

## TEACHERS' PARTICIPATION IN MATHEMATICS CURRICULUM DEVELOPMENT IN TANZANIA

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### **Abstract**

The aim of the study was to assess the participation of primary school maths teachers in adopting the multiple choice format in grade seven maths exam and to assess effectiveness of this format in assessing pupils' performance. Using a questionnaire, data was collected from 318 grade 6 and 7 maths teachers selected from 268 primary schools in 14 regions in Mainland Tanzania. Effectiveness of the multiple choice format in assessing pupils performance was assessed by administering an exam first in the multiple choice format and later as a non-multiple choice to 491 pupils. The results showed that the majority of teachers (98.9%) were not consulted before the format was adopted; the majority of teachers (95%) do not like the multiple choice format in maths exams; and the multiple choice format does not reflect actual learners' ability. It is being recommended that responsible authorities should consider dropping this multiple choice format due to its disadvantages and that teachers' participation should be improved when deciding the best way to test knowledge in maths.

**Keywords:** *teacher's participation, multiple choice format, pupil's performance*

### **1.0 Introduction**

Curricula are generally dynamic, and continually adapting in response to changes in society. In Tanzania, the primary school curricula have been developing in response to technological advancement and evolving societal needs. Teachers are the persons responsible for delivering the curricula to students in both primary and secondary schools. Given this fact, they are in an excellent position to know the interests and abilities of their students and should be able to identify the factors that would facilitate or inhibit their learning.

Early writers on curriculum recognised the importance of involving teachers, and the importance of their collaboration with curriculum specialists in any curriculum development endeavour due to their awareness of student needs. Involving teachers is also important as it ensures their co-operation in the implementation of such changes (Caswell & Campbell, 1935; Rugg & Shumaker, 1928). Consistent with these early writers, more recent educationalists have emphasised the important role



that teachers can play in curriculum development and recommend that teachers should work with the departments managing education in their respective countries when developing or modifying curricula (Bergenholtz, 2009; Petts, 1999; Sinclair & Diduck, 2005).

In Mainland Tanzania, the education system requires that all students sit for national examinations on two occasions before they are selected to join secondary schools, completing these examinations in the fourth and seventh grades. Promotion to secondary school is dependent on attaining a minimum standard in the seventh grade (URT, MOEC, 1995).

With the exception of mathematics, examinations in all other subjects in grade seven have been using a multiple choice format. Mathematics was the only subject using a different format, as it was argued that the scores in mathematics were being used to reduce or eliminate the adverse impacts of guessing in the examinations. As a consequence of a recent decision that mathematics examinations should also adopt the multiple choice format, this format was adopted in 2011. As a result of such adoption in all grade seven final examinations, more than 5,000 of the pupils who were selected to progress to secondary school education had very poor literacy skills, many lacking the ability to read or write (URT, 2012). The advancement of students with poor literacy skills has been attributed to the sole reliance on multiple choice testing for student selection.

In this form of testing, students have to read a question and select the correct answer out of a set of answers that have been provided. This means that any student can get a good number of the answers correct purely by guessing. Further, multiple choice assessment measures a student's capacity to recognise information rather than their capacity to recall it, so it is testing an inferior form of knowledge. Perhaps the worst feature of multiple choice testing is that there is no need for a student to actually write a word; it is merely a matter of ticking boxes. Therefore, students who can recognise a correct answer, but are totally incapable of writing a complete sentence, can gain a high score on multiple choice tests.

It is the teachers in the primary schools who must prepare the students for the national examinations, and it is the teachers in the secondary schools who must teach the students who gain entry into these schools. Therefore, teachers are key stakeholders in the education sector; and it is essential that they are involved in important decisions such as curriculum development or review.



## **2.0 Intention of the study**

The aim of this study was to assess the effectiveness of multiple choice format in measuring students' performance in mathematics examinations and identify the extent to which teachers were involved in the decision to change the format of the grade seven mathematics examination to a multiple choice format. The study also sought to assess the degree of acceptance of the new format among teachers and pupils.

