EVALUATION OF THE JUNIOR SECONDARY EDUCATION MATHEMATICS CURRICULUM IMPLEMENTATION USING CIPP MODEL

[1] **Daso Peter Ojimba,**

[2] **Zalmon Ibaan Gogo**

&

[3] **William-West Ibniokuruye Simeon**

[1, 2 & 3] Department of Mathematics/Statistics, Faculty of Natural and Applied Sciences, Ignatius Ajuru University of Education, Port Harcourt, Nigeria

Abstract

The study evaluated the junior secondary education Mathematics curriculum implementation in Akuku-Toru local government area of Rivers State using Stufflebeam's Context Input Process Product (CIPP) evaluation model. The study adopted an evaluation survey design. The population of the study consisted of 612 students and teachers. A sample of 243 students and Mathematics teachers was randomly selected for the study. The instrument for data collection was Mathematics Curriculum Evaluation Questionnaire (MCEQ). Test-retest method and Pearson's product moment correlation were adopted to obtain the reliability coefficient of 0.65 for MCEQ. Four objectives, four research questions and one null hypothesis guided the study. Mean and standard deviation were adopted to answer the research questions while regression analysis was used to test the null hypothesis. Findings of the study revealed that the context of implementing the curriculum, the extent of available learning resources and the quality of instructional delivery did not significantly contribute to the effective implementation of the junior secondary education Mathematics curriculum. The study recommended that private individual, cooperate groups and the communities should support the government and religious body in implementing the junior secondary education Mathematics curriculum by providing learning resources. Teachers and students should effectively utilize available learning resources for teaching and learning of junior secondary Mathematics.

Keywords: *Evaluation, junior secondary, education, Mathematics, curriculum, implementation*

Introduction

Mathematics has been given much relevance in the society due to its prominent roles in science, technology, engineering and innovation. The inclusion of Mathematics as one of the core subjects offered in basic and post-basic education levels in Nigeria reflects the importance of the subject in national development. Basic education is the compulsory, free, universal and qualitative education given to children between the ages of zero and fifteen years. Basic education in Nigeria comprises of early child care and development education, pre-primary education, primary education and junior secondary education (Federal Republic of Nigeria, 2014). The junior secondary education is the three years basic education the child receives immediately after the six years primary education. The objectives of the junior secondary education are to provide the child with diverse basic knowledge and skills for entrepreneurship and educational advancement, develop patriotic young people equipped to contribute to social development and the performance of their civic responsibilities, inculcate values and raise morally upright individuals capable of independent thinking and who appreciate the dignity of labour and inspire national consciousness and harmonious co-existence irrespective of differences in endowment, religion, colour, ethnic and socio-economic background

(Federal Republic of Nigeria, 2014). To achieve the objectives of the junior secondary education, several curriculum-based subjects are being taught with defined curriculum objectives. Mathematics is one of the compulsory curriculum-based subjects taught at the junior secondary education level.

The term curriculum has been defined differently by different people but most educationists viewed the definition of Tanner and Tanner as modest but comprehensive. Tanner and Tanner (1975) as cited in Odili (2006) defined curriculum as the planned and guided learning experiences and intended learning outcomes, formulated through the systematic reconstruction of knowledge and experience under the auspices of the school, for the learner's continuous and willful growth in social competence. Curriculum is a blue print of an instructional guide while the Mathematics curriculum is a blue print of an instructional guide in Mathematics (Zalmon, et al., 2020). Zalmon et al. (2020) described the Mathematics curriculum as a booklet produced by the Nigerian Educational Research and Development Council (NERDC) which contain a plan of Mathematics learning experiences consisting of objectives of teaching Mathematics, themes, sub-themes, topics, performance objectives, content, teacher and learner activities, learning materials and evaluation guide. The junior secondary Mathematics curriculum was first produced in 1978 by the Nigerian Educational Research Council (NERC) with the four broad themes of number and numeration, algebraic processes, geometry and mensuration and everyday statistics and seven objectives which is the same with the senior secondary Mathematics curriculum (Odili, 2006). The seven objectives are to generate interest in Mathematics and provide a solid foundation for everyday living; develop computational skills; foster the desire and ability to be accurate to a degree relevant to the problem at hand; to develop and practice logical and abstract thinking; develop ability to recognise problems and to solve them with related Mathematics knowledge; provide necessary mathematical background for further education; and to stimulate and encourage creativity.

