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Evaluation of Mathematics Teachers' Competence in the Implementation pf Mathematics Curriculum in Senior Secondary Schools in Kano State

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ABSTRACT

This paper evaluates the mathematics teachers' competence in the implementation of mathematics curriculum in senior secondary schools in Kano State. The study was carried out with the objectives to: determine the extent to which teachers have adequate knowledge of mathematics curriculum contents in senior secondary schools in Kano State; find out the teachers professional competence in teaching the topics in mathematics curriculum content in senior secondary schools in Kano State; and ascertain the teaching methods used by the teachers in the implementation of mathematics curriculum in senior secondary schools in Kano State. Also, corresponding research questions and hypotheses were postulated in line with the stated objectives. Survey research design was used for the study and the population of the study comprised of all the (2,533) senior secondary school mathematics teachers in Kano State out of which a sample of 333 mathematics teachers were randomly selected. The instruments used to generate responses from the subjects consisted of a researcher made questionnaire. This instrument was validated by the research experts in measurement and evaluation and was found to be reliable based on the result of pilot study conducted by the researchers, which show a reliability figure of 0.91. The data collected were analysed using descriptive statistics and chi-square was used to test the hypotheses at 0.05 level of significance. Finding among others shows a significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State. In view of the findings, recommendations were made among others that there is a need for Kano state government to train and retrain mathematics teachers on the content, objectives and methodology of mathematics. Also, government should employ and assign competent teachers to teach Mathematics at all levels of education.

1. Introduction

As the world is changing so is the school, and so is what we mean by teaching and learning. An educational institution performs a significant function of providing learning experiences to lead their students from the darkness of ignorance to the light of knowledge. The key personnel in the institutions who play an important role to bring about this transformation are teachers. The teacher is the most important element in any educational programme. It is the teacher who is mainly responsible for implementation of the educational process at any stage (NCTE, 1998). This shows that it is imperative to invest in the preparation of teachers, so that the future of our nation can be secured. The importance of competent teachers to the nation's school system can in no way be overemphasized. The National Policy on Education (FRN, 2009) places demands and expectations on the teacher, which need to be addressed by both initial and continuing teacher education. The teacher stands out as one, the most important factors determining the quality of education and its contributions to national development. At every level, people who go to school look on the teacher for the acquisition of the necessary skills to enable

them become what they want to be. Thus, students often look on the personal qualities, their educational qualities and professional competence which are rewarding to the learners, especially in the mathematics class.

Mathematics is a universal language of science and engineering and a central intellectual discipline of technologically developed societies (Odeyemi, 1995). According to Oguniyi (1996), it is the bedrock to understanding of other fields of learning. Setidisho (1996) also observes that, it is a fundamental science which is necessary for understanding of other fields. Adetoye and Aiyedun (2003), in the same vein believe that no subject forms such a binding force among the various branches of sciences, physical, biological and social as mathematics. It plays vital roles even in contemporary society. Mathematics is therefore indispensable not only to individual development but to nation building in general. Based on this, the mathematics curriculum contents has to be subjected to effective implementation if it is to achieve its proposition of nation building.

Curriculum is a plan that consist of learning opportunities for a specific time frame and place, a tool that aims to bring about behaviour changes in students as a result of planned activities, and involves all learning experiences received by students within the guidance of the school (Goodland and Su cited in Yusuf, 2012). Curriculum is an educational plan that spells out which goals and objectives should be realized; which topics should be taught, and which methods are to be used for learning, teaching and evaluation (Wojtezak in Yusuf, 2012). Since the society is not static but dynamic in nature, therefore the curriculum should also be dynamic in its planning and implementation to achieve the desired needs and aspiration of such society.