The study was conducted in Mainland Tanzania. The research was limited to the Mainland as the island of Zanzibar has a different educational system, with a different curriculum. The 14 regions selected for inclusion in the study were Dar es Salaam, Morogoro, Njombe, Iringa, Dodoma, Singida, Songea, Kagera, Mbeya, Tabora, Tanga, Mwanza, Arusha and Kilimanjaro.

## **3.0 Curriculum development**

All curricula for secondary school are developed by the Tanzania Institute of Education (TIE) which is under the Ministry of Education. The National Examinations Council of Tanzania (NECTA), on the other hand, is responsible for administering examinations. The Education and Training Policy of Tanzania developed by the Ministry Education recognises the importance of mathematics. It emphasises that the teaching of mathematics, science and technology should be improved in all levels of education (URT, MOEC, 1995).

In the final grade seven examinations, pupils sit for the following examinations: Mathematics, Kiswahili, Social Studies, English and Science. All the questions in all the examinations are given as multiple choice questions and for each question there are five alternative answers of which only one is correct. Students have to choose the correct answer. This means that in each question, every student has a 20% probability of guessing an answer correctly.

## **4.0 Procedure and results**

In assessing participation of teachers in adopting the multiple choice format in the mathematics examination and degree of acceptance of the format, a cross-sectional study design was used to collect data using a structured questionnaire. The questionnaire instrument was chosen for data collection as it is efficient, and time and cost effective. Participants in the study can complete the questionnaires in private and remain anonymous; therefore, questionnaires should yield reliable and



valid responses (Best & Khan, 1993). Data from existing records was used to identify the nature of the curriculum and examinations, and to assess examination outcomes.

The one-page questionnaire contained questions seeking demographic information and one pre-coded and three open-ended questions which addressed the issues of teachers' participation in curriculum development or review, and teachers' views on the format of the grade seven mathematics examination. The samples were selected from teachers who taught mathematics in either grade six or seven. The intention was to select one mathematics teacher from each of the 268 schools, but some schools had more than one teacher involved in teaching mathematics at grades six or seven, so there were occasions when there was more than one teacher chosen from a particular school.

Questionnaires were completed by 318 mathematics teachers from 268 primary schools in 14 regions, throughout the country. The samples consisted of 128 (40.3%) female teachers and 190 (59.7%) male teachers, which also reflects the gender distribution of mathematics teachers in primary schools (Figure 1). The normality test shows that the sampled male teachers in each region were not normally distributed ( $P=0.0083$  which is  $<0.05$ ) while the sampled female teachers were normally distributed ( $P=0.1$  which is  $>0.05$ ). The difference between the mean number of male and female teachers in each region was not significant (Wilcoxon matched paired test,  $P>0.005$ ). Teaching experience ranged from 5 months (a volunteer) to 39 years, with a mean of about 12 years of experience in the classroom. Approximately, half (47.8%) of the teachers had less than 10 years of teaching experience, with the others reporting 11-20 years (27.3%), 21-30 years (22.3%) and 31-40 years (5.0 %) of teaching mathematics.

The questionnaire was prepared in English and then translated into Kiswahili which is the national language. The data collection took place between July 2012 and March 2014.



Figure 1 below shows the distribution of mathematics teachers from different regions, by sex.