The new junior secondary education Mathematics curriculum was produced in 2007 and reviewed in 2012 by the Nigerian Educational Research and Development Council (NERDC) with five new prolonged themes of number and numeration, basic operations, algebraic processes, geometry and mensuration and everyday statistics. The nine years basic education Mathematics curriculum for primary and junior secondary schools is focused on giving learners the opportunity to acquire Mathematics literacy necessary to function in an information age; to become prepared for further studies in Mathematics and other related field; to take advantage of the numerous career opportunities provided by Mathematics; to develop the essential elements of problem solving, communication, reasoning and connection within the study of Mathematics and to cultivate the understanding of and application of mathematical concepts necessary to thrive in the ever changing technology world (NERDC, 2012). After decades of implementing the junior secondary Mathematics curriculum, it becomes imperative to evaluate the extent of implementation or realization of the objectives of the curriculum. Curriculum implementation is one of the three stages of curriculum process. The curriculum process includes curriculum development, implementation and evaluation.

Curriculum development refers to the process of designing, planning and producing the curriculum to be used for instructional delivery. Curriculum development is the process of planning learning opportunities intended to bring about certain changes in the learner (Achuonye & Ajoku, 2013). Curriculum implementation refers to the process of translating the curriculum document to operating curriculum in such a way that the pre-determined objectives are attained (Achuonye & Ajoku, 2013). Curriculum implementation is the instructional phase in the curriculum process; it is the task of translating the curriculum document into the operating curriculum by the combined efforts of the students, teachers and others concerned (Odili, 2006). Curriculum implementation involves effectively utilizing the input variables in a learning context for quality instructional process (Zalmon, et al., 2020). Curriculum evaluation is an assessment of the curriculum development and implementation process for possible success or failure. Curriculum evaluation is a feedback mechanism that guarantees a reliable and dependable basis for action or the fate determiner of a given curriculum package (Williams & Olele, 2015). Curriculum evaluation is vital in an educational system because it provides information on the strength and weakness of a particular curriculum or programme for possible decision to modify, review, improve or end the curriculum (Williams & Olele, 2015). Several models of curriculum evaluation exist such as needs/assessment models, formative evaluation model, summative evaluation models, Kirkpatrick's four-level evolution model, Stufflebeam's summative evaluation model, Stake's evaluation model and Provus model.

Stufflebeam's evaluation model commonly refers to as the CIPP model is derived from the following four levels of decision guides: Context evaluation (planning decision), Input evaluation (structure decision), Process coordination (implementing decision) and Product evaluation (recycling decision) (Williams & Olele, 2015; Stufflebeam, 1971).

According to Zalmon, et al. (2020), the variables in Stufflebeam's evaluation model are Context Input Process and Product (CIPP) variables of curriculum or programme evaluation. The organizations or groups involved in the implementation of the curriculum constitute the context variables, the input variables are the injections into the curriculum such as the human and material resources required for effective teaching and learning of Mathematics. The process variables express the operational procedures and management of a curriculum such as effective lesson planning and teaching, utilization of innovative and conventional teaching methods and efficient evaluation techniques required for effective Mathematics curriculum implementation. The products of the curriculum refer to the output variables which basically are the graduates of the programme who at the point of graduation are expected to achieve the objectives of the curriculum (Zalmon, et al., 2020). This study adopted the Stufflebeam's CIPP model to evaluate the junior secondary education Mathematics curriculum implementation in Akuku-Toru local government area of Rivers State, Nigeria because of the minimal steps or processes involved. CIPP model is also a popular model used in curriculum evaluation.

