

Assessment of Gender Differences in Mathematics Counselling Needs among Secondary School Students in Maara District, Kenya

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Abstract

School counsellors have been instrumental in assisting students to overcome barriers towards excellent mathematics achievement. However, boys seem to outperform girls in spite of both genders being exposed to similar mathematics learning conditions and intervention measures. Thus, to enhance school counsellors' efforts in narrowing the gender gap in mathematics achievement, this study sought to determine gender differences in mathematics counselling needs among secondary school students in Maara district, Kenya. The descriptive survey research design was adapted for the study whose respondents were derived from a target population of 12,371 students and teachers in the district. Additionally, questionnaires were used for data collection. The findings indicated that there existed statistically significant gender differences in mathematics counselling needs among secondary school students. Therefore, it was recommended that gender specific mathematics counselling strategies, programmes and advocacy services be used in order to narrow the gender gap and improve overall achievement in the subject.

Key Terms: Gender, Counselling, Mathematics, Achievement.

1. Introduction

Mathematics education is vital for realization of the vision 2030 in Kenya. However, achievement in the subject among secondary school students is marred with diverse challenges and misconceptions (Mwenda, Nyaga, Muthaa & Reche, 2013) which may be of concern to school counsellors. Some of these challenges and misconceptions may be innate to individual students such as low mathematics self concept and anxiety during mathematics tests, while others may externally emerge from the environment such as teacher centered instructional methods, inadequate mathematics teaching/learning resources and the confusing mathematics language (Githua, 2013). In spite of the muddled mathematics learning environment, boys seem to outperform girls in the students' efforts to maximize achievement in the subject. This gender gap in mathematics achievement appears to get even more amplified among students at high achievement levels (Ellison & Swanson, 2010). Therefore, it can be inferred that there exist intricate gender related factors in mathematics learning among the students. For instance, the social and cultural environment has been blamed for mathematics achievement disparities among boys and girls of similar innate abilities (Kane & Mertz, 2012). Additionally, boys and girls tend to differ in their mathematics attitudinal and motivational scores (Manoa, Indoshi & Othuon, 2011) which are major factors in academic achievement. Besides, changes in social, cultural, legal and political factors during the 1960s in the United States of America lead to substantial reduction of the gender gap in mathematics achievement among students (Kane & Mertz, 2012). Thus, in an attempt to narrow the gender gap and improve overall achievement, there is need for gender specific intervention programmes related to mathematics study among secondary school students. Hence, to facilitate school counsellors in the development of more gender based mathematics counselling strategies, programmes and advocacy services, this study sought to investigate gender differences in mathematics counselling needs among secondary school students in Maara district, Kenya.

2. Objectives of the Study

The objective of this study was to determine whether statistically significant gender differences exist in mathematics counselling needs among secondary school students.

3. Methodology

The descriptive survey research design was adapted for this study while purposive sampling and simple random sampling techniques were used to obtain a convenient sample of 360 Form Three Students, 9 Heads of Mathematics Departments and 9 Heads of Counselling Departments from 9 secondary schools within Maara District, Kenya. Questionnaires containing test items on demographic characteristics of the respondents and gender differences in mathematics counselling needs among secondary school students were used to obtain the required data. The data were collected during the month of September 2012 with approval from the National

Council of Science and Technology. The obtained data were coded and entered into the computer for analysis using SPSS version 17.0. Chi Square Test Statistic, the range, means and percentages were used to analyze the data.

4. Results and Discussion

This section first presents the results obtained from the study then followed by discussions of those results.

4.1 Demographic Characteristics

Information obtained on demographic characteristics was meant to reveal the nature of the study respondents.

4.1.1 Students' Demographic Characteristics

The students' demographic data analysis results revealed that 47% of student participants were male while 53% were female. This anomaly may be attributed to the simple random sampling technique used in selecting the form three student participants who were streamed according to subjects of specialization. Regarding the students' age, the range was 4 years with the majority comprising 49% being 17 years old. The students' mathematics achievement by gender indicated a mean score of 36% for male students and 27% for the female counterparts. This implies that there exist gender related factors that limit students' achievement in mathematics at secondary school examinations and therefore, gender specific interventions may narrow the gender gap and facilitate improvement in mathematics achievement for the students.

4.1.2 Mathematics Heads' Demographic Characteristics

Concerning the heads of mathematics departments, data obtained indicated that 87.8% were male while only 22.2% were female. This finding supports the views of Steinberg (2007) who suggests that girls associate mathematics with masculinity because of a lack of substantial number of successful female mathematician role models. Further, the majority comprising 44.4% were within the age bracket 51 years to 60 years, 33.3% were within 41 years to 50 years age bracket while 22.2% were aged 31 years to 40 years. This means that the heads of mathematics departments were experienced in the profession. Regarding professional qualifications, majority of the heads of mathematics departments comprising 77.8% held a bachelors degree while 22.2% had a diploma in education.

