
A STUDY ON QUALITY OF MATHEMATICS TEACHERS IN CONTENT MASTERY IN PRIMARY SCHOOLS OF KADUNA STATE

BY

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ABSTRACT

The study looked at some aspects of mathematics teachers' competences during a universal Basic Education Board retraining workshop for primary school teachers in Zaria. These aspects include the teacher's competences in common content knowledge (CCK), pedagogical content knowledge (PCK) and special content knowledge (SCK). Out of 400 primary school teachers present during the workshop, 50 teachers were purposely selected for the study. A test of 50 questions was administered to the teachers at the beginning and at the end of the workshop. The test covered the 3 areas mentioned above. Two experts in mathematics education validated the test and the reliability coefficient was calculated to be 0.85. One group pre-test and posttest was adopted for the study. The findings include; Primary school teachers do not have adequate mastery of the 3 domains (CCK, PCK and SCK). No significant differences was found between the performance of male and female teachers with $t=0.6$. More so, No significant difference was found between the performance of the less experienced teachers and that of more experienced teachers. Therefore, it recommended that teacher training institutions should revise the NCE curriculum to cover the 3 domains.

INTRODUCTION

Teaching is one of the most important professions in the world. It is through teaching and learning knowledge, values and ideals are passed from one generation to another. The teacher is said to be the custodian of knowledge and values the society expect their children to learn (Lassa, 1984). In other words, Ukeje (1991) asserts that education is the door that leads to modernization and it is the teacher who holds the key that unlocks the door. It is not surprising that the Federal Republic of Nigeria National Policy on Education (FRN, 2010) stated that no nation can rise above its level of education. More so, it is the reason that when pupils fail in examination, their teachers are first to be blamed.

Quality of a good teacher as described by Ehrenberg and Brewer (1994), Ferguson and Ladd (1996) includes strong academic skills, appropriate formal training in the field which they teach and several years of teaching experience. However, the quality and quantity of mathematics and science teachers produced in Nigeria in the last seven years has declined (Ali, 2000). Moreso, research has shown that some primary school teachers themselves perform poorly in the subject they teach i.e. mathematics (Lassa 1979, Osibodu 1984, Okon 1995 and Musa 2011). Furthermore Obioma (2005) reported that majority of primary mathematics teachers demonstrated competencies comparable to those of the pupils they teach instead of the fundamental assumption that the teachers should master more content than the pupils they teach.

Similarly, Harbor-Peters and Ogomaka (1991) conducted a research on 600 mathematic teachers in South East Nigeria. The teachers were given test based on common entrance examination questions. The researchers found out that the teachers scored only 55.18 percent of primary school mathematics content. This is not good enough. This makes the writers of this work to investigate the problem of teachers' poor performance in primary mathematics content further.

The above mentioned studies tested only common content knowledge. The researchers of this work wish to investigate the competence of teachers further in three domains; the common content knowledge (cck); pedagogical content knowledge (pck) and special content knowledge (sck).

In order to improve the teachers knowledge states Universal Basic Education Boards Organize retraining programmes for their teachers. In addition, the National Teachers Institute in collaboration with the Millennium Development Goals (MDGs) organizes such workshop for teachers from 2006 annually (NTI, 2009). However, Musa (2011) reported that the said MDGs workshops have very little impact on teacher's efficiency and effectiveness because the trainings are superficial. The training material does not normally cover some demanding aspects in geometry and problems involving fractions and averages. Also the training does not cover the domains mentioned above.

Another aspect of teacher quality is years of teaching experience. It is said that experience is the best teacher. That is one of the reasons why older teachers earn more than the new teachers. However, Harbor Peters and Ogomaka (1991) did not find any significant difference between the mean score of the experienced teachers and the mean score of the less experienced teachers.

Another aspect of this study is gender. Odili (2005) observed that our educational institutions produce more female teachers than male teacher,

specifically; the ratio of female teachers to male teachers is 3: 1. This research work will also want to find out if there is significant difference between the mean score of female teacher and that of their male counterparts in content mastery.