Statement of the Problem

The poor achievement of students in Mathematics is certainly connected with the poor implementation of the Mathematics curriculum. The implementation of Mathematics curriculum at the junior secondary education level is not without challenges. There are several challenges confronting the effective implementation of the Mathematics curriculum such as poor involvement of government and non-governmental organizations, poor funding, inadequate provision of human and material learning resources and poor quality of the instructional process due to teachers' incompetency and lack of qualification. Stufflebeam categorized the instructional variables into context, input, process and product variables. The extent to which the available context, input and process variables contributes to achievement of the objectives (product variable) of the junior secondary education Mathematics curriculum is focus of this study.

Aim and Objectives of the Study

The aim of the study was to evaluate the junior secondary education Mathematics curriculum implementation in Akuku-Toru local government area. The objectives of the study are to:

1. Determine the context of implementing the junior secondary education Mathematics curriculum.
2. Ascertain the extent of availability of input variables for junior secondary education Mathematics curriculum implementation.
3. Examine the extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation.
4. Investigate the extent of the achieving the junior secondary education Mathematics curriculum objectives (product variables).

Research Questions

The following research questions guided the study:

1. What context is the junior secondary education Mathematics curriculum implemented?
2. What is the extent of availability of input variables for the junior secondary education Mathematics curriculum implementation?
3. What is the extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation?
4. What is the extent of achieving the junior secondary education Mathematics curriculum objectives (product variables)?

Hypothesis

The following null hypothesis formulated at 0.05 level of significance guided the study:

H_{01}: There is no significant joint contribution of the context, input and process variables to the product variable in the junior secondary education Mathematics curriculum implementation.

Methodology

Research Design

The study adopted an evaluation survey design. Evaluation survey design is the survey carried out on any issue or event in order to make judgment about the value or worth or effectiveness of that issue. In this study, an evaluation of the junior secondary Mathematics curriculum was carried out to in order to make judgment about the effectiveness or ineffectiveness of its implementation.

Population of the Study

The population of the study consisted of 14 teachers from the 6 public junior secondary schools and 598 senior secondary class one students from the 6 public senior secondary schools in Akuku-Toru local government area making a population of 612 respondents. The senior secondary class one students were used for the study because they are graduates or products of the junior secondary education Mathematics curriculum.

Sample and Sampling Technique

A sample of 243 respondents including 237 students and 6 Mathematics teachers was selected by simple random sampling technique and was used for the study.

Instrument for Data Collection

The instrument for data collection was 48-items self-designed Mathematics Curriculum Evaluation Questionnaire (MCEQ). The instrument was patterned after a modified Likert rating scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE) and Very Low Extent (VLE). The MCEQ had four sections: sections A, B, C and D. Sections A elicited information on the teachers and students demographic variables while sections B, C and D elicited information on the input, process and product variables relating to evaluation of thee junior secondary school education Mathematics curriculum implementation. The criterion mean of 2.50 was used.

Validity of Instrument

The face and content validity of the MCEQ was established by three Mathematics educators. Each copy of the instrument attached with the aim and objectives of the study, research questions and hypothesis was given to the experts to ensure the preservation of the instrument's face and content validity.

Reliability of Instrument

Test-retest method and Pearson's product moment correlation were adopted to obtain the reliability coefficient of 0.65 for the Mathematics Curriculum Evaluation Questionnaire.

Method of Data Collection

Due permissions were obtained from the Principals of the schools used for the study. The instrument was administered and retrieved on the spot from students with the assistance of the Mathematics teachers. The Mathematics teachers willingly responded to the questionnaire.

Methods of Data Analysis

Mean and standard deviation were adopted to answer the research questions while regression analysis was used to test the null hypothesis.

Results

Research question one: What context is the junior secondary education Mathematics curriculum implemented?

