

Teachers' gender and primary school pupils' achievement in Mathematics in Kenya

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Abstract

This descriptive causal comparative study examined the relationship between teacher's gender and in primary schools pupils' performance in mathematics in Kenya. The study objective was to investigate the effect of teachers' gender on primary schools pupils' mathematics achievement in Vihiga district Kenya. The study was conducted through an ex-post facto research design. A total of 46 mathematics teachers were sampled from 153 schools. Data was collected using a Mathematics Teacher's Questionnaire (MTQ). Results of a Mathematics Achievement Test (MAT) were used as a measure of teachers' contribution towards pupils' academic achievement. Mathematics education experts reviewed the MTQ for content, face and construct validity. A pilot study was also carried out in 2 primary schools outside the district of study. The data collected was translated into frequency counts which were presented in pie and bar charts. Chi square statistic was then used to establish whether there was a relationship between teachers' gender and its contribution towards pupils' achievement in mathematics. The findings of the study showed that there was a significant relationship between teachers' gender and pupils' achievement in primary mathematics. The results of this study suggest that more female teachers be trained and deployed to teach mathematics at upper primary school levels since their contribution towards pupils' performance is profound.

Keywords: teachers' gender, primary school, pupil's achievement in mathematics

Introduction

Mathematics is a fundamental part of human thought and logic (Woo, 2004). In the learning of mathematics and the consequent students' achievement in the subject, the teacher is the single most important factor (Sander and Rivers, 1996). Teachers in Kenya may be forced to abandon traditional methods of teaching primary school mathematics where pupils' learning is measured by their ability to recite multiplication tables and to store basic calculation solutions in memory instead of conceptual knowledge of principles (Cowan et al. in Kigotho, 2013). Mathematics teaching through rapid mental calculations and evaluation procedures where pupils' progress is measured on how quickly they are able to answer basic mathematical questions may have to be practices of the past if Kenya is to compete at the global arena (Cowan et al. in Kigotho, 2013). The best way to teach primary mathematics is to let pupils understand numbers and the quantities that those numbers represent (Ibid).

As to who should teach primary mathematics for higher students' achievement, research results are abound (UNESCO, 2006). Increasing the number of female teachers is often recommended as a strategy for raising enrolment and achievement among girls and women (Chege and Sifuna, 2006; UNESCO, 2006). But unless female and male teachers are trained to be sensitive to gender equity, increasing the number of female teachers alone may not have the desired result. At early stage of mathematics, the primary school teacher in her daily classroom work is 'at home'. The problems she talks with her pupils are those of her own traditional domain (Phillida, 1995). Walden and Walkerdine (1985) remarks that in early mathematics, domestic tasks (weighing, measuring and shopping) are used as a matter of course. This allows stereotypically feminine activities to be used as the site for the teaching of mathematics. Teachers often perpetuate sex role stereotypes directly and indirectly through what they teach and through their behavior, their interaction, different skills and abilities of girls and boys. Female teachers may inspire girls to higher achievement and accomplishment or direct them towards conformity with prevailing domestic ideals. Having qualified female teachers is therefore important but not sufficient. They must also understand sex role stereotypes and their potential effects.

According to Agrighabo and Mji (2004), the conservative, reproductive nature and function of education continues from pre-service to profession teaching. They contend that the status of sex role stereotype does not therefore seem to be countered by the teacher education colleges and that there is a positive association between teacher gender and pupils' achievement. Chudger and Sanker (2008) asserts that being in a female teacher's classroom is advantageous for language learning but teacher gender has no effect on mathematics learning.

However Casey (2010) found out that if a female teacher has anxiety of her mathematics skills, then this will be transferred more likely to female students who will acquire the impression that boys are better than girls in mathematics and these will cause the students to perform poorer in mathematics. Walker and Walkerdine (1985) were interested in exploring how it is that girls who start off as good as or better than boys in mathematics gradually fall behind in the subject, generally ending up mathematically incompetent. They discovered gender stereotyping of school knowledge. Mathematics and science are characteristically seen as objective, high level, high status and quit essentially a male subject. Languages and the arts in contrast are seen as softer, less vigorous subject for girls rather than boys. As another consequence of the stereotyping process, men typically end up teaching the 'male' subjects and women the 'female' ones (Phillida, 1995). Where schools are segregated by gender, the availability and quality of female teachers crucially affect enrolment, achievement and attainment. Despite their predominance in teacher training colleges in the country, women are a minority in the teaching force (Chege and Sifuna, 2006)