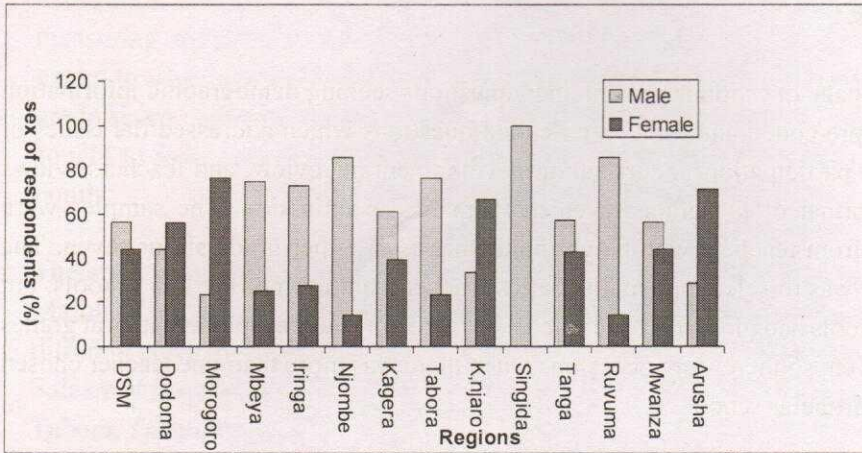


Figure 1: Distribution of teachers from different regions by sex

### 5.0 Teachers' views on the format of grade seven mathematics examination

Teachers were asked about their views regarding the new examination format. They were provided with three alternatives to choose from: 'format is good', 'format is bad' and 'don't know'. The responses indicate that the new multiple choice format was seen as bad by 95.0% of the mathematics teachers, whilst only 5.0% of the teachers thought it was good (Figure 2). The mean of the teachers who did not support the multiple choice format in each region is significantly higher than the mean of those who supported it (Wilcoxon matched paired test and two paired t tests,  $P < 0.05$ ). Everyone was aware of the change in the format as none opted for 'don't know'.

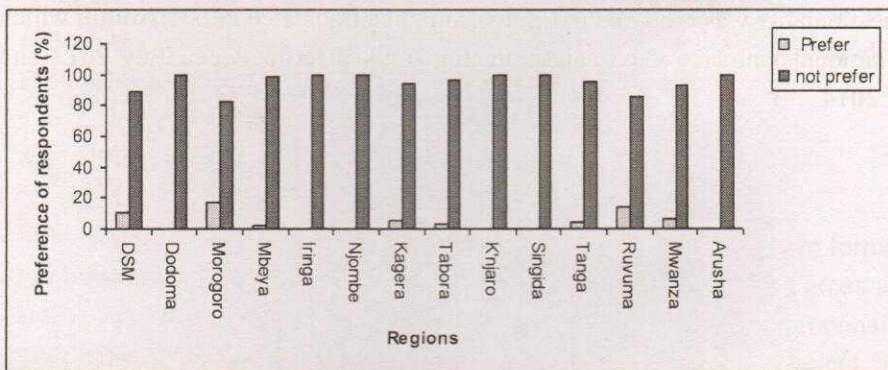


Figure 2: Teachers' views on the format of grade seven mathematics examination



Teachers' dislike of the multiple choice format is consistent with the reports of other researchers who have suggested that students' scores do not fairly represent true achievement unless the scores are transformed in some way to reduce the adverse effects of guessing (Downing, 2006). In mathematics, teachers are often more interested in the processes involved in solving the problems than in the answers obtained. Multiple choice tests do not enable the teachers to assess such processes.

### **6.0 Teachers' participation in the adoption of the multiple choice format**

Teachers' participation in adopting the multiple choice format was assessed by the question – "Were you involved in the adoption of the format?" They were provided with two possible responses: 'yes' or 'no'. The results show that most of the teachers were not involved in the adoption of the new format. Out of 318 teachers, 314 or 98.7% were not involved. Only four teachers (1.3%) had some involvement in making the decision. Two of these teachers rated the change 'good' and two rated it 'bad'. Statistically, there is a significant difference between the teachers involved in the adoption of the format and those not involved, in each region (Wilcoxon matched paired test, and two paired t tests,  $P < 0.05$ ).

In addition to the information provided in the questionnaire, many teachers showed concern about the fact that they had not been involved in making such an important decision. This concern over lack of involvement has been expressed by many other researchers who argue that teachers are the best placed persons to develop curricula, and that curricula should be developed within schools with or without the help of outsiders (Brady, 1990; Garrett, 1990; Kimpston & Rogers, 1988; Print, 1987).