Table 1: Context of implementing the junior secondary education Mathematics curriculum

S/N	Context variables	VHE	HE	LE	VLE	Mean	Std.	Decision
1.	Government	169	50	19	5	3.60	0.70	High
2.	Religious body	103	60	69	11	3.00	0.40	High
3.	Private Individual	56	38	52	97	2.20	1.20	Low
4.	Cooperate group	30	49	38	126	1.90	0.80	Low
5.	Community	25	34	18	166	1.60	0.70	Low
	Grand mean					**2.46**	**0.76**	**Low**

Data in table 1 showed that government and religious body implements the junior secondary education Mathematics curriculum implementation in the area.

Research question two: What is the extent of availability of input variables available for the junior secondary education Mathematics curriculum implementation?

Table 2: Extent of availability of input variables for the implementation of the junior secondary education Mathematics curriculum

S/N	Input variables	VHE	HE	LE	VLE	Mean	Std.	Decision
1.	Ventilated staff room with chairs/tables	33	170	20	20	2.90	0.7	High
2.	Ventilated classroom	119	76	40	8	3.30	0.9	High
3.	White maker board	4	31	119	89	1.70	0.6	Low
4.	Chalk board	138	75	6	24	3.30	1.2	High
5.	Seat and Desk	44	131	30	38	2.70	0.8	High
6.	Marker/chalk	105	90	15	33	3.10	1.0	High
7.	Junior Secondary Mathematics Curriculum	129	44	40	30	3.10	0.8	High
8.	Instructional Materials	40	33	133	37	2.30	0.6	Low
9.	Mathematics laboratory	9	13	32	189	1.30	1.1	Low
10.	Library containing mathematics textbooks and accessible to students	6	4	92	141	1.50	0.9	Low
11.	Librarian	27	44	68	104	2.00	0.6	Low
12.	Qualified mathematics teachers	85	22	48	88	2.40	0.2	Low
13.	Junior secondary mathematics textbooks belonging to students	63	49	44	87	2.40	0.5	Low
14.	Mathematics workbooks belonging to students	39	53	114	37	2.40	0.7	Low
15.	Register	82	79	55	27	2.90	0.7	High
16.	Diary	101	71	27	44	2.90	0.4	High
17.	Scheme of work	99	83	19	42	3.00	0.4	High
18.	Note book and pen for students	72	94	47	30	2.90	0.5	High
19.	Continuous assessment booklet	58	123	41	21	2.90	0.6	High
20.	Playground and sporting activities	62	91	50	40	2.70	0.4	High
	Grand mean					**2.56**	**0.68**	**High**

Data in table 2 indicated that the extent of availability of input variables for the junior secondary education Mathematics curriculum implementation is high (Mean=2.56; Std.=0.68).

Research question three: What is the extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation?

Table 3: Utilization of learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation

S/N	Process variables	VHE	HE	LE	VLE	Mean	Std.	Decision
1.	Lesson plan usage for instruction	75	153	7	8	3.20	0.5	High
2.	Use of instructional materials	38	150	25	30	2.80	0.6	High
3.	Using conventional instructional strategies and methods to teach	98	13	21	111	2.40	0.6	Low
4.	Use of innovative instructional strategies and methods	19	20	82	122	1.70	0.7	Low
5.	Evaluation by test	52	161	6	24	3.00	0.5	High
6.	Evaluation by class work	139	60	20	24	3.30	0.4	High
7.	Evaluation by assignment/home work	20	18	98	107	1.80	0.6	Low
8.	Evaluation by short quiz	20	17	101	105	1.80	0.8	Low
9.	Organizing quiz competition in Mathematics	31	20	63	129	1.80	0.6	Low
10.	Marking students test, class work, assignment and making necessary corrections	121	71	31	20	3.20	0.9	High
	Grand mean					**2.50**	**0.62**	**High**

Data in table 3 revealed that the extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation is high (Mean=2.50, Std.=0.62).

Research Question Four: What is the extent of achieving the junior secondary education Mathematics curriculum objectives (product variable)?

