than t-table (1.96) at 0.05 level of significance. This led to the rejection of hypothesis two. Hence, there is significant difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics. The mean overall score of further mathematics students (2.75) was greater than the mean overall score of non-further mathematics students (1.41).

H_{03} : There is no positive relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects.

Table 5: Matrix Correlation Coefficients for Mathematics, Biology, Chemistry, Physics and Further Mathematics

Variables	Mathematics	Biology	Chemistry	Physics	Further Mathematics
Mathematics	1				
Biology	0.67	1			
Chemistry	0.69	0.71	1		
Physics	0.85	0.62	0.65	1	
Further Mathematics	0.92	0.78	0.67	0.95	1

The result presented in table 5 revealed that the relationship between students score in Mathematics & Biology (0.67), Mathematics & Chemistry (0.69), Mathematics & Physics (0.85), Biology & Chemistry (0.71), Biology and Physics (0.62), Biology & Further Mathematics (0.78), Chemistry & Physics (0.65), Chemistry & Further Mathematics (0.67) and Physics & Chemistry (0.95) were high and greater than 0.21 at 0.05 level of significant. This led to rejection of hypothesis three. Hence, there is positive and significant relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects.

Discussion of Results

The finding of the study revealed that there was significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics. Further mathematics students performed better than their counterparts in non-further mathematics group.

Another finding of the study revealed that there was significant difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics. Further mathematics prepares students in science oriented class for advance studies in science oriented programme. Menal (2008) considered further mathematics as an essential foundation for many other subjects areas as well as many occupation in life. Setidisho (2006) also stressed that mathematics is a fundamental science which is necessary for understanding of most other field as there was no other subject that forms a binding force among the various branches of science.

The study also revealed that there was positive and significant relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects. Aderounmu (2007), Aworanti (2007) and Kasali (2007) pointed that the performance of students in further mathematics usually facilitate students' performance in mathematics and other science subjects in secondary schools.

Summary

This study investigated the impact evaluation of further mathematics curriculum on secondary school students in Ikere Local Government. The study specifically examined the difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics, The difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics and the relationship in the performance achievement between each of

the subject and other science subjects. In view of these, three research questions were raised for the study which led to the development of three research hypotheses tested at 0.05 level of significance.

Several literatures were reviewed in the study. The areas reviewed include; emergence of further mathematics curriculum, relevance of further mathematics to senior secondary school curriculum in Nigeria, further mathematics teaching in Nigeria secondary schools, students' performance in other science subject (Physics, Chemistry and Biology), relevance of motivation theories to further mathematics teaching and learning.

This study adopted *ex-post-facto* research design which involves collection of information from records. The study comprises of all secondary school students in Ikere local government area of Ekiti state. Stratified random sampling technique was used to select 100 students from four selected schools. Inventory was used for data collection and analyzed using descriptive statistics (mean and standard deviation) t-test and correlation at 0.05 level of significance.

The result showed that there was significant difference between further mathematics and non-further mathematics students' achievement in Mathematics, Biology, Chemistry and Physics, there was significant difference between further mathematics and non-further mathematics students' overall achievement in Mathematics, Biology, Chemistry and Physics and there was positive and significant relationship between each of the subjects (Mathematics, Biology, Chemistry and Physics) and other science subjects.

Conclusion

Based on the findings of this study, it was concluded that the inclusion of further mathematics to secondary school curriculum is contributing to better academic achievement of students in other science subject in Ikere Local Government. This implies that students with good knowledge of further mathematics will perform excellently well in Physics, Chemistry, Biology and Chemistry.

Recommendations

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

1. Mathematics teachers should, therefore, be encouraged to teach further mathematics in the school in order to develop students' scientific skills right from secondary schools.

2. Education providers should provide enabling facilities and environment that can assist teachers to teach further mathematics with ease.
3. School authorities should invite or employ specialist for the teaching of Further Mathematics.

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