4.1.3 Counselling Heads' Demographic Characteristics

The third group of respondents comprised the heads of counselling departments whose data analysis results indicated that 88.9% were female while 11.1% were male. This implies that much of the counselling work is delegated to female teachers possibly based on the belief that females are better at nurturing than the males. Moreover, the majority of the heads of counselling departments comprising 55.6% were within the age bracket 41 years to 50 years, 33.3% were within 31 years to 40 years whereas 11.1% were aged 21 years to 30 years. Unfortunately, most of the heads of counselling departments comprising 77.8% had no special training in guidance and counselling while 22.2% were trained at the certificate level.

4.2 Gender Differences and Mathematics Counselling needs

In the attempt to determine gender differences in mathematics counseling needs among secondary school students, the following null hypothesis was tested:

H_0 : There is no statistically significant gender difference in mathematics counselling needs among secondary school students.

The data about respondents' views on items regarding gender differences in mathematics counselling needs among secondary school students were analyzed using Chi Square Test Statistic and tested at a significance level of .05. In addition, percentage analysis of the respondents' views was computed in order to determine the trend of the Chi Square Test Statistic results.

4.2.1 Students' Views Data Analysis Results

The Chi Square Test Statistic obtained after analyzing students' responses on items regarding gender differences in mathematics counselling needs among secondary school students was .000. Since the p-value is less than .05, the null hypothesis was rejected meaning that there was a statistically significant gender difference in mathematics counselling needs among the students. To determine the trend of the Chi Square Test Statistic results, percentage analysis of the responses was computed and represented on table 1.

Table 1. Students' Views on Gender and Mathematics Counselling Needs

Statements	No (%)	Yes (%)
Boys are more active than girls in mathematics discussion groups	32.8	67.2
Boys have more time than girls for practicing mathematics at home	40.8	59.2
Boys are more talented in mathematics compared to girls of the same age	33.9	66.1
There are more male than female successful mathematicians	38.6	61.4
Mathematics is required more in masculine than feminine careers	38.3	61.7
Boys require less effort than girls to succeed in mathematics	35.0	65.0
Boys schools perform better than girls schools in mathematics	33.3	66.7
Boys are more exposed to mathematics related activities compared to girls	26.9	73.1

The information on Table 1 indicates that boys were more favourably endowed in the mathematics education and achievement compared to girls. It appears that boys were more active than girls in mathematics discussion groups; had more time than girls for practicing mathematics at home; were more talented in mathematics compared to girls of the same age; required less effort than girls to succeed in mathematics and were more exposed to mathematics related activities than girls. Further, boys' schools seemed to perform better than girls' schools in mathematics. The information on Table 1 also indicated that there were more of the male than female successful mathematicians. Besides, most of the respondents also suggested that mathematics was required more in masculine than feminine careers. It is therefore evident that girls may exhibit more counselling needs in mathematics education compared to boys.

4.2.2 Mathematics Heads' Views Data Analysis Results

The heads of mathematics departments were asked to indicate whether boys were more affected than girls by mathematics counselling needs. A Chi Square Test was carried out to determine whether there were differences in the expected and observed frequencies obtained. The Chi Square Test Statistic obtained from the data analysis was .020. Since the p-value is less than .05, the null hypothesis was rejected. This means that there was a statistically significant gender difference in mathematics counselling needs among the secondary school students. Further, as indicated on Table 2, percentage analysis was done to determine the trend of the obtained Chi Square Test Statistic results.

Table 2. Mathematics Heads' Opinions on Gender and Mathematics Counselling Needs

Statements	Boys (%)	Girls (%)
Who need more encouragement in the learning of mathematics?	11.1	88.9
What gender is more motivated in mathematics education?	88.9	11.1
Who are you more likely to advice on taking advanced mathematics courses?	88.9	11.1
Who are more confident about their mathematics ability?	88.9	11.1
Given a choice, what gender would you prefer to teach mathematics?	100.0	0.0
Who are more comfortable with low mathematics achievement?	11.1	88.9
With whom are you more likely to wrap concepts in non technical terms when teaching	11.1	88.9

According to the heads of mathematics departments' opinions specified on Table 2, more boys than girls were motivated in mathematics education, advised on taking advanced mathematics courses and also confident about their mathematics ability. Contrary, more girls than boys needed encouragement in the learning of mathematics; were more comfortable with low mathematics achievement and teachers tended to wrap concepts in non technical terms when teaching the girls compared to boys. In addition, all the heads of mathematics departments involved in the study preferred teaching mathematics to boys than the girls.

4.2.3 Counselling Heads' Views Data Analysis Results

The Chi Square Test Statistic computed from heads of counselling departments' responses on items regarding gender differences in mathematics counselling needs among secondary school students was .020. Given that the p-value is less than .05, the null hypothesis was rejected leading to the acceptance of the alternative hypothesis

indicating that there was a statistically significant gender difference in mathematics counselling needs among the students. To determine the direction of the obtained Chi Square Test Statistic results, percentage analysis of the respondents' views represented on Table 3 was computed.

