

# **MATHEMATICS TEACHERS' ATTITUDES TOWARD MATHEMATICS CURRICULUM CHANGE**

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## **Abstract**

*This study focused on the attitudes of mathematics teachers toward curriculum change in mathematics education. Variables such as new concepts in curriculum, teaching facilities, teacher gender, age, rank, professional qualification, teaching experience, teacher workload, class level taught, participation in curriculum review, pre-service training, in-service training, irregular power supply etc were used to elicit teachers' attitudes toward curriculum change in mathematics. Questionnaire was the major instrument used to collect data. Interviews and observations were also used as basis for the study. One hundred questionnaires were administered on randomly selected mathematics teachers in secondary schools in Kogi central. The one hundred questionnaires were carefully completed and returned for analysis. A four point scale such as strongly agree, agree, disagree and strongly disagree was used and statistical analysis was based on percentages, mean score and rank. The results showed that teachers who are old in age, in-experienced with low qualifications, excessively worked and those teaching at JSS classes have negative attitude toward curriculum change in mathematics. It was concluded that curriculum change is a necessity, unavoidably and timely if vision 2020 is to be realized. Thus, it was recommended that in whatever form of curriculum change in mathematics, teachers of mathematics must be carried along at all stages of the curriculum change.*

The organization of schooling and further education has long been associated with the idea of a curriculum. This implies that, the idea of curriculum is hardly new - but the way we understand and theorize it has altered over the years - and there remains a considerable misunderstanding as to the exact definition of curriculum. Curriculum came from the Latin word for *race course*, referring to the course of deeds and experiences through which children grow to become mature adults. A useful starting point for us here might be the definition offered by John Kerr and taken up by Vic Kelly in his standard work on the subject. Kerr defines curriculum as, 'all the learning which is planned and guided by the school, whether it is carried on in groups or individually,

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inside or outside the school (Kelly, 1983; Kelly, 1999). In other words, a curriculum is the set of courses, and their contents, offered at a school or high institution. A curriculum is prescriptive, and is based on a more general syllabus which merely specifies what topics must be understood and to what level to achieve a particular grade or standard. Curriculum has numerous definitions, which can be slightly confusing. In its broadest sense a curriculum may refer to all courses offered in a school. This is particularly true of schools at the high institution level, where the diversity of a curriculum might be an attractive point to a potential student.

A curriculum may also refer to a defined and prescribed course of studies, which students must fulfill in order to pass a certain level of education. For example, an elementary school might discuss how its curriculum, or its entire sum of lessons and teachings, is designed to improve national testing scores or help students learn the basics. An individual teacher might also refer to his or her curriculum, meaning all the subjects that will be taught during a school year. On the other hand, a higher institution might refer to a curriculum as the courses required in order to obtain one's Diploma, National certificate in Education (NCE) or a Bachelors degree. They might also refer to curriculum in exactly the same way as the elementary school, and use curriculum to mean both individual courses needed to pass, and the overall offering of courses, which help prepare a student for life after high school.

However, the above definitions of curriculum are pointers, that curriculum is planned and executed with the aim to meet the dynamic societal needs. Thus, no matter how well a curriculum is designed and managed, it can never meet the demands of the society and so, the need for curriculum review, reform or change.

In many countries including Nigeria, reform in mathematics education is a current major concern. Curriculum theory has moved from discussion about educational and psychological perspectives (Howson, Keitel & Kilpatrick, 1981; Robitaille & Dirks, 1982) to considerations about the models and dynamics of curriculum change (Burkhardt, Fraser & Ridgway, 1986; Popkewitz, 1988) and the politics of curriculum hegemony (Dowling & Noss, 1990). The idea that mathematics curriculum is something to be changed is as old as the mathematics education itself. Curriculum development projects in mathematics began to emerge as countries sought to catch the "new math" wave that was sweeping across the world, especially in Europe and America (Howson, Keitel, & Kilpatrick, 1981). Nigeria's experience in the early 1990s appears to have been much like that of other countries when they were adopting new math reforms. Regardless of the nature of a project to change the school mathematics curriculum, it appears that the role of the teacher is critical. According to Thompson (1992) what teachers do in the classroom is fundamentally influenced by their personal views and beliefs, as if these were essentially an individual matter. Thus, every mathematics

teacher is expected to be involved in mathematics curriculum development. There are obvious reasons why mathematics teachers should know as much as possible about its construction and be able to examine it critically (Howson et al, 1981). This is because every curriculum change is local, and personal (Kilpatrick, 1998, 1999).

