Gender attitudes and perceptions towards mathematics performance and enrolment in Rwandan secondary schools

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Abstract
This study aimed at investigating the different gender attitudes and perceptions towards mathematics education. It used questionnaires, interviews and classroom observations to collect data from a sample of 150 participants including 60 females, 84 males' students, as well as 6 male mathematics teachers, who were purposefully selected. The main findings from this study show, in general that, boys and girls demonstrate shared perceptions towards the importance of mathematics subjects. However, boys manifested more negative perceptions towards girls' ability to perform well in mathematics. Besides, some few females also manifested negative perceptions, which can explain their low confidence in mathematics. A particular trend which was highlighted in this study indicates the role of the teacher in shaping gender differences that are observed in mathematics learning. Hence a more longitudinal study, particularly focusing on teachers' classroom gender related practices, attitudes, beliefs with their impact on students' performance can provide more generalisable findings.

Keywords: *Gender, attitudes, perceptions, mathematics performance*

Résumé
Cette étude visait à identifier les attitudes et perceptions des filles et garçons envers l'enseignement des mathématiques. Il a utilisé des questionnaires, interview et observation en classe pour recueillir des données. L'échantillon consistait de 60 étudiantes, de 84 étudiants et de 6 enseignants des mathématiques sélectionnés de manière ciblée. Les principaux résultats de cette étude montrent, en général, que les garçons et les filles ont des mêmes perceptions vis-à-vis la nature et l'importance des mathématiques. Cependant, les garçons manifestent souvent des perceptions négatives de la capacité des filles de réussir des mathématiques. En outre, quelques filles ont également manifesté des perceptions négatives, ce qui pourrait expliquer leur faible confiance dans les mathématiques. Particulièrement, l'étude a révélé que l'enseignant jouerait un rôle important dans le renforcement des différences de genre pendant l'apprentissage des mathématiques. Par conséquent, une étude plus longitudinale, axée en particulier sur les pratiques des enseignants, leurs attitudes liées au genre et leur impact sur la performance des élèves peut fournir des résultats plus généralisables.

Key words: *genre, attitudes, perceptions, performance des mathématiques*

Introduction

There is mutual influence between the quality of mathematics that are taught to students and their attitudes towards it as well as their subsequent enrolment and performance in that particular subject. In seeking to achieve quality mathematics that is necessary to develop desired skills for sustainable development, it is important to explore students' perceptions and attitudes towards mathematics subjects. Quality education encompasses equal opportunity for girls and boys. Therefore, gender differences in learning should no longer be regarded as an issue and should aim at reducing the gaps in performance in mathematics subject. Currently, policies, initiatives and strategies promoting girls' enrolment in mathematics and science subjects are being implemented in Rwandan education system (Kestelyn, 2010). These policies and initiatives include the Girls' Education Strategic Plan that was approved in 2009, the First Lady's national awards for the best performing girls and the School Campaign, The National Taskforce for the coordination of girls' education that was established in 2005 and sanitation and hygiene facilities that is provided in every newly constructed school (MINEDUC, 2013). The

strategies put in place to implement these policies include strengthening gender sensitive and learner-centred methodologies and promoting affirmative action policies, where appropriate, to ensure equal opportunities for girls (MINEDUC, 2013). All these policies and initiatives aim at promoting equality in education where gender sensitivity is a key principle (Kestelyn, 2010). Prokop, Tuncer and Shuta (2007) indicated that identifying students' gender related attitudes towards a subject is important in promoting their achievement and interest in that particular subject.

The issue of gender difference in mathematics education had been tackled in various studies (Amelink's, 2009; Hall's, 2012; Kiptum, et al., 2013; Goldin, Ronsken&Torner, Masanja, 2006; Owiti, 2011, Tang, Chen & Zhang, 2010 and OCDE, 2014). While most of these research studies were focusing on gender issues in mathematics (Hall, 2012; Tang et al. 2010) or gender disparities in mathematics (Amelink, 2009; Masanja, 2006), few studies focused on students' attitudes by gender (Owiti, 2011; LaFleur, 2011). Very few research studies which explored the gender component in the context of Rwanda focused on girls education in general, but without paying a particular attention to mathematics education (Huggin, & Randell, 2007; Kestelyn, 2010).