Mathematical Knowledge For teaching

According to Schulman (1986); teacher's knowledge can be categorized as follows;

- I. Content knowledge: This is also known as common content knowledge (CCK). This includes according to Schulman (1987) in Ball (2008) knowledge of a subject, facts, concepts and its structure.
- II. General Pedagogical Knowledge; with special references to those broad principles and strategies of classroom management and organization.
- III. Curriculum knowledge.
- IV. Pedagogical content knowledge: this special amalgam of content and pedagogy that is uniquely the province of teacher.
- V. Knowledge of learners and the characteristics.
- VI. Knowledge of educational context.
- VII. Knowledge of educational ends.

Building on Schulman's work, Ball (2008) and her colleagues developed a practice based theory of pedagogical content knowledge. Ball (2008) defined pedagogical content knowledge (PCK) as "the most useful forms of representation of those ideas, the most useful analogies, illustrations, examples, explanation and demonstration, i.e. in a word ,the most useful ways of representing and formulating the subject to make it comprehensive for others.

In addition to Schulman works Ball (2008) introduced special content knowledge (SCK). This is a distinctive mathematical knowledge needed to carry the work of teaching. With this type of knowledge teacher need not to understand that something is so,

the teacher must further understand why it's so. For example, the differences in formulae for finding the volume of cylinder and that of cone πr^2h and $\frac{1}{3}\pi r^2h$. For a teacher to have special context knowledge *should* be able to understand when an answer is incorrect and why it's incorrect. This knowledge according to Ball (2008) is beyond what is called error analysis in mathematics.

Furthermore Rowland and Turner (2008) described mathematics subject knowledge for teaching as substantive, syntactic and pedagogical content knowledge. According to Rowland and Turner (2008) substantive knowledge encompasses the key facts, concepts, principles, structures and explanatory frameworks in a discipline; whereas syntactic subject matter knowledge concerns the rules of evidence and warrants of truth within that discipline.

Statement of the problem

Primary Education is the Foundation of higher Education. If the foundation is weak higher education will not be sound. Unfortunately researches conducted by Lassa (1979) in some Northern states; Harbor Peters (1991) in South East of Nigeria; Ali (2000) in Edo state and Musa (2011) in Sabon Gari Local Government in Kaduna state showed that primary teachers do not have adequate mastery of primary school mathematics content. The research works mentioned above investigated only one aspect of teacher knowledge common content knowledge (cck). This work intends to find out whether teachers of mathematics in the North Zone of Kaduna state have adequate mathematical knowledge 3 domains (cck, pck and sck) to effectively teach in the primary school.

This paper therefore intends to:

Find out the level of mastery of primary school mathematics in common content knowledge, pedagogical content knowledge and special content knowledge.

Find out whether the years of teaching experience have any influence in terms of mastery of mathematic content.

Find out if there exist gender differences among teachers in terms of their knowledge of the primary school mathematics content.

RESEARCH QUESTIONS

The following research questions were asked to guide the study:

1. What is the level of primary school mathematics teachers' mastery in the three domains mentioned above?
2. Are more experienced teachers better in mastery of some primary mathematics content than the less experienced teachers?
3. Is there any difference between the scores of male and female mathematics teachers in primary mathematics content mastery?

HYPOTHESES

The following hypotheses were formulated based on the above research questions.

HQ1: Primary mathematics teachers do not have adequate mastery of primary mathematic content.

HQ2: There is no significant difference between the performance of more experienced teachers and that of less experienced teachers.

HQ3: There is no significant difference between the scores of male and female teachers in primary mathematic test content mastery.

METHODOLOGY

The population of the study consisted of all the teachers in Northern Senatorial Zone of Kaduna State. The sample was made up of 400 primary teachers from seven local Governments of the above zone. Then, 50 teachers were purposely selected for

the study because they obtained their NCE in Mathematics and Mathematics related courses. A test of 50 questions which covered mathematical content knowledge (mck), pedagogical content knowledge (pck) and special content knowledge (sck) which was validated by 2 experts served as the instrument of the study. The reliability coefficient was calculated to be 0.85 using split half method.

One group pretest and posttest design was used. The subject was pretested at the beginning of the

H01: Primary mathematics teachers do not have adequate mastery of primary mathematic content, as in (cck, pck, and sck).

workshop and then post tested on the last day of the workshop. The test was administered by the researchers themselves. The teachers were given enough time to answer the questions. The data collected from the test was analyzed using statistical packages for social sciences (spss).