A reasonable estimate from experience might be that for the reform efforts in Nigeria; fewer than 10% of mathematics teachers have been professionally involved in curriculum change. The approach casts the teacher as an obedient employee who is given a curriculum to implement and who plays no role in co-constructing the curriculum along with students. In that sense, we can view the curriculum as a hierarchy decision at the top which filters down to classrooms. In effect, the public most of the times reacts to the reform efforts even if they are not necessary and most especially where they are not well informed about the substance of the reforms.

However, a neglected aspect of the change process is a study of the attitudes of the most relevant participants especially the teachers. The reasons for studying the attitudes of teachers are grounded in the assumption that these have a significant influence on their thinking and actions. Attitudes act as a sort of filter. They are indispensable in forming and organising the meaning of things, but on the other hand they can block the perception of new realities and of the identification of new problems.

Mathematics teachers organise the learning experiences of their students and consequently are in a critical position to influence their views, conceptions and attitudes. However, very little was known about the relationships between the attitudes of teachers and those of their students, nor about the relationships between teachers' conceptions and attitudes and their classroom practice. In a period of intense educational reform it is also of interest to explore how curriculum innovation affects teachers' attitudes and perceptions toward mathematics and mathematics learning. In addition, mathematics teachers are responsible to the views, attitudes, and expectations of students regarding the discipline of mathematics which have been considered to be a very significant factor underlying their school experience and achievement (Borasi, 1990; Schoenfeld, 1985). Their general attitudes and conceptions shape the way they approach mathematical tasks, which if negative, in many cases lead them down non-productive paths.

The curriculum change in mathematics education places mathematics teachers as the fulcrum of the entire process without which the reforms cannot be successful. It becomes pertinent therefore that the attitudes of these teachers toward accepting the changes are kick-starters to ensuring the success of the mathematics curriculum change. Freedman (1987) defined attitude towards any idea, object, or person as an enduring system with cognitive and affective components and behavioural tendency. One important thing to note is that attitude can be learned, changed and influenced by several

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variables. Ogunsaju (1985) investigated the influence of sex, age, discipline, likely problems, and qualification on attitudes of teachers toward change and innovation in secondary schools. His findings revealed that there were significant differences between the variables tested.

Though attitude cannot be seen, since they are internal and intangible, yet their manifestations are observable. It is in the light of this that the researcher tried to ascertain precisely, mathematics teachers' attitudes toward curriculum change in secondary schools.

### **Statement of the Problem**

In secondary schools in Nigeria, it has been observed that many mathematics teachers are more comfortable with existing mathematics curriculum during and at the beginning of their teaching careers. In the event of a change in the mathematics curriculum there are notable reactions and corresponding changes in attitudes of mathematics teachers. Several variables may be responsible for their reactions and change in attitudes. Do new concepts in curriculum, envisaged problems, teaching facilities, teacher gender, age, rank, professional qualification, teaching experience, teacher workload, class level taught, participation in curriculum review, pre-service training, in-service training, irregular power supply, etc influence mathematics teachers' attitudes toward curriculum change in secondary schools? This is the main problem under study.