Table 4: Extent of achieving the junior secondary education Mathematics curriculum

S/N	Product variables	VHE	HE	LE	VLE	Mean	Std.	Decision
1.	Acquire mathematical literacy necessary to function in a technological age	108	82	23	30	3.1	0.8	High
2.	Cultivate the understanding of and application of mathematical skills necessary to thrive in the ever changing technological world	56	26	119	42	2.4	0.6	Low
3.	Cultivate the understanding of mathematical concepts necessary to thrive in the ever changing technological world	61	47	55	80	2.4	0.4	Low
4.	Develop the essential elements of problem solving, within the study of mathematics	96	6	19	122	2.4	0.3	Low
5.	Develop the essential elements of communication within the study of mathematics	55	39	45	104	2.2	1.0	Low
6.	Develop the essential elements of reasoning and connection within the study of mathematics	99	12	33	99	2.5	0.7	High
7.	Study Engineering courses	63	49	122	9	2.7	0.4	High
8.	Study Technology based courses	77	109	39	18	3.0	0.4	High
9.	Study Science courses	67	150	13	13	3.1	0.8	High
10.	Study Statistics	52	148	16	27	2.9	1.2	High
11.	Study Management courses	15	99	93	20	2.3	0.7	Low
12.	Study Economics	99	52	51	41	2.9	0.5	High
13.	Study General Mathematics	109	87	41	6	3.2	0.9	High
14.	Study Further Mathematics	85	87	43	28	2.9	1.1	High
15.	Become prepared for further studies in Mathematics and other related fields	93	67	55	28	2.9	1.0	High
	Grand Mean					**2.73**	**0.72**	**High**

Data in table 4 showed that the extent of achieving the junior secondary education Mathematics curriculum objectives (product variable) is high (Mean=2.73, Std.=0.72).

H_{01}: There is no significant joint contribution of the context, input and process variables to the product variable in the junior secondary education Mathematics curriculum implementation.

Table 5: Summary of regression analysis of the joint contribution of the context, input and process variables to the product variable in the junior secondary education curriculum implementation

Table 5a: Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.09[a]	0.007	-.010	5.51771	1.263

a. Predictors: (Constant), Context, Input, Process
b. Dependent Variable: Product

Table 5b: ANOVA[a]

Model		Sum of Squares	df.	Mean Square	F	Sig.
1	Regression	39.103	3	13.034	.428	0.733[b]

Residual	5358.342	176	30.445
Total	5397.444	179	

a. Dependent variable: Product
b. Predictors: (Constant), Context, Input, Process

Table 5c: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	32.81	2.693		12.183	.000	27.491	38.120
	Context	-.08	.139	-.042	-.557	.578	-.351	.197
	Input	-.02	.026	-.059	-.777	.438	-.071	.031
	Process	-.03	.058	-.038	-.504	.615	-.144	.085

a. Dependent Variable: Product

Data in table 5a revealed a week positive relationship ($r = 0.09$) between the joint context, input and process variables and the product variable with the joint variables contributing 0.70% to the product variable in the implementation of the junior secondary education Mathematics curriculum. Data in table 5b showed that there is no significant joint contribution of the context, input and process variables to the product variable in the junior secondary education Mathematics curriculum implementation ($F_{(3,176)} = 0.428, p > 0.05$). Therefore, the null hypothesis one was retained at 0.05 level of significance. Data in table 5c gives the regression equation $y = 32.81 - 0.08x_1 - 0.02x_2 - 0.03x_3$ where x_1, x_2 and x_3 are the context, input and process variables respectively while y is the product variable. The regression equation of the joint contribution of the independent variables indicated that a unit increase in the context, input and process variables will lead to a unit decrease in the product variable.

Discussion of Findings

Context of implementing the junior secondary education Mathematics curriculum

Data in table 1 showed that government and religious body implements the junior secondary education Mathematics curriculum implementation in the area. Zalmon, et al. (2020) found out that the extent of involvement of government and non-governmental organizations in the implementation of the senior secondary education Mathematics curriculum was high but noted that implementation by religious body was low.

