

## EVALUATION OF THE IMPLEMENTATION OF FURTHER MATHEMATICS CURRICULUM AT SENIOR SECONDARY SCHOOLS LEVELS

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### ABSTRACT

The study evaluated the implementation of further mathematics curriculum (fmc) in senior secondary schools in Abia State. Two research questions were posed for the study and two null hypotheses were tested at 0.05 level of significance. The study adopted the descriptive survey design. A sample of 200 comprising of 9 education supervisors, 20 further mathematics teachers and 171 students, adopted through purposive sampling technique, was used for the study. The instrument for data collection was a questionnaire titled "Evaluation of the Implementation of Further Mathematics Curriculum for Abia State Secondary Schools" (EIFMCAS), was constructed by the researchers. The instrument was face validated by three validates. Using the cronbach alpha method, the internal consistency of the questionnaire (EIFMCAS) was 0.84. The research questions were answered using the mean, while the null hypotheses were tested using the analysis of Variance (ANOVA). Results revealed that qualified and experienced teachers in the further mathematics area are not enough. The time allotted to teaching of further mathematics is insufficient. Many schools, lack both human and material resources for the effective implementation of FMC. Based on these findings, the study recommended that qualified further mathematic teachers should be employed to teach further mathematics, relevant stakeholders should provide adequate instructional materials and encourage potential science students to study further mathematics a secondary school level, since this will ensure easy transition to higher academic studies. Adequate instructional materials such as well equipped libraries, ICT equipments, computers, audio visual materials and laboratories should be made available in schools for effective implementation of Further Mathematics curriculum.

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**KEYWORDS:** Implementation, Further Mathematics Curriculum, Secondary Schools, Stakeholders, Academic Studies

### INTRODUCTION

Further Mathematics (FM) curriculum is a complete published document, with a philosophy, a set of goals and various selected mathematics contents, with specifications and necessary prescriptive suggestions for its interpretation and evaluation. The objectives of further mathematics were derived from the general goals of mathematics, which include; to assist students develop concepts and manipulative skills in mathematics so as to prepare them for further studies in mathematics and its application, (FMC, 2014). According to Odili and Vincent, (2011), the purpose of introducing further mathematics in secondary school level is to provide an essential base for students wishing to continue advanced and undergraduate study in Mathematics, Science, Engineering, Economics, Business and Computer related fields.

Further Mathematics was introduced into the Nigerian school curriculum after a critique workshop on mathematics curricular held at Onitsha, in 1981. According to Abbott, (2014), Curriculum is defined as the knowledge and skills students are expected to learn. Which includes the learning standards or learning objectives they are expected to meet; the units and lessons that teachers teach; the assignments and projects given to students; the books, materials, videos, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning. In 2005, a re-evaluation of the curriculum

content of further mathematics was carried out by the National Council for Curriculum Assessment (NCCA), to ascertain how well the objectives of further mathematics curriculum is being translated; since according to Umar, (2014), the objectives of curriculum evaluation include; to determine the outcome of a program; to help decide whether to accept or reject a program; to ascertain the need for revision of the course content and to help future development of the curriculum materials for continuous improvement. After the review, the National Council on education, mandated The Nigeria Educational Research and Development Council, (NERDC) to develop a curricular for use at all levels of the educational system in Nigeria to meet the targets of the National Economic Empowerment and Development Strategies (NEEDS) and the Millennium Development goals (MDGS). Between January 2007 and March 2008 a re-structured further mathematics curriculum was introduced. This curriculum represents the total experiences to which all learners must be exposed; which include the contents, performance objectives, activities of both teachers and learners, teaching and learning materials and evaluation guide, (NERDC, 2008). It's worthwhile to note that in spite of the restructuring, the objectives for which the further mathematics curriculum was introduced in 1985 remains the same.