### **Purpose of the Study**

To a very large extent, attitudes of mathematics teachers are significant influence on their thinking and actions in mathematics classes. In addition, mathematics teachers are responsible to the views, attitudes, and expectations of students regarding the discipline of mathematics which have been considered to be a very significant factor underlying their school experience and achievement (Borasi, 1990; Schoenfeld, 1985). It is also true that for the success of any curriculum, teachers have vital roles to play. Thus, this study becomes necessary in order to:

1. asses the mathematics teachers attitude towards a change in mathematics curriculum,
2. investigate the percentage of mathematics teachers that had training and those that are willing to be trained on the new mathematics curriculum and
3. investigate the variables that are related to the mathematics teachers attitudes toward a change in mathematics curriculum

### **Research Question**

The following research questions were raised for the study:

1. What is the mathematics teacher's attitude towards a change in mathematics curriculum?
2. What percentage of the mathematics teachers participated in mathematics curriculum review or had training on a new mathematics curriculum?
3. What is the percentage of mathematics teachers that are willing to be trained on the new mathematics curriculum?
4. What variables are related to the mathematics teachers' attitudes toward a change in mathematics curriculum?

### **Research Method**

The research design used for the study is sample survey of the attitudes of mathematics teachers toward curriculum change in mathematics education in secondary schools in Kogi central of Kogi state.

### **Population and Sample**

The population used for this study are one hundred and forty one (141) mathematics teachers in twenty (29) secondary schools in Kogi central of Kogi state (Ministry of State Education[MSE], 2004). One hundred (100) mathematics teachers were randomly sampled out and used for the study.

### **Instrument**

Questionnaire was used to collect data for this study. The questionnaire was pilot tested and a reliability coefficient of 0.87 was established using the Combach Alpha reliability test. The first section of the questionnaire was used to collect demographic data. Following this were sections about assessment of the mathematics teachers attitudes toward a change in mathematics curriculum, those that had training and the number that are willing to be trained on a new mathematics curriculum. Also, the variables that are related to the mathematics teachers' attitudes toward a change in mathematics curriculum. Respondents were asked to indicate their levels of agreement on the above items using a four-point scale (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). The scores were interpreted as follows: one (1) is the lowest possible score, which represents a negative attitude, while four (4) is the highest possible score which represents a very strong positive attitude. 2.50 is the mean point of the four-point scale and taken as the cut-off point for decision taking (i.e for accepting or rejecting a decision). Mathematics teachers were also asked to respond "yes" or "no" to ascertain their attitudes toward a change in mathematics curriculum and the need for training those that had no training on a new mathematics curriculum.

### **Procedure for Data Collection**

The data were collected by the researcher with the use of colleagues as research assistants who administered the questionnaire to the mathematics teachers in their various schools. One hundred (100) copies of the questionnaire were distributed. The one hundred questionnaire copies were carefully completed and retrieved for analysis. That is 100% of the questionnaire were retrieved from the respondents upon several visits and found usable for the study.

### **Data Analysis**

#### **Research Question 1**

What is the mathematics teachers' attitude towards a change in mathematics curriculum?

**Table 1: Teachers' Attitude towards a Change in Mathematics Curriculum**

<b>Category of Teachers</b>	<b>Mean score</b>	<b>% of teachers with positive attitude</b>	<b>% of teachers with negative attitude</b>
Male teachers	2.55	63.75	36.25
Female teachers	2.50	62.50	37.50
Young aged teachers	2.54	63.50	36.50
Middle aged teachers	3.05	76.25	23.75
Old aged teachers	2.20	45.0	55.0
Junior ranked teachers	1.95	48.75	51.25
Middle ranked teachers	2.50	62.50	37.50
Senior ranked teachers	2.68	67.0	33.0
NCE teachers	2.31	42.25	57.75
First degree teachers	2.53	63.25	36.75
Master degree teachers	3.03	75.75	24.25
Low experience teachers	2.25	43.75	56.25
Middle exp. teachers	3.19	79.75	20.25
High exp. teachers	2.50	62.50	37.50
Moderate workload teachers	2.83	70.75	29.25
Excess workload teachers	2.42	39.50	60.50
JSS teachers	2.11	47.25	52.75
SSS teachers	2.54	63.50	36.5

Data in Table 1, shows mean score which represents the descriptive statistics of the mathematics teachers responses on the instrument measuring their assessment of opinions related to their attitudes toward curriculum change in mathematics. Also, the table shows the percentage of teachers with positive and those with negative attitudes

toward mathematics curriculum change for various categories of 100 mathematics teachers. Mean score of 2.50 (the cut-off point for decision taking) or greater than 2.50, implies that higher percentage of the teachers in the category under consideration have positive attitude toward a change in mathematics curriculum and so is the reverse.