### **7.0 Effectiveness of the multiple choice format in mathematics examination**

*The effectiveness of the multiple choice format in mathematics exams was assessed by administering one maths exam first as a multiple choice format and later as a non-multiple choice format. The exams were administered to 491 pupils from selected 4 regions: Tanga, Dar es Salaam, Dodoma and Iringa. The results obtained from both formats were compared. The teachers who were teaching mathematics were asked to categorise the pupils into 'high', 'low' and 'moderate' achievers and in some cases results from the non-multiple choice format were used to classify the pupils. The performance of high achievers in the two types of exams are approximately equal compared to low achievers, as shown by the closeness of the two scores (Figures 3-14). However, statistically, there was no significant difference between multiple and non-multiple scores regardless of the category of*



the pupils (Wilcoxon matched paired test and paired  $t$  tests,  $P < 0.0001$ ). Pupils' average scores are presented in the figures that follow.

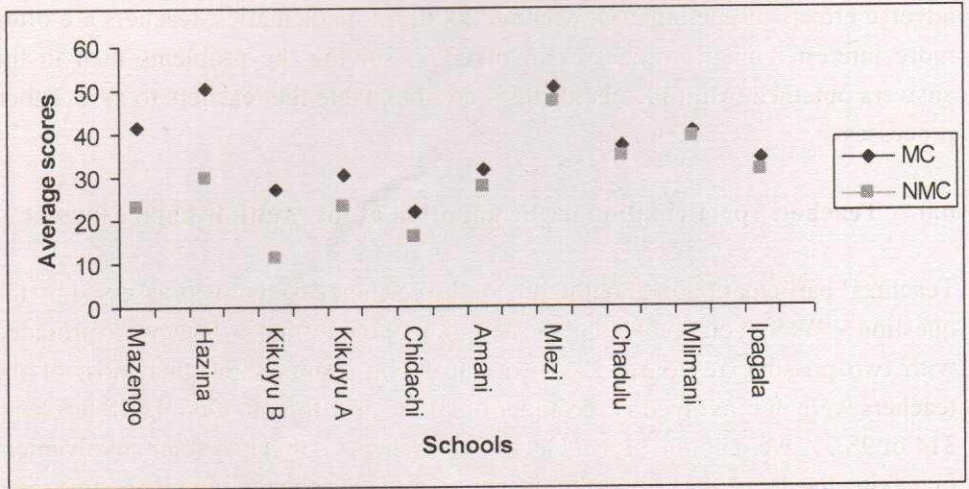


Figure 3: Average performance of low achievers in selected schools in Dodoma Region

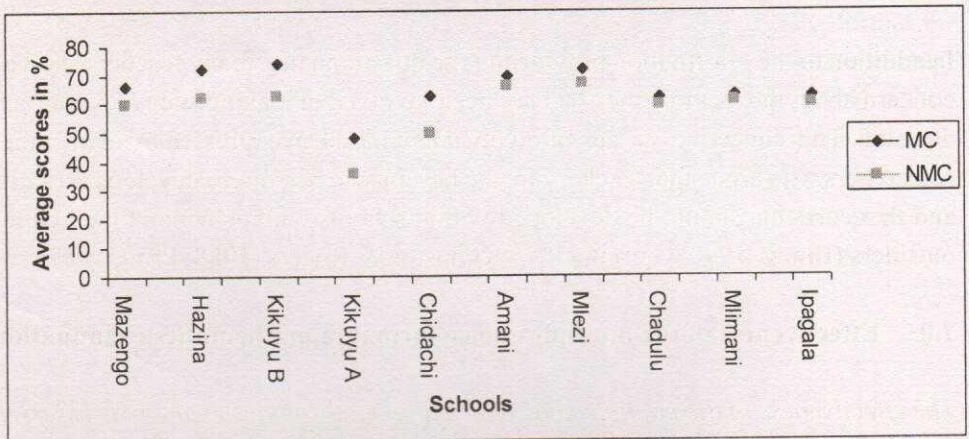


Figure 4: Average scores for moderate achievers in selected schools in Dodoma Region