RESULTS AND DISCUSSIONS

Table1; Summary of the Descriptive statistics of Mastery of primary mathematics Content Test

	N	Maximum Score	Minimum Score	Mean	Std deviation
Score	50	84	0	34.54	23.4

From table 1, it can be seen that the scores of the teachers in Primary Mathematics Content Test (MPMCT) range from 0% to 84%. In addition, the mean score for the fifty teachers is 34.5%, which falls below the mean got by Harbors Peters (1991) and that of Lassa (1979). One of the reasons that might cause the difference could be that this study used essay questions while the earlier studies used objective

questions which can enable the teachers to guess the answers. Another reason could be the location of the study. Harbors Peters conducted her study in South East of Nigeria, which is educationally more advantaged while this study was conducted in the Northern part of Nigeria, which is educational less advantaged.

H02: There is no significant difference between the performance of more experienced teachers and that of less experienced teachers.

Table2: Summary of inferential statistics of Mastery of Mathematics Content Test.

	N	Df	Mean	t	P	Decision
More experienced Teachers (10 years & above)	22	20	24.0		1.099	0.277 Not significant
Less experienced Teachers (Less than 10 years)	28	26	21.48			

From the results indicated in table 2, it is clear that years of teaching experience do not count in the performance of teachers in Primary Mathematics Content Test Mastery (PMCTM) with $p=0.277$ which is

greater than 0.05 . This finding agrees with the findings of Harbor Peters (1991) which stated that more experienced teachers did not perform better than the

less experienced teachers in primary mathematics content mastery test.

H03: There is no significant difference between the scores of male and female teachers in primary mathematic test content mastery.

Table 3; Summary of performance of teachers in Primary Mathematics Content Test Mastery according to their gender

Sex	N	\bar{x}	SD	t	P	Decision
Male	27	37.89	23.611			
Female	23	30.61	23.039			
				0.676	0.52	Not significant

This shows that the male perform better than the female teachers with mean 37.89 and 30.61 respectively. Also with $p=0.52$ which is greater than 0.05 its shows that there is no significant difference between the performance of male and female teachers in primary mathematics test mastery. This is in line with findings of Holden (1998). And Leahey and Guo (2001) which show that at early age that there is no difference between male and female pupils; but boys tends to progress more quickly as they become older than their female counterparts.

FINDINGS

The first hypothesis stated: Primary school teachers do not have mastery of primary school mathematics, content. This hypothesis was retained because the mean score of the teachers was 34.8%.

The second hypothesis was also retained at 0.05 level of significant. The P value 0.277, which shows that there is no significance difference between the scores of the more experienced teachers and that of the less experienced teachers.

The third hypothesis was rejected, as the mean of the male teacher in PMCTM was higher than that of the female teacher. The mean score of the male was 37 and that of the female was 30. The t value is equal to 0.676 and the p value is 0.52, which shows

that the hypothesis was retained at 0.05 level of significant.

CONCLUSION

It was surprising to see that teachers cannot perform well in a test such as primary mathematics content test. Also more experienced teachers were not better than the less experienced teachers; the reason may be the older teachers have not been teaching senior primary mathematics content where the questions were chosen from. This implies that primary school pupils are not well taught by their teachers. Ideally, teachers are supposed to know more than their pupils. Unfortunately, the research shows that this is not the case. This poor mastery of primary mathematic content by the teacher may be one of the causes of persistent failure in mathematics at NECO and WAEC senior secondary school certificate examinations. Therefore, government at various levels and teacher training institutions should make joint effort to raise the standard of primary school teaching.

RECOMMENDATIONS

Based on the findings of the study, the writers of this work wish to give the following recommendations:

1. Teacher training institutions should raise the standard of teachers they produce, through in cooperating primary school and junior secondary school content in N.C.E curriculum.
2. State universal Education Board (UBEC) should continue to organize rigorous re-training workshops in order to improve the standard of teachers in mathematics content.
3. Special allowance should be paid to science and mathematics teachers to make the subject more attractive
4. Teachers should be encouraged to go for in-service courses

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