Curriculum implementation means to put in to use, to actualize the planned curriculum. It is the translation of the curriculum contents into practice or action. In the words of Offorma (1994), Nzewi, Okpara and Akudolu (1995), implementation of curriculum is normally done in the classroom through the joint efforts of the teacher and the learners and those concerned. The teacher adopts the appropriate teaching methods and instructional materials to guide the students learning. The students on their own are actively involved in the process of interacting with the learning activities. A good curriculum according to Nzewi *et al*., (1995) can be marred at the implementation stage if adequate consideration is not given to the input and process that allows for effective implementation, as success is attainable only on the efficient management of the input and process of implementation.

Offorma (1994) stressed that the implemented curriculum determines the extent to which educational objectives are achieved. The planned curriculum may be ideal for the achievement of educational objectives. The extent of achievement of these objectives depends on the effectiveness of the implemented curriculum. To do this effectively facilities or materials must be obtained to facilitate the conduct of meaningful students learning experiences. These facilities or materials invariably are called curriculum materials. Curriculum materials represent resources that assist a teacher or an instructor in bringing about positive behavioural changes in learners. These in combination with teaching methods and strategies which are main approaches to teaching, and this is dependent mainly upon the skillful direction of the teacher to achieve desired results.

In the teaching –learning situation, the teacher teaches while the students are expected to learn. Teaching and learning are therefore two sides of the same coin. After instruction, there is usually an attempt to evaluate the student with a view to finding out how well he has learned what he was taught. On the other hand, not much effort is made to find out how well he was taught. It is expected that while efforts are made to evaluate learning, we should also endeavour to evaluate teaching because what a child learns depends to a large extent on how he is taught. Unfortunately, in Nigeria, and indeed Africa, serious attention has not been given to the study of teaching effectiveness. This can be shown by the finding made by May-Parker and Ozumba cited in Shaibu (2011) which indicated that, by the close of the 70s, the amount of research done in Africa relating to curriculum implementation still remained scanty, as against the report by Travers in Shaibu (2011), that many studies on effective implementation were undertaken (in the developed countries) during the period 1910 to 1945. This then calls for the need for more conscious effort in the study of teaching effectiveness and its evaluation. It is on this note that the evaluation of Mathematics Teachers competence in the implementation of mathematics curriculum in senior secondary schools in Kano State becomes imperative.

2. Literature Review

Literature reviewed constantly reveals low performance of students at all levels of education in the subject (Odeyemi, 1995; Oyedeji, 1996; Falayajo, Makuju, Onugha & Olubodun, 1997; Okoro, 2005). Other reports on the same subject matter have over the years indicated poor academic performance and general negative attitudes of students towards the subject

(Agwagah, 1993; Ezema, 2000). Various factors such as lack of interest in the subject, inadequacy of instructional materials, shortage of qualified teachers, overcrowded classes, poor teaching methods and so forth, have been adduced by many researchers as responsible for this predicament. However, other findings have shown that issues of poor strategy of teaching the subject are the most important stumbling block to students' performance in the subject. Osafehinti (1997) stressed that lack of appropriate method of teaching mathematics is one of the major problems associated to under-achievement in the subject. Also, Akinsola (1994); Broussand and Garrison (2005) have stressed the importance of appropriate strategy of teaching mathematics as most essential.

Hence, the classroom teacher forms the "corner stone" in curriculum implementation. He is the main force and the last person that ensures that the curriculum is implemented according to specification (Ben-Yunusa, 2000). The teacher is at the centre of the curriculum implementation which is the stage of bringing the curriculum down to where the learner can learn it. The classroom teacher decides on what to teach and what time to teach even when the teaching scheme must have been prepared in advance to follow. In the process of implementing the curriculum, the teacher is involved in all the steps of curriculum development.

Awka (1995) observed that in the context of implementation, the teacher takes the "curriculum plan at its global level and breaks it down to the operational specific classroom level". Ben-Yunusa (2000) supported this claim as he states that the teacher interprets the syllabus and breaks it into teaching scheme and lesson plans". He decides on what instructional materials to use, the methodology to adopt, the amount of time to spend on each aspect and the equipment and space to use. The teacher interprets the curriculum further and breaks it down to classroom level by driving specific performance objectives from the general objectives. These specific objectives are explicitly stated in behavioural terms and are easily measurable. These objectives are very relevant in the implementation process of the curriculum as they give direction to education enabling the teacher to select experiences and control and to consider how best to organize them for effective result.