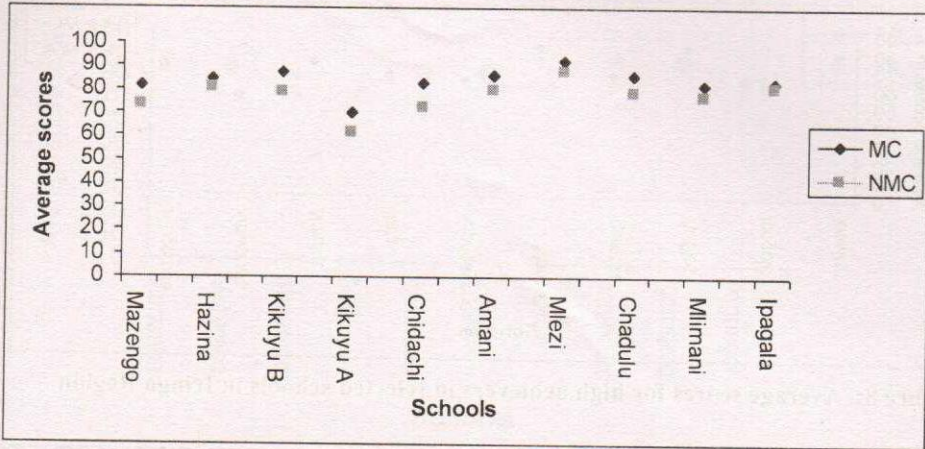


Figure 5: Average scores for high achievers in selected schools in Dodoma Region

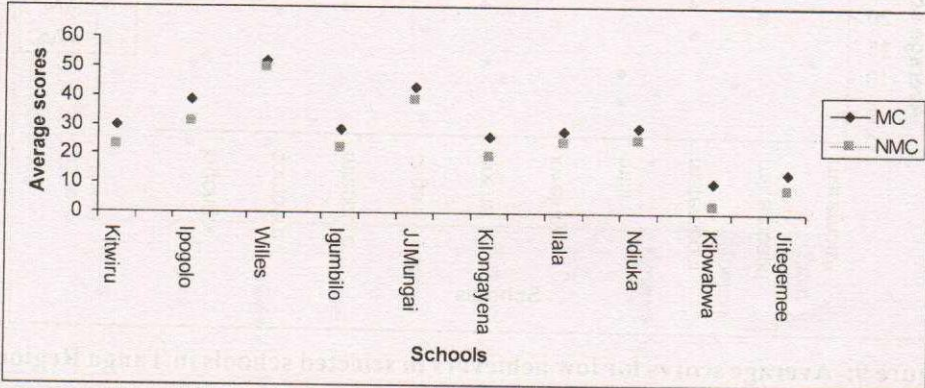


Figure 6: Average scores for low achievers in selected schools in Iringa Region

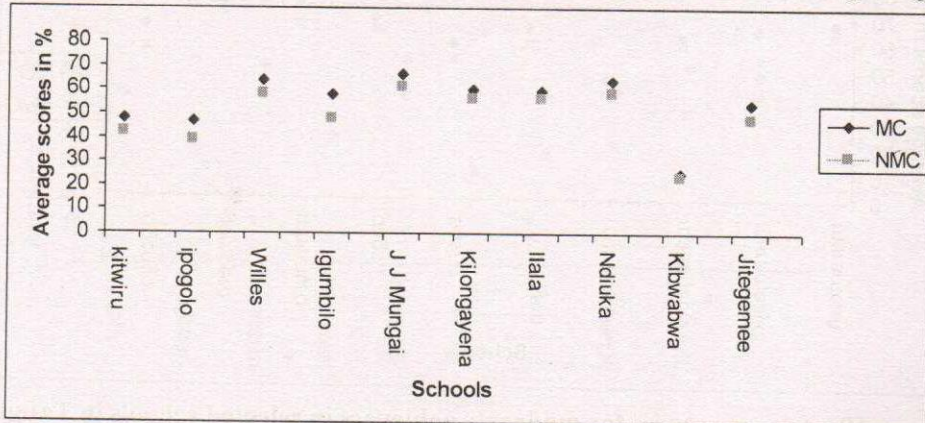


Figure 7: Average scores for moderate achievers in selected schools in Iringa Region