**Research Question 2**

What percentage of the mathematics teachers participated in mathematics curriculum review or had training on a new mathematics curriculum?

**Table 2: Mathematics Teachers Who Participated in Mathematics Curriculum Review or Had Training on New Mathematics Curriculum**

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<b>Frequency % of teachers who participated or had training on new maths curriculum</b>	
Never	93
Rarely	7
Often	<b>0</b>
<b>Total</b>	<b>100</b>

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Data in Table 2, shows that almost all the teachers (93 out of 100, i.e 93% of the teachers) never had training on new mathematics curriculum. Only very few mathematics teachers (7 out of 100, i.e 7% of the teachers) rarely had training on new mathematics curriculum. None of the teachers often attended training on new mathematics curriculum.

**Research Question 3**

What is the percentage of mathematics teachers that are willing to be trained on the new mathematics curriculum?

**Table 3: New Mathematics Curriculum and Training Needed**

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<b>Training needs</b>	<b>% yes if free</b>	<b>% yes if not free</b>
Training course for curriculum development	91	28
Training course for new curriculum contents	98	22
Training course for curriculum implementation	100	42
Training course for curriculum evaluation	84	20

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Data in Table 3, shows the area of training needs, the percentage of teachers who responded “yes” to be trained on new mathematics curriculum if no financial

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involvement and those who responded “yes” to be trained if there is financial involvement. Training course for curriculum implementation has the highest percentage for both when the training is free (i.e 100%) and even when not free (i.e 42%). However, training course for curriculum evaluation has the lowest percentage for both free (i.e 84%) and not free (i.e 20%).

### **Research Question 4**

What are the factors that affect mathematics teachers’ attitudes toward a change in mathematics curriculum?

**Table 4: Variables Related to the Mathematics Teachers’ Attitudes toward a Change in Mathematics Curriculum**

<b>Variables (Factor)</b>	<b>Mean score</b>	<b>Rank</b>	<b>Remark</b>
New concepts in curriculum	3.10	3	S
Envisaged problems	2.83	6	S
Teaching facilities	3.04	5	S
Teacher gender	2.40	13	NS
Teacher age	2.54	12	S
Teacher rank	2.58	11	S
Professional qualification	2.62	10	S
Teaching experience	2.69	9	S
Teacher workload	2.80	7	S
Class level taught	2.22	14	NS
Participation in curriculum review	3.27	1	S
Pre-service training	3.06	4	S
In-service training	3.16	2	S
Irregular power supply	2.74	8	S

\*Note: S implies significant while NS implies not significant.

Data in Table 4, shows mean score which represents the descriptive statistics of the mathematics teachers responses on the instrument measuring their assessment of factors related to their attitudes toward curriculum change in mathematics. Also, the table shows ranking of the respondents mean score and remarks or decisions on the respondents’ mean score. Note that mean score of 2.50 is the cut-off point for decision taking. Thus, mean score of 2.50 or greater than 2.50, implies that the variable under consideration is significantly related to or affects mathematics teachers’ attitudes toward mathematics curriculum change.



## **Findings**

1. Old aged, junior ranked, National Certificate of Education, in-experience, over worked, and JSS teachers have negative attitude toward a change in mathematics curriculum with excess workload teachers having the highest percentage.
2. Both male and female, young aged, middle aged, middle ranked, senior ranked, first degree, master degree, middle level experienced, high level experienced, moderate workload, and SSS teachers have positive attitude toward a change in mathematics curriculum with middle level experienced teachers having the highest percentage.
3. Nearly all mathematics teachers never participated in mathematics curriculum review or had training on new mathematics curriculum.
4. Most mathematics teachers are willing to be trained on new mathematics curriculum.
5. Variables such as new concepts in curriculum, envisaged problems, teaching facilities, teacher age, teacher workload, teacher rank, professional qualification, teaching experience, participation in curriculum review, pre-service training, in-service training, irregular power supply except teacher gender, class level taught are capable of affecting mathematics teachers' attitudes toward mathematics curriculum change.