The need to juggle teaching duties and domestic responsibilities accounts for a reportedly high rate of absenteeism, sometimes this leads to the abandonment of the profession or a decline in productivity among female teachers (Chege and Sifuna, 2006). Female teachers if adequately trained can identify girls at risk of dropping out and provide the special care and encouragement needed to keep them in school (Elsanabary, 1993). Stake and Katz (2001) argued that female teachers were more positive that their male counterparts in their attitudes and behaviors towards pupils. This had a direct bearing on achievement for classes taught by female teachers. On the contrary, Driessen (2007) insisted that teachers' sex had no effect whatsoever on the achievement, attitude or behavior of pupils.

Purpose of the study

The purpose of this study was to determine and describe the nature of the relationship between teachers' gender and its contribution towards pupils' achievement in mathematics at primary school level in Kenya. The results would also inform policy formulation on affirmative action with respect to mathematics teacher education in Kenya.

Research question

The study was guided by the following main research question:

Are there any significant differences in mathematics achievement of students (classes) that were taught by male and female teachers?

Methodology and Research design

The study employed an ex-post facto research design in which from a total of 153 primary school teachers in Vihiga district of Kenya, a total of 46 teachers comprising of 26 P1 (Primary 1) teachers, 16 ATS (Approved Teacher Status) teachers and 4 graduate teachers who taught class 8 mathematics in public primary schools were randomly selected to take part in the study. The sample constituted 12 females and 34 male teachers (See Table 1). A questionnaire for the mathematics teachers was developed and first presented to mathematics educators who read through and endorsed it with respect to face, construct and content validity. Their views together with the results of piloting in 2 primary schools in the neighboring district (number of teachers?) were used in revising the instruments (See Appendix 1). The instrument yielded similar data from similar respondents over time with reliability coefficient of 1.0. The rule of thumb is that alpha values of at least 0.7 are considered optimal (Kulter, 2007).

Table 1: Gender of respondents

Gender	Number (%)
Male	34 (74%)
Female	12 (26%)

The researcher visited the 46 sampled schools and administered the questionnaire to the respondents in person. Frequency counts of responses were presented in pie charts and contingency tables for teachers' gender and pupils' achievement in mathematics was drawn and chi square value computed. Calculated chi square value was compared with critical chi-square table value at 0.05 alpha level to establish if there were any associations between teachers' gender and pupils' achievement in mathematics.

Data analysis

Chi-square statistic was used to analyze the data. A contingency table for teachers' gender and pupils' achievement in mathematics was drawn and chi-square value computed. The calculated chi-square value was compared with critical chi-square table value at a significance level of 0.05 to establish if there were any

associations between teachers' gender and pupils' achievement in mathematics.