Despite the efforts made to improve the teaching and learning of further mathematics, the rate of failure in further

mathematics remains high. Only very few students register for further mathematics in standard examination. Many candidates during standard examination could not answer half of the questions, not because of time factors, but inability to confidently and independently attempt the questions (Aminu, 2005). Many public schools refuse to register their students for further mathematics due to fear of failure. Based on these seeming problems, one will naturally ask, do FM teachers cover the content of the further mathematics curriculum? Are there qualified and experienced teachers to effectively teach further mathematics in Nigeria senior secondary schools? Is the time allotted to teaching and learning of further mathematics enough? Are the instructional materials implored appropriate? Do education supervisors monitor teaching and learning of further mathematics to ensure the effective implementation of its curriculum? These questions fundamentally form the background to this study. As the low level of further mathematics achievement has become an issue of concern, the necessity to evaluate possible causes becomes more urgent.

According to Odili, (2011), Evaluation as an educational endeavor provides the basis for judgment about educational programs. Evaluation consists of objective assessment of a project, programme or policy at all the stages of planning, implementation and measurement of outcomes. It provides reliable and useful information that allows the application of the knowledge obtained in the decision making process. Ali, (1998), had earlier noted that evaluation of school curricula had received little research attention in Nigeria, unlike elsewhere such as Britain, the United State of America and other educationally developed countries. Harbor-Peter (1992) specifically called for curriculum evaluation studies of the further mathematics curriculum, saying that most of the modifications made on the previous mathematics curricula were based on “armchair” criticisms. Hence, there is need for a study that will evaluate the implementation of further mathematics curriculum.

The findings of this study will be of immense benefit to the further mathematics students and undergraduate mathematics students, curriculum planners and educational supervisors, teachers and curriculum implementers, school administrators and researchers. This study is limited to senior secondary schools in Abia state.

The researcher investigated the following aspects of implementation strategies:

- a. The availability of qualified and experienced further mathematics teachers
- b. The availability of instructional materials used in teaching and learning

### **Research Questions**

The following research questions were posed for the study

1. How qualified and experienced are further mathematics teachers for the effective implementation FM curriculum

2. How adequate are instructional materials used in teaching and learning further mathematics

### **Hypotheses**

The following two null hypotheses tested at 0.05 level of significance were used

1. There are no significant differences among the mean responses of students, teachers and education supervisors on the availability of qualified and experienced FM teachers
2. There are no significant differences among the mean responses of students, teachers and education supervisors on the availability of instructional materials used in the teaching and learning of FM

### **RESEARCH METHOD**

The study adopted descriptive survey design, the study was carried out in Abia State of Nigeria, which has 17 Local Government Areas, there are three education zones in Abia State namely, Umuahia, Aba, and Ohafia zones, and about 255 secondary schools. The population of the study was 1579, which comprised 1550 students who offered further mathematics, 20 further mathematics teachers from and 9 Education supervisors from the 3 education zones. Out of these secondary schools, only 9 public Senior Secondary Schools were used because they offer further mathematics, as provided by the Secondary Education management board.

Through purposive sampling technique, 9 educational supervisors, 20 further mathematics teachers and 171 students, were selected from the entire population. A questionnaire titled “Evaluation of the Implementation of Further Mathematics Curriculum for Abia State Secondary Schools” (EIFMCAS), constructed by the researchers was the main instrument for data collection. The questionnaire was structured on a four point Likert Scale of Strongly agreed – 4, agreed– 3, disagree – 2, and strongly disagree– 1. It comprised forty two (42) items, based on the two research questions posed for the study. The questionnaire was face validated by 5 experts, 3 in further mathematics education and 2 in Measurement and Evaluation all of the science education department of Michael Okpara University of Agriculture, Umudike Abia State. They ascertained the appropriateness of language clarity and suitability of the items. The reliability of the instrument 0.84, was determined using Cronbach Alpha Coefficient Method, by pilot testing some staff and students outside the study sample. The researchers visited the sampled secondary schools, the education supervisors and the further mathematics teachers. Since a four point Likert scale was used, a mean of 2.50 was a cut off score such that any score above is accepted and any score below is rejected

Research Question 1: How qualified and experienced are further mathematics teachers for effective implementation of further mathematics curriculum