## **Discussion**

This study revealed that the attitude of a teacher depends on who the teacher is and his/her function(s) in a school. This view is in agreement with Thompson (1992) when she said that what teachers do in the classroom is fundamentally influenced by their personality. As indicated in table 1, old aged, excess workload, junior ranked, low experience, holders of NCE and JSS class teachers have negative attitudes toward a change in mathematics curriculum. Curriculum change involves modification of the existing one which is associated with introduction of new concepts and teaching facilities. As a result, teachers who are of old age, those charged with much responsibilities and inexperienced ones who are usually teachers with low qualifications, junior ranked and those teaching in junior classes may prefer to retain the curriculum which they have been used to or trying to get used to. This is because acquisition of new skill in a system is usually a problem for old and inexperienced people. The reverse is the case for young aged, moderate workload, senior ranked, highly qualified and experienced teachers who are likely to teach in senior classes.

The study confirmed that nearly all mathematics teachers (precisely, 91%) never participated in mathematics curriculum review or had training on new mathematics curriculum. According to Harden & Crosby (2000), teachers are responsible for curriculum planning, organising and implementing and not the government agents. By implication, if government or whoever may be concerned reviewed and present the curriculum to the teachers, the implementation is bound to be poorly carried out due to lack of understanding. The results are enormous as the outputs of such educational system are usually low achievers and unemployable.

Teachers are willing to have training on new curriculum in mathematics if given the opportunity. However, this study has confirmed that incentives to the teachers like financial support, free sponsorship and training opportunities in form of conferences or seminars are required by majority of the teachers. Such incentives to attend free conferences and subsequent understanding of the curriculum are capable of developing positive attitude in teachers towards curriculum change in mathematics.

Apart from lack of participation in curriculum review and training due paucity of finance, there are other factors revealed in this study that are capable of influencing teachers' attitude toward curriculum change in mathematics. Factors such as new concepts in a curriculum, envisaged problems, teaching facilities, teacher age, teacher workload, teacher rank, professional qualification, teaching experience, lack of participation in curriculum review, pre-service training, in-service training, irregular power supply etc are significantly related to teachers' attitude toward curriculum change in mathematics; although with significant difference in the factors investigated. This was also revealed by Ogunsaju (1985) when he investigated the influence of sex, age, discipline, likely problems, and qualification on attitudes of teachers toward change and innovation in secondary schools and also found a significant difference between the variables tested. Obviously, a newly reviewed mathematics curriculum is accompanied with new concepts, teaching facilities and teaching methods. Unfortunately, majority of mathematics teachers lack the knowledge and skill to implement the new curriculum due to lack of training opportunity. Thus, they envisage problems which make it difficult for them to accept a change in the curriculum. Often, due to teachers' qualities such as old age, lack of experience and qualification and excessive responsibilities, a teacher tends to prefer to retain what he/she is acquainted to and trying to acquire. Sometimes the problem may go beyond lack of knowledge and skill to operate some teaching facilities to lack of power supply to operate the teaching facilities. Thus, teachers in such schools will not be willing to accept curriculum change in mathematics.

## **Conclusion**

A society that is progressive must have embraced changes in the course of her developmental process. Mathematics is known to be vital in any form of the

development. Thus, curriculum change in mathematics is a necessity, unavoidable and timely if vision 2020 is to be realized. Attitude of mathematics teachers who implement the curriculum is therefore an issue of concern to all stakeholders of the society.

### **Recommendation**

On the basis of the findings the following recommendations were made:

Old age and inexperienced teachers should be made to handle a class with experienced and active teachers.

Excess workload should be discouraged in schools.

Training workshops, conferences or seminars should be organised on new curriculum and its implementation for mathematics teachers on regular basis and made free with a token as honorarium to encourage their participation.

All schools should adequately be provided with teaching facilities as required by the curriculum and power supply should be sufficient for maximum utilization of the facilities.

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