The extent of availability of input variables for junior secondary education Mathematics curriculum implementation

Data in table 2 indicated that the extent of availability of input variables for the junior secondary education Mathematics curriculum implementation is high. Zalmon, et al. (2020) reported that the input variables for the implementation of the senior secondary education Mathematics curriculum are available.

The extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation

Data in table 3 revealed that the extent of utilizing learning materials, methods, strategies and techniques for quality instructional process in the junior secondary education Mathematics curriculum implementation is high. Findings of this study collaborated with the findings of Zalmon, et al. (2020), who revealed that the extent of utilizing effective instructional practices during the process of instruction in senior secondary Mathematics curriculum implementation. However, this finding differs with the finding of Aminu (2005).

The extent of achieving the junior secondary education Mathematics curriculum objectives

Data in table 4 showed that the extent of achieving the junior secondary education Mathematics curriculum objectives (product variable) is high. Data in table 5 revealed a week positive relationship between the joint context, input and process variables and the product variable and also showed that there is no significant joint contribution of the context, input and process variables to the product variable in the junior secondary education Mathematics curriculum implementation. The implication of the finding is that there is no effective implementation of the junior secondary education Mathematics curriculum in the area of this study with the context, input and process variables contributing negatively to the realization of the noble objectives of the Mathematics curriculum. Zalmon et al. (2020) showed that the extent of achieving the senior secondary education Mathematics curriculum objective is high with a unit increase in the context and process variables leading to a unit increase in the product variable while a unit increase in input variable leading to a unit decrease in the dependent variable. Also, there was no significant joint contribution of the context, input, and process variables to the product variable in the implementation of the senior secondary education Mathematics curriculum. Findings of this study conform to the early studies conducted by Aminu (2005).

Conclusions

The study evaluated the junior secondary education Mathematics curriculum implementation in Akuku-Toru local government area of Rivers State using CIPP model and found no significant joint contributions of the context, input and process variables to the product variable. The study revealed that context of implementing the curriculum, the extent of available learning resources and the quality of instructional delivery did not significantly contribute to the effective implementation of the junior secondary education Mathematics curriculum.

Recommendations

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

1. Private individual, cooperate groups and the communities should support the government and religious body in implementing the junior secondary education Mathematics curriculum by providing learning resources.
2. Teachers and students should effectively utilize available learning resources for teaching and learning of junior secondary Mathematics.
3. Mathematics teachers should improve on the quality of instruction by utilizing innovative learning materials, methods, strategies and techniques for effective junior secondary education Mathematics curriculum implementation.
4. Effective instructional supervision and monitoring is required by principals of schools, Ministry of Education and the Universal Basic Education Board to guarantee effective implementation of the junior secondary education Mathematics curriculum implementation.

References

Achuonye, K. A. & Ajoku, L. I. (2013). *Foundations of curriculum development and implementation (2nd ed.).* Port Harcourt: Pearl Publishers.

Aminu, S. (2005). A survey of problems of Mathematics teaching in primary and junior secondary schools in Bauchi State. Unpublished M.Ed Thesis, University of Abuja.

Federal Republic of Nigeria (2014). *National policy on education (6th edition).* NERDC Press.

Nigerian Educational Research and Development Council (2012). *9-Year basic education curriculum: Mathematics JSS1-3.* NERDC Press.

Odili, G. A. (2006). *Mathematics in Nigeria secondary schools: A teaching perspective.* Rex Charles & Patrick Limited and Anachuma Educational Books.

Stufflebeam, D. L. (1971). *Educational evaluation and decision making.* Bloomington: Phi-Delpa.

Williams, C. & Olele, C. N. (2015). Curriculum evaluation. In C. N. Olele & C. Williams (Eds), *Technology-driven curriculum for 21st-century learners* (169-181). Port Harcourt: Paragraphics.

Zalmon, I. G., Daso, P. O. & Uranta, G. A. (2020). Evaluation of the Nigerian senior secondary education Mathematics curriculum implementation. *International Journal of Research and Scientific Innovation (IJRSI), TVII(XII),* 138-147.