In view of this, the National Council for Curriculum Assessment (2005) has noted that many students view mathematics as a difficult subject, but Bolaji (1990) pointed out that through proper knowledge of curriculum contents and effective method of teaching, it may be possible to make mathematics lively and less difficult. Moreover, mathematics is a practical subject. It is believed that even children at primary school level can enjoy learning of the subject, if there is a well developed, motivating, practically oriented, appropriate and relevant method of instruction that will enhance learning.

3. Objectives of the Study

This study was carried out with the objectives to:

1. determine the extent to which teachers have adequate knowledge of mathematics curriculum contents in senior secondary schools in Kano State.
2. find out the teachers' professional competence in teaching the topics in mathematics curriculum content in senior secondary schools in Kano State.
3. ascertain the teaching methods used by the teachers in the implementation of mathematics curriculum in senior secondary schools in Kano State.

4. Research Questions

The following are the research questions that guided the study;

1. What is the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State?
2. How competent is the teachers in teaching the topics in mathematics curriculum content in senior secondary schools in Kano State?
3. What are the teaching methods used by the teachers in the implementation of mathematics curriculum in senior secondary schools in Kano State?

5. Hypotheses

The following null hypotheses was tested in the course of the study at 0.05 alpha level of significance:

Ho_1 There is no significant difference in the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State.

Ho_2 There is no significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State.

Ho_3 There is no significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State.

6. Research Methodology

Survey research design was used for the study. The population of this study comprised of all the (2,533) senior secondary school mathematics teachers in Kano State out of which a sample of 333 mathematics teachers were randomly selected using stratified sampling technique. A researcher made instrument titled "Evaluation of Mathematics Teachers' Questionnaire - EMTQ" was used to generate responses from the subjects. The questionnaire was the modified 4-point Likert scale of Strongly Agree (SA), Agree (A), Strongly Disagree (SD), and Disagree (D). The instrument was divided into two sections. The first section consisted of information on the respondents' biographical data while the second section was made up of five item statement structured in line with the research questions and hypotheses. This instrument was validated by research experts in measurement and evaluation and was found to be reliable based on the result of pilot study conducted by the researchers, which shows a reliability figure of 0.91 for the questionnaire instrument. This instrument was personally administered on the respondents by the researchers and this enhanced good and prompt response from the respondents. The research questions were analysed using descriptive statistics of frequencies, mean and standard deviation, while the null hypotheses was tested using chi-square at 0.05 level of significance.

7. Data Analysis

Research Question One: What is the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State?

Table I: Opinions of teachers on the adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State

S/N	Item Statement	SA	A	D	SD	Mean	SD
1.	Only few mathematics teachers are with grasp, depth and upto date knowledge about the subject.	34	06	92	201	2.582	1.8484
2.	Teacher's knowledge of the curriculum contents will influence his choice of materials, contents and teaching methods.	222	32	53	26	4.521	1.1035
3.	Some mathematics teachers do not have the prerequisite knowledge to effectively implement the mathematics subject content.	209	18	06	100	3.256	1.8484
4.	Teachers with little knowledge of mathematics curriculum content implement the mathematics curriculum content better than those with adequate knowledge of the curriculum.	82	102	09	140	2.818	1.6496
5.	Proper understanding of the curriculum contents/nature of the subject can only guarantee the implementation of the curriculum.	19	212	53	49	4.357	1.8034

Source: Field Study, 2016.