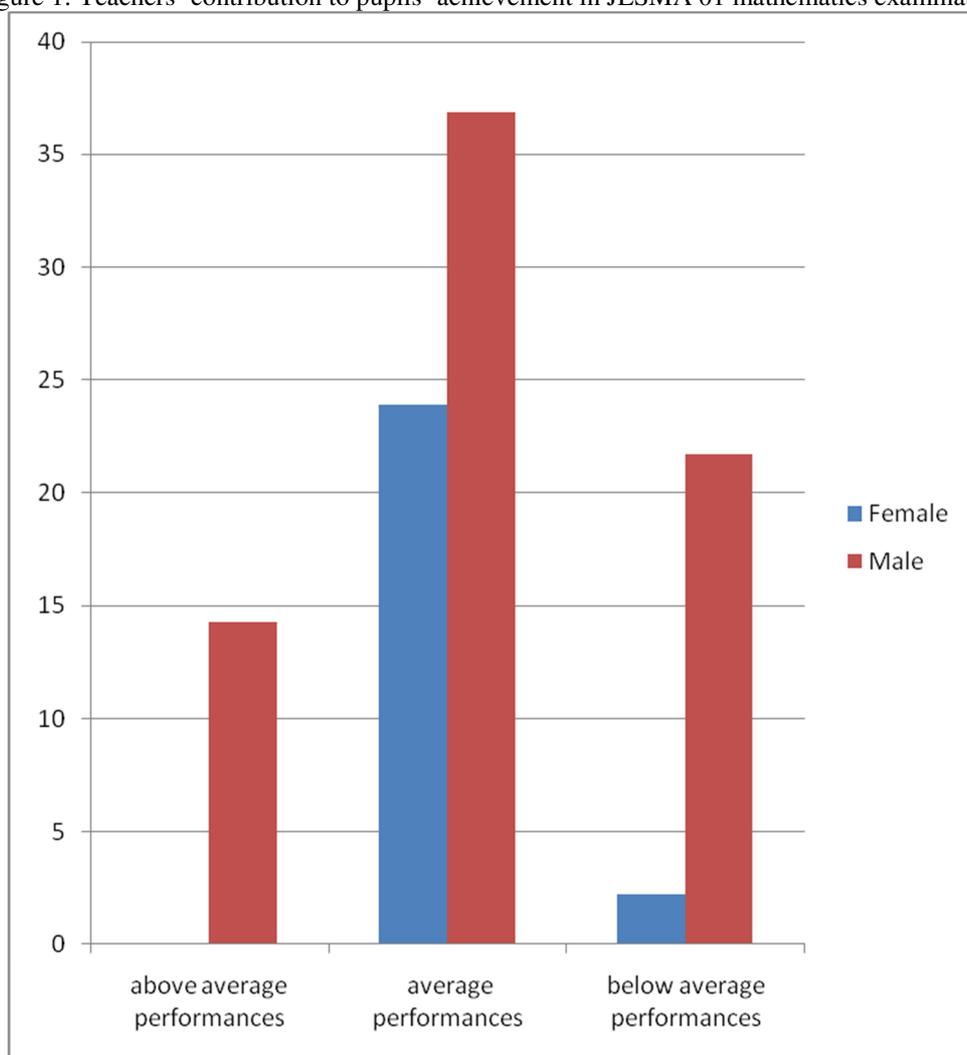
Results and discussion

There were more male than female teachers of mathematics in the sampled schools. More male teachers (27.7%) contributed to students' below average performance in mathematics than female teachers (2.2%). None of the female teachers contributed to above average performance while 14.3% of the female teachers contribution to above average performance by pupils (See Table 2 & Figure 1).

Table 2: Teachers' gender and their contribution to pupils' achievement in JESMA 01 mathematics examination

Gender of teacher	No of teachers with above average performances	No of teachers with average performances	No of teachers with below average performances	Total
Female	0(0%)	11(23.9%)	1(2.2%)	12
Male	7(14.3%)	17(36.9%)	10(21.7%)	34
Total	7	28	11	46

Figure 1: Teachers' contribution to pupils' achievement in JESMA 01 mathematics examination



For most pupils, performance at primary school predicts subsequent mathematical achievement and ability to manage the numerical demands of everyday life and adulthood (Kigotho, 2013). Whereas a child's attainment in mathematics could be influenced by family and school characteristics (Kigotho, 2013), socio- emotional functioning of the child and teachers' gender could have a far reaching impact (Krieg, 2005; UNESCO, 2005; Thomas, 2006; all in Sanker and Chudgar, 2008).

To establish whether there was a relationship between mathematics teachers' gender and students' performance, chi-square was calculated. The chi-square value calculated was 6.65 and was greater than the chi-square critical value of 5.999 at significance level 0.05 for degree of freedom equals 2. This indicated that there was a

significant relationship between mathematics teachers' gender and achievement of pupils in class 8 mathematics. The findings are in concordance with studies supporting the view that regardless of gender student taught by women perform better in mathematics than those taught by men (Barnett, 1980; Agrighabu, 2004; Krieg, 2005; UNESCO, 2005 in Sanker and Chudgar, 2008). Stake and Katz (2001) also argued that availability and quality of mathematics female teachers crucially affect achievement and attainment. To Thomas Dee (2006) in Sanker and Chudgar (2008), girls do better in school when taught by women and boys do better when taught by men. Although mathematics teaching in primary schools in Vihiga district was dominated by male teachers, there is evidence that female teachers had a substantial influence on pupils' performance in mathematics. This phenomenon could be explained by general tendency on the part of female teachers of mathematics who could be paying more efforts to preparing their lessons and creating more appropriate teaching aids. Besides, female teachers are perhaps more willing than their male counterparts to change their presentation and speaking style to be closer to pupils' ways of speaking and build up closer relationship with their pupils hence better performance. In deed research shows that female teachers have different teaching styles that are more favourable with young children (Sanker & Chudgar, 2008).