Table 1: The mean rating of the students, teachers and education supervisors on the availability of qualified and experienced further mathematics teachers

S/NO	ITEMS	Students		Teachers		Education Supervisors	
		$\bar{X}$	Remarks	$\bar{X}$	Remarks	$\bar{X}$	Remarks
1.	Do you agree that they are enough further mathematics teachers in Abia State	3.45	Agreed	3.55	Agreed	3.11	Agreed
2.	Do you agree that they are competent teachers in the field to teach further mathematics in Abia State	3.01	Agreed	3.15	Agreed	3.01	Agreed
3.	Do you agree that relevant education sectors need to employ teachers in further mathematics						
	Do you agree that due to lack of motivation many qualified further mathematics teachers have left the field in search of greener pastures	3.46	Agreed	3.50	Agreed	3.56	Agreed
4.	Do you agree that teachers with N.C.E will effectively teach further mathematics						
		3.66	Agreed	3.60	Agreed	3.89	Agreed
5.	Do you agree that teachers with OND will effectively teach further mathematics						
	Do you agree that teachers with 0–5 years of experience will effectively teach further mathematics	1.80	Disagreed	1.75	Disagreed	1.89	Disagreed
6.	Do you agree that teachers with 5–10 years of experience will effectively teach further mathematics	2.07	Disagreed	1.60	Disagreed	1.78	Disagreed
7.	Do you agree that teachers with 10–15 and above years of experience will effectively teach further mathematics	2.12	disagreed	2.00	disagreed	2.43	disagreed
8.	<b>Grand Mean</b>						
		3.61	Agreed	3.45	Agreed	2.87	Agreed
9.		3.42	Agreed	3.00	Agreed	4.00	Agreed
		<b>2.65</b>		<b>2.64</b>		<b>2.77</b>	

The analyzed table 1 showed that the students, teachers and education supervisors agreed on items 1, 2, 3, 4, and 9 with

mean value greater than 2.50, while they all disagreed on items 5, 6, and 8 since all were below 2.50

**Research Question two.** How available are the instructional materials employed in the teaching and learning of further mathematics

Table 2: The mean rating of the students, teachers and education supervisors on the availability of instructional materials employed in the teaching and learning of further mathematics

S/NO	ITEMS	Students		Teachers		Education Supervisors	
		$\bar{X}$	Remarks	$\bar{X}$	Remarks	$\bar{X}$	Remarks
10.	Do you agree that the school library is well equipped with relevant textbook and reference material	1.94	Disagreed	1.65	Disagreed	1.96	Disagreed
11.	Do you agree that they charts for illustration	2.21	Disagreed	2.30	Disagreed	2.21	Disagreed
12.	Do you agree that graph sheet are provided for teaching of further mathematics	1.60	Disagreed	1.40	Disagreed	1.61	Disagreed
13.	Do you agree that each further mathematics student have access to a computer for effective teaching & learning of further mathematics	1.39	disagreed	1.35	disagreed	1.39	disagreed
14.	Do you agree video clip, visual and audio material will be more effective in illustrating mathematical procedure than chalk-board	3.42	Agreed	3.60	Agreed	3.42	Agreed
15.	Do you agree that most schools lack ICT equipment for FM studies	2.64	Agreed	3.70	Agreed	3.75	Agreed
16.	Do you agree that they are conducive classrooms for teaching and learning of further mathematics	2.64	Agreed	2.00	disagreed	1.75	disagreed
17.	Do you agree that they enough periodicals, diaries, calculators and mathematical sets	1.00	disagreed			1.75	disagreed
	<b>Grand Mean</b>	2.45	disagreed	2.46	disagreed	2.48	disagreed
		<b>2.38</b>		<b>2.46</b>		<b>2.48</b>	

The analyzed data on table 2 showed that the students, teachers and education supervisors agreed on items 14 and 15 with respective mean scores above the mean cut-off score of 2.50. while they all disagreed on items 10, 11, 12, 13, 16, and 17 with mean scores below the mean cut-off score of 2.50.