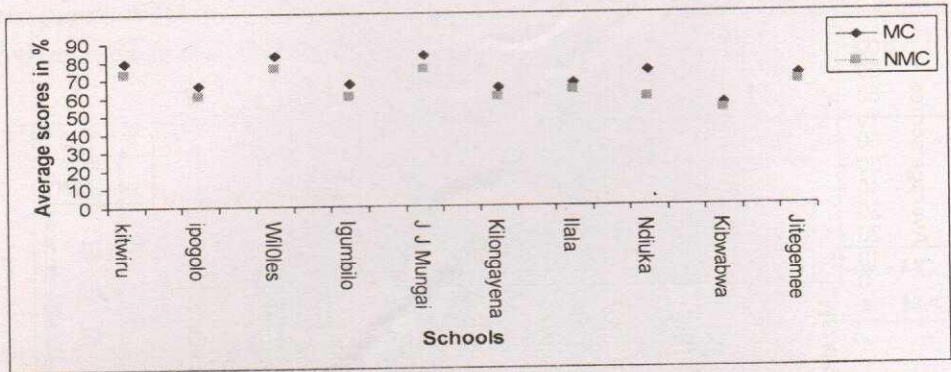


Figure 8: Average scores for high achievers in selected schools in Iringa Region

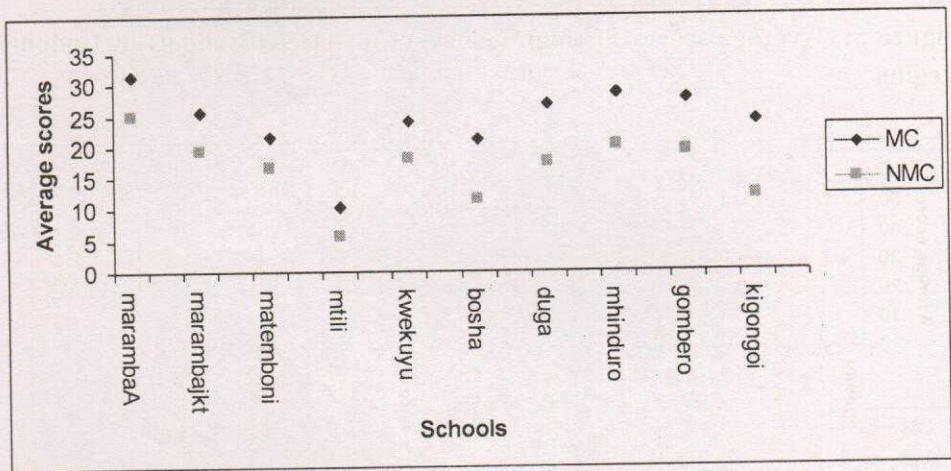


Figure 9: Average scores for low achievers in selected schools in Tanga Region

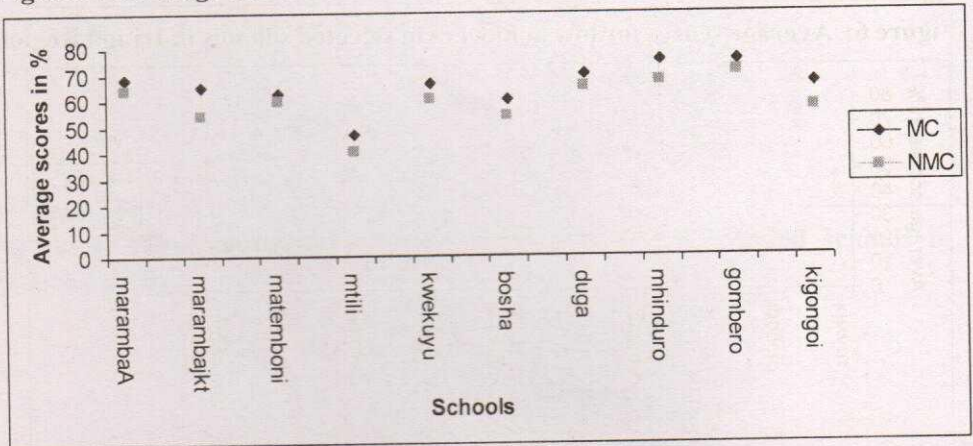


Figure 10: Average scores for moderate achievers in selected schools in Tanga Region