Conclusion

Based on the results of the study, there was a significant relationship between teachers' gender and their contribution to primary school pupils' achievement in mathematics. The results agree with findings of Barnett (1980) as well as those of Sanker and Chudgar (2008). Consequently, as the ministry of education in Kenya continues to seek ways of improving students' achievement, the government should put in place specific policies and strategies meant to encourage both the girl child and female college students to exhibit interest in learning and teaching primary schools mathematics. UNESCO (2006) in Sanker and Chudgar (2008) argues in favour of hiring more female teachers particularly in developing countries like Kenya so as to improve on girls' enrolment, learning and achievement. Affirmative action to encourage female students to enroll for teacher education programme should be adopted to ensure an increase in the number of female teachers of mathematics in Kenya. Barriers that may prevent women from teaching mathematics at any grade should be dropped (Barnett, 1980).

References

- Agrighabu, A. A. and Mji, A. (2004). *Is Gender a Factor in Mathematics Performance among Nigerian Pre-service Teachers' Sex Roles?* Vol.59 No. 11-12 Pp749-753.
- Barnett, W.J. (1980). Effects of teacher gender on mathematics achievement of first Grade students, Unpublished PhD thesis, Oregon State University, USA
- Casey, J. (2010). *Studying The Science Gender Gap at High School Level, Science in The Moment* PNAS, Pp143
- Chege, F.N and Sifuna, D.N. (2006). *Girls and Women Education in Kenya* Nairobi: Unesco.
- Chudgar, A. and Sanker, D. (2009). *The Relationship Between Teacher Gender and Student Achievement Evidence from five Indian States*, A Journal of Comparative Education Vol.38 Pp 627-644
- El-Sanabary, N. (1993). Middle East and North Africa in E.M King and M.A Hill (Eds) *Women Education in Development Countries Barriers Benefits and Policies*.
- Driesses, G. (2007). *The Feminization of Primary Education Effects on Teachers Sex on Pupils Achievement Attitudes and Behaviours* International Review of Education Volume 52 No.2 Pp183-203.
- Kigotho, W. (2013). Teaching Primary Mathematics (8), The Standard Newspaper, Sept 2013 pg 23
- Kultar, S. (2007). *Qualitative Social Research Methods*, Sage Publications. Los Angeles.
- Phillida, S. (1995). *Psychology in the Classroom*. Wellington Houston, London
- Sanders, W. L. and Rivers, J. L. (1996). Cumulative and Residual Effects of Teachers on Future Academic Achieved University Value Added Research and Assessments Centre.
- Sanker, V. and Chudgar, A. (2008). The relationship between teacher gender and students' achievement: evidence from five Indian states, in Compare: a journal of comparative and international education, 38:5, 627 – 642
- Stake, J. and Katz, J. (2001). Teacher-Pupil Relationship in the Elementary School Classroom Teacher Gender.
- Walden, R. and Walkerdine, V. (1985). *Girls and Mathematics from Primary to Secondary Schooling*, Bedford Way Paper No.9, London Institute of Education.
- Woo, C. (2004). *Applied Mathematics*, Oxford University Press, London

Appendix 1: Mathematics teachers' questionnaire

Dear colleague mathematics teacher, I am Kati Robert a post graduate student at MMUST conducting a research within Vihiga District on the relationship between teacher factors and pupil achievement in mathematics for class 8 pupils 2009. Please answer the questions as best as you can by **ticking** in the box corresponding to the

answer you give or by filling in the space provided. The information you give will be treated with utmost confidentiality.

SECTION A

1. Gender Male Female
2. Indicate your highest academic achievement
- a) CPE/K.C.P.E. d) PI/PII
- b) K.J.S.E. e) Diploma
- c) E.A.C.E./K.C.E./K.C.S.E. f) Bed/Pgde
3. What is your professional qualification?
- a) P3/P2/91 d) MED
- b) S.I./ATS/DIP e) Others specify
- c) BED/PGDE
4. How many times have you prepared the class 8 pupils for K.C.P.E. mathematics?
- a) Once
- b) Between 1 – 4 times
- c) Between 5 – 10 times
- d) Over ten times
5. For how long had you been teaching Mathematics to the 2009 candidates' class?
- a) Since they were in class 4
- b) Since they were in class 5
- c) Since they were in class 6
- d) Since they were in class 7
- e) While in class eight only
6. Is teaching in your school **vertical** or **horizontal**? Vertical (you teach class 6, then move with them to class 8). Horizontal (you teach class 6 then somebody else teaches in class 7 etc)
- Vertical Horizontal
7. What was the class 8 mathematics mean score in JESMA 01 in 2009?-----

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