Table I present the response rate of the respondents with detail showing that 222 of the respondents strongly agreed and 32 agreed with the item while 53 disagreed and 26 strongly disagreed with the highest mean response of 4.521 to the fact that teacher's knowledge of the curriculum contents will influence his choice of materials, contents and teaching methods. This goes to show that the proper understanding of the curriculum contents/nature of the subject can only guarantee the implementation of the curriculum. This show that 19 of the respondents strongly agreed and 212 of them agreed with the item while 53 disagreed and 49 strongly disagreed with the highest mean response of 4.357. This signifies that the teachers need to update their knowledge and ideas from time to time to be in tune with recent happening in the world of knowledge.

Research Question Two: How competent is the teachers in teaching the topics in mathematics curriculum content in senior secondary schools in Kano State?

Table II: Opinions of teachers in respect to the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State

S/N	Item Statement	SA	A	D	SD	Mean	SD
1.	One does not need to be professionally trained before teaching the topics in the mathematics curriculum contents.	29	17	243	44	1.916	.81808
2.	Mathematics teacher's competence and academic qualification influence curriculum implementation in Senior Secondary School.	189	66	12	66	3.858	1.2260
3.	Keeping of up-date record of work by Mathematics teachers foster curriculum implementation.	104	18	11	200	2.818	1.6496
4.	Only competent teachers can teach the mathematics curriculum contents in such a way that it provides opportunities for students to learn by doing.	261	15	37	20	4.357	1.0679
5.	The mathematics curriculum contents and activities are made to make teacher's role in the classroom dominant.	04	38	70	197	1.848	.62672

Source: Field Study, 2016.

Based on the descriptive analysis on table II, majority of the respondents numbering 261 strongly agreed with highest mean response of 4.357 are of the opinion that Only competent teachers can teach the mathematics curriculum contents in such a way that it provides opportunities for students to learn by doing. In addition, the second highest means response of 3.858 that the Mathematics teacher's competence and academic qualification influence curriculum implementation in Senior Secondary School. This is because 186 of the respondents strongly agreed and 66 of them agreed compare with 12 that disagreed and 66 that strongly disagreed with this notion.

Research Question Three: What are the teaching methods used by the teachers in the implementation of mathematics curriculum in senior secondary schools in Kano State?

Table III: Opinions of teachers in respect to the teaching methods used by the teachers in the implementation of mathematics curriculum in senior secondary schools in Kano State

S/N	Item Statement	SA	A	D	SD	Mean	SD
1.	Effective implementation of the mathematics curriculum will depend on the teaching methods used by the teachers.	226	51	40	16	1.357	.81808
2.	Teachers frequently used the inquiry method while implementing the mathematics curriculum in senior secondary schools.	04	70	62	197	2.818	1.2260
3.	Lecture method is commonly used by the teachers in the implementation of mathematics curriculum in senior secondary schools.	209	100	16	08	4.521	1.0679
4.	Effective implementation of the mathematics curriculum requires teachers' use of demonstration method.	63	37	200	33	2.582	1.5285
5.	Problem-solving method is considered as the best method for mathematics curriculum implementation.	165	29	104	35	2.848	1.0118

Source: Field Study, 2016.

Analysis on table III revealed that the majority of the respondents numbering 209 strongly agreed with highest mean response of 4.521 are of the opinion that Lecture method is commonly used by the teachers in the implementation of mathematics curriculum in senior secondary schools. Therefore for implementation to be effective, teachers require updating their knowledge for adequate implementation of the mathematics curriculum.

Hypothesis One: There is no significant difference in the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State.

Table IV: Summary of Chi-square (X^2) statistics on the adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State

N	CalX^2	df	□	CriticalX^2	Decision
333	15.5	4	0.05	388.8	Retained

Source: Field Study, 2016.

The non-parametric statistic of Chi-square (X^2) on table IV portrayed that X^2 calculated of 15.5 was less than the X^2 critical of 388.8 under the df of 4, at 0.05 alpha level of significance. Since the X^2 calculated was less than the X^2 critical, the decision was to accept the null hypothesis which states that there is no significant difference in the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State.

Hypothesis Two: There is no significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State.