**Hypothesis 1:** There are no significant differences among the mean responses of the students, teachers and education supervisors on the availability of qualified and experienced further mathematics teachers in senior secondary schools, for effective implementation of FM curriculum

Table 3: The Analysis of Variance (ANOVA) among the mean responses of the students, teachers and education supervisors on the availability of qualified and experienced further mathematics teachers for the effective implementation of its curriculum in Senior Secondary schools.

Source of variation	Sum of square	Df	Mean sum of square	F-Cal	P. Value	Decision
Between Group	0.4695	2	0.23	0.71	0.493	Not Significant
Within Group	65.29	197	0.33			
Total	65.76	199				

The data on table 3 shows an F-calculated value of 0.71 and a P. value of 0.493 > 0.05, meaning that the null hypothesis should be retained. That there is no significance difference among the mean responses of the students, teachers and

education supervisors on the availability of qualified and experienced teachers for the effective implementation of the Fmc in Senior Secondary schools.

**Hypothesis 2:** There are no significant differences among the mean responses of students, teachers and education supervisors on the availability of instructional materials employed in the teaching and learning of further mathematics

Table 4: The Analysis of Variance (ANOVA) among the mean responses of the students, teachers and education supervisors on the availability of instructional materials employed in the teaching and learning of further mathematics

Source of variation	Sum of square	Df	Mean sum of square	F	P. Value	Decision
Between Groups	0.04	2	0.0225	0.07	0.94	Not Significant
Within Groups	66.03	197	0.3357			
Total	66.07	199				

The data on table 4 showed an F-calculated value of 0.07 and a P-value of 0.94, > 0.05. This indicates we retain the null hypothesis, that there is no significant difference among the mean responses of the students, teachers and education supervisors on the availability instructional materials employed in the teaching and learning of fm towards the effective implementation of FMC.

**DISCUSSIONS OF RESULTS**

The analyzed data on table 1 showed that most secondary schools lack qualified and experienced teachers. Often teachers with NCE and OND are mostly employed to teach mathematics, while many mathematics teachers qualified to teach further mathematics have left the teaching field in search of greener pastures. This leads to haphazard curriculum content coverage. Teachers with Ph.D., M.Ed., B.Sc., M.Sc., B.Ed. will effectively implement further mathematics curriculum. These findings are in agreement with the findings of Abdu (2014) whose findings revealed that there are many unqualified teachers, teaching Further Mathematics. Furthermore, teachers with 5 years and above teaching experience will effectively implement further mathematics curriculum better than teacher with 0–5 years of teaching experience.

The analyzed data on Table 2 showed that the available instructional materials in schools are not enough. All the respondents agreed that the school library is not well equipped with relevant textbook, periodicals and reference materials. There are no suitable charts for illustration of points. This finding agrees with Aminu (2005) whose findings revealed that there are inappropriate instructional materials in the teaching and learning of further mathematics. In the present study, the respondents all agreed that each further mathematics student should each have access to a computer; and that video clips, visual and audio materials will be more effective in illustrating mathematical procedure than chalkboard.

**CONCLUSIONS**

Further mathematics remains an important subject of study in the secondary schools that will help to lunch students into the new world of technology. This study provided empirical evidences in evaluating the implementation of the further mathematics curriculum, purposively using Abia as a representative state in Nigeria. Thus, the findings of the study conclude that qualified and experienced teachers are needed in the teaching and learning of FM; teachers with lower grade of qualification should upgrade themselves. Relevant stakeholders should provide the necessary

instructional materials in schools and more time should be given for the teaching and learning of further mathematics.

**RECOMMENDATIONS**

Based on the findings of the study, the following recommendations were proffered;

1. Qualified further mathematics teachers should be employed to ensure that they adequately cover the further mathematics curriculum. Available teachers should be adequately motivated to encourage them to stay in the teaching field.
2. Adequate instructional materials such as well equipped libraries, charts, video clips, audio visual materials, conducive classrooms and laboratories should be made available in schools for effective implementation of Further Mathematics curriculum.
3. Time of study should be improved on

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