Table 3. Counselling Heads' Opinions on Gender and Mathematics Counselling Needs

Statements	Boys (%)	Girls (%)
What gender is more likely to seek counselling help about mathematics study	88.9	11.1
Who are more motivated in mathematics education if taught by a teacher of similar gender	11.1	88.9
Whose mathematics study is affected more by chores at home	11.1	88.9
Who are more likely to view themselves as lacking in mathematics ability	11.1	88.9
Who are more open in seeking counselling help about low achievement in mathematics	88.9	11.1
Who are more likely to choose mathematics oriented careers	88.9	11.1

The Results on Table 3 indicate that 88.9% of the girls were more affected by house chores with respect to mathematics achievement; were more motivated when taught by a female teacher and were more likely to view themselves as lacking in mathematics ability compared to 11.1% of the boys. In contrast, 88.9% of the boys were more likely to choose mathematics oriented careers; to seek counselling help about low mathematics achievement and were more open in seeking mathematics counselling help compared to 11.1% of the girls.

4.3 Discussion

It is apparent from the data analysis results on gender differences in mathematics students' counselling needs that girls face more challenges than boys in the mathematics study and achievement. These findings concur with Steinberg (2007) consenting that girls come to see mathematics as part of the masculine role and develop negative attitudes towards the subject. As a result, the girls have few role models of successful mathematicians as reflected by the higher percentage of male than female heads of mathematics departments in the secondary schools. Consequently, girls are less likely to aspire to enter the mathematics oriented fields like engineering or major in advanced mathematics at the college level of education. Thus, school counsellors can intervene and break this vicious cycle of associating mathematics with masculinity by influencing an appropriate belief system among the girls.

Besides, boys were found to be more confident and motivated than girls in the mathematics education. According to Bassy, Joshua and Asim (2008) males present higher mean scores than females in the various positive mathematics attitudinal variables such as determination, confidence and motivation. This explains the gender disparity observed in mathematics students' counselling needs since attitude correlates positively with mathematics achievement. Hence, School counsellors need to design more of mathematics motivation and confidence building counselling workshops for the female students.

Further, majority of the heads of mathematics departments attested to using non technical terms when explaining mathematical concepts to girls. Steinberg (2007) explains that the habit of wrapping mathematical concepts in non technical terms causes girls to perceive themselves as lacking in mathematics ability. Moreover, in the process of teaching girls, teachers set up expectations that girls would have difficulties with assignments by offering help before it is required. This denies the girls the opportunity to explore, discover and solve mathematics problems on their own. Hence, the girls are unable to develop mathematics confidence. Furthermore, the psychological distress that teachers suffer in trying to simplify mathematical concepts with girls may justify why all the heads of mathematics departments preferred teaching boys to girls.

The study results also indicated that girls viewed themselves as lacking in mathematics ability and therefore preferred other subjects unlike boys who preferred mathematics and sciences. These results support the findings of Bassy *et al.*, (2008) asserting that girls are less likely to receive advice and encouragement to take advanced mathematics courses. This is because of the general belief that females are better at languages and arts while boys are good at mathematics and sciences. Kipronoh (2011) recommends that parents, teachers, siblings and the society at large be fair when encouraging both boys and girls about mathematics study and achievement. Effort should therefore be made in order to hinder the advancement of gender stereotypes in mathematics.

Incidentally, girls were suggested to be more affected in mathematics study by house chores. Supporting these findings, Hyde and Mertz (2009) noted that social and cultural factors determine how girls and boys differ in the mathematics study. Among many cultures, girls seem to be disadvantaged in mathematics home study because they perform more time consuming house chores compared to boys. Moreover, boys are allowed to freely visit their friends late into the night as opposed to girls who must be at home most of the time. It therefore appears

that boys have more time to study and even discuss mathematics problems with friends at home. Hence, through family therapy, school counsellors can advocate for more home study time and a favourable study environment for the girls. Moreover, psychotherapy may be employed to help the girls cope with the many house chores thus creating time for mathematics study at home.

5. Recommendations

Based on the finding of this study, the following recommendations were proposed:

- i. Career counselling that entails inviting successful female professionals in mathematics related fields such as medicine, engineering and architecture should be offered especially to girls in order to motivate them to excel in and pursue mathematics related subjects
- ii. Education stake holders including parents, teachers, school administrators and concerned government and nongovernmental organisations should intentionally create a positive mathematics learning environment among school girls through positive mathematics conversations and by giving incentives that would motivate girls to excel in the subject.
- iii. School counsellors should develop intensive gender specific counselling strategies, programmes and advocacy services that would target mathematics anxiety, confidence building, mathematics self concept, class participation and motivation levels among school girls.
- iv. Mathematics teachers should be encouraged to teach mathematics to girls without wrapping concepts in non technical terms and offering to assist with problem solving before such help has been solicited for. This may assist girls to build more confidence and interest in mathematics study thus boosting their mathematics self concept.

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