Table V: Summary of Chi-square (X^2) statistics on the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State

N	CalX^2	df	□	CriticalX^2	Decision
333	19.4	4	0.05	7.81	Rejected

Source: Field Study, 2016.

Table V contained the results of the Chi-square statistics which revealed that P< 0.05 this was due to the fact that the obtained X^2 Calculated (19.4) is greater than X^2 critical (7.81), this means that there is a significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State. Consequently, the null hypothesis which states that there is no significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State was rejected.

Hypothesis Three: There is no significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State.

Table VI: Summary of Chi-square (X^2) statistics on the relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State

N	CalX^2	df	□	CriticalX^2	Decision
333	624.1	4	0.05	3.84	Rejected

Source: Field Study, 2016.

In respect to the Chi-square statistics on table VI which revealed the obtained X^2 Calculated of 624.1 which is greater than X^2 critical of 3.84 at 0.05 alpha level of significance. This means that there is a significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State. Therefore, the null hypothesis which states that there is no significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State was rejected.

8. Discussion of Findings

The analysis of the data collected for this study provided some insight into the main objectives of the study, which was to evaluate the mathematics teachers competence in the implementation of mathematics curriculum in senior secondary schools in Kano State. The non-parametric statistic of Chi-square (X^2) on table IV portrayed that X^2 calculated of 15.5 was less than the X^2 critical of 388.8 under the df of 4, at 0.05 alpha level of significance. Since the X^2 calculated was less than the X^2 critical, the decision was to accept the null hypothesis which states that there is no significant difference in the extent to which teachers have adequate knowledge of the mathematics curriculum contents in senior secondary schools in Kano State. This finding contradicts the opinion of Bolaji (1990), that through proper knowledge of curriculum contents and effective method of teaching, it may be possible to make mathematics lively and less difficult.

Table V contained the results of the Chi-square statistics which revealed that $P< 0.05$ this was due to the fact that the obtained X^2 Calculated (19.4) is greater than X^2 critical (7.81), this means that there is a significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State. Consequently, the null hypothesis which states that there is no significant difference in the teacher's professional competence and the teaching of topics in mathematics curriculum content in senior secondary schools in Kano State was rejected. This finding supported the findings of Akinsola (1994); Aminu (2005); Broussand and Garrison (2005), whom opined that without proper and the needed required professional qualification and competency, no objective can be realized, even with the existing problems of poor students' background and inadequate teaching and learning facilities, professionally competent teachers can adequately and proficiently help in ameliorating the existing problem.

In respect to the Chi-square statistics on table VI which revealed the obtained X^2 Calculated of 624.1 which is greater than X^2 critical of 3.84 at 0.05 alpha level of significance. This means that there is a significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State. Therefore, the null hypothesis which states that there is no significant relationship between the teaching methods used by the teachers and the proper implementation of mathematics curriculum in senior secondary schools in Kano State was rejected. This finding agreed with the assertion of Osafehinti (1997) that, lack of appropriate method of teaching mathematics is one of the major problems associated to under-achievement in the subject.

9. Conclusion

In view of the findings of the study, many factors were identified among others that teacher's knowledge of the curriculum contents will influence his choice of materials, contents and teaching methods. This goes to show that the proper understanding of the curriculum contents/nature of the subject can only guarantee the implementation of the curriculum. In addition to the findings, it has been revealed that only competent teachers can teach the mathematics curriculum contents in such a way that it provides opportunities for students to learn by doing and that the Mathematics teacher's competence and academic qualification influence curriculum implementation in Senior Secondary School.

10. Recommendations

In light of the insights of the study and conclusions drawn, the following recommendations were made:

1. There is a need for Kano state government to train and retrain mathematics teachers on the content, objectives and methodology of mathematics.
2. Government should employ and assign competent teachers to teach Mathematics at all levels of education.
3. Mathematics curriculum contents should be reviewed to reflect on the modern methods of teaching and internationally approved practices.
4. There should be a re-organization and improvement in the present system of teacher education to include specialists training in the teaching of mathematics.

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