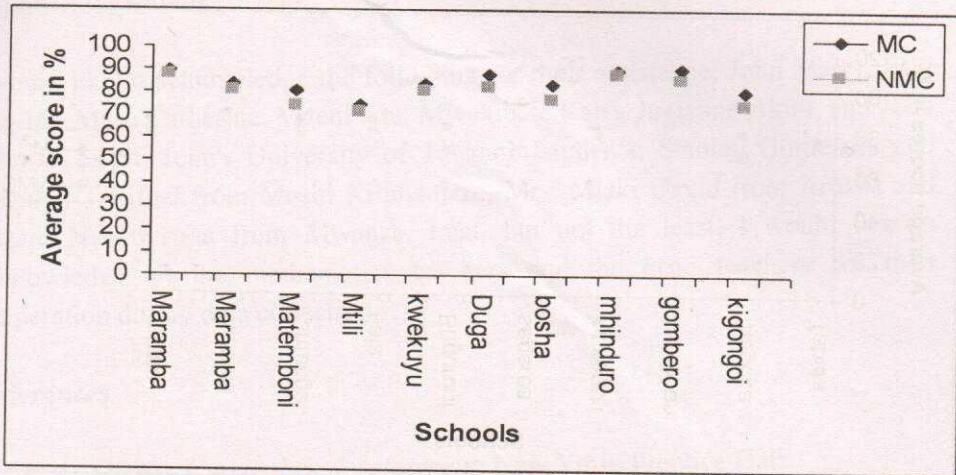


Figure 11: Average scores for high achievers in selected schools in Tanga Region

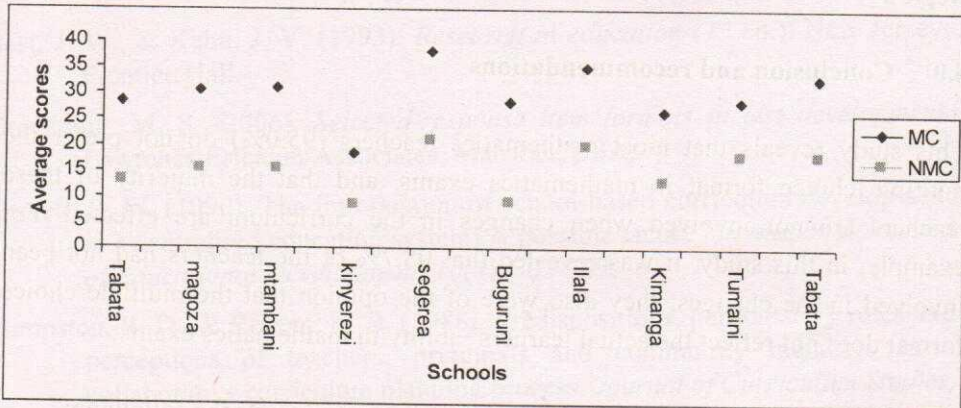


Figure 12: Average scores for low achievers in selected schools in DSM Region

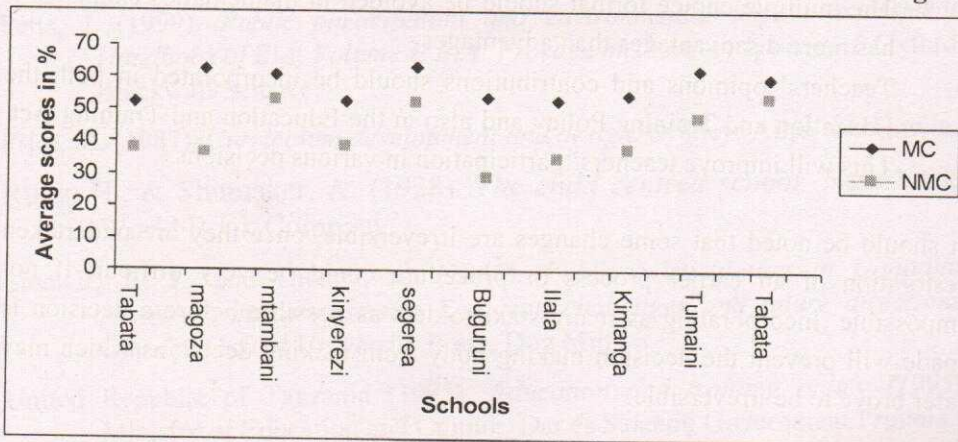


Figure 13: Average scores for moderate achievers in selected schools in DSM Region



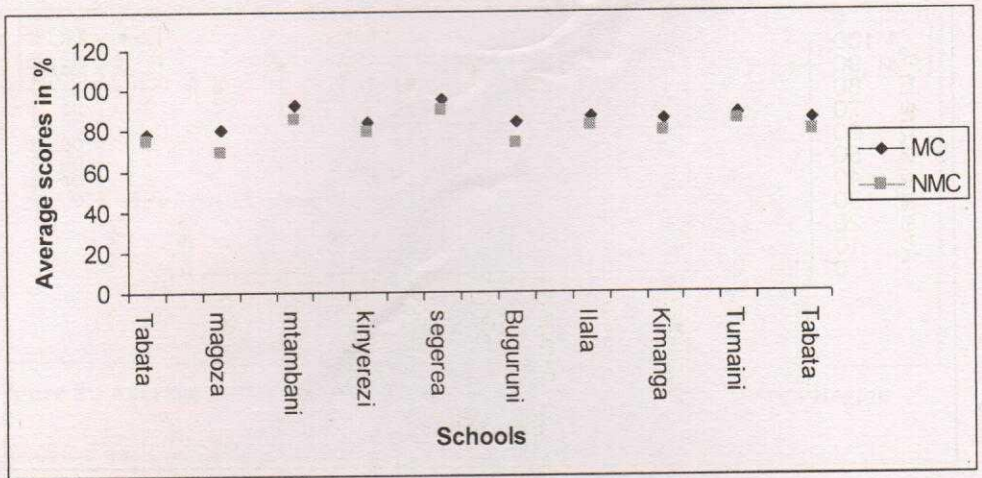


Figure 14: Average scores for high achievers in selected schools in DSM Region

### 8.0 Conclusion and recommendations

This study reveals that most mathematics teachers (95.0%) do not prefer the multiple choice format in mathematics exams, and that the majority of these teachers are not involved when changes in the curriculum are effected. For example, in this study, it was revealed that 98.7% of the teachers had not been involved in the changes; they also were of the opinion that the multiple choice format does not reflect the actual learners' ability in mathematics exams.

Following such observations, the study therefore recommends the following:

- The multiple choice format should be avoided in mathematics exams as it has more disadvantages than advantages.
- Teachers' opinions and contributions should be incorporated in both the Education and Training Policy and also in the Education and Training Act. This will improve teachers' participation in various decisions.

It should be noted that some changes are irreversible, once they are undertaken restoration of an earlier process or procedure could be very difficult if not impossible. Incorporating as many stakeholders as possible before a decision is made will prevent the decision making body from making decisions which may later prove to be irreversible.



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