In African countries, gender issues in mathematics education were explored in countries like Kenya (Owiti, 2011) and Tanzania (Masanja, 2006). They were also explored in other developed countries like Canada (Hall, (2012). These issues include students' enrolment, participation, performance, stereotypes, gender mainstreaming policies etc. In this regard, Owiti's (2011) study revealed that students' gender and their attitudes towards mathematics are correlated. Regarding the student's attitudes and participation in mathematics class, males substantially demonstrated more positive attitudes towards mathematics (Owiti, 2011) and higher level of participation in no-mandatory levels of mathematics than females (Owiti 2011; Hall, 2012). Gender difference in attitudes had been found to be highly linked to the developmental level (Amelink, 2009), to educational level (Masanja, 2006) and to social trends (Huggin & Randell, 2007). As Masanja (2006) has observed, gender disparity in enrolment and performance at primary may exist, but gender difference is almost nonexistent at primary school levels (Amelink, 2009; MINEDUC, 2011). It rather starts emerging with adolescence and increases at advanced levels of education (Masanja, 2006).

As for the factors behind female low enrolment in mathematics, Amelink (2009) indicated that they include fear of failure, gender biased classroom practices, girls' lack of confidence in solving mathematics problems, stereotypes by students themselves or influential people, as well as gender difference in experiences in the same classroom. In contrast, in LaFleur's (2011) study, specific classroom did not show significant effects on students' participation or attitudes about mathematics. In Rwanda, girls' education in general and mathematics education specifically had been facing challenges for a long time, due to cultural image of girls in the society, which labelled them as late starters in formal education (Uworwabayeho, Rubagiza, Iyamuremye, 2007). Due to policies and initiatives empowering women in education in general (Kestelyn, 2010), girls enrolment has significantly increased since 2000. However, much needs to be done on gender and mathematics achievement in Rwanda as well as in all sub-Saharan African countries (World Bank, 2016).

It is within this background that this study examined gender differences in terms of attitudes and perceptions, focusing on girls' and boys' enrolment and performance in Rwandan high schools. The motivation to

conduct this study was prompted by the fact that there are still very few research studies in mathematics education which focus on gender component in the Rwandan education system. This study may therefore be among the few empirical studies in Rwanda (e.g. Habineza, 2016) which have tackled attitudes and perceptions in mathematics education, with focus on gender issues. It seeks to contribute to a deeper understanding of some issues in mathematics education in Rwanda with hope that the findings may bring about attitudinal changes as far as mathematics curricula and mathematics teaching methods are concerned.

Aim and purpose of the study

The present study aimed at:

1. Examining the students' and teachers' attitudes and perceptions towards girls' and boys' mathematics enrolment and performance, as well as identifying related factors,
2. Suggesting possible strategies for promoting performance and enrolment in mathematics subject by all students, specifically female students.

Therefore, the study sought to answer the following research questions:

1. What are genders related perceptions and attitudes that students and teachers have towards mathematics subject?
2. What are gender related perceptions and attitudes do students and teachers have towards boys' and girls' enrolment and performance in mathematics subject?
3. To what extend do gender differences in attitude and perceptions affect their enrolment and performance?

Methodology

This study was conducted in 4 four high schools in Rwanda, including both private and public schools. Two schools were located in Kigali city, while other two schools are located in the Southern Province. Private schools were selected on the basis of the school mission, especially those which do not have high performing students, because they are not rated as best performing schools. On the contrary, the selected public schools had enrolled those students who performed well in the national leaving examination from primary to lower secondary, and from lower secondary to upper secondary (New Times, 2011) .The selection also built on Bridgeland, et al.'s (2009) gender concern in mathematics education, who observed that public schools in Rwanda perform better than private schools in general, and this affects girls' progression in mathematics education in schools of excellence and in mathematics studies at university level.

The study adopted the mixed methods design (Creswell, 2014). According to Creswell's arguments about mixed research methods, the combination of qualitative and quantitative research methods aimed at providing a more complete understanding of the research problem than either approach alone (Creswell, 2014).Methods of data collection consisted of combining questionnaire, interviews and classroom observation. Data collected from the questionnaires were analyzed and interpreted using the spreadsheet; while video recording, transcription and translation from Kinyarwanda into English were used to collect and analyze qualitative data. Data from questionnaires, interviews and observation schedules were triangulated for reliability and trustworthiness of the study.

The sample of this study consisted of 150 participants: 60 female and 84 male students and 6 male mathematics teachers. It is important to note that no female mathematics teacher was found in schools that participated in this study and this information had been commented on in the discussion. Respondents were selected purposively considering whether they teach mathematics (for teachers); and whether they study mathematics or not (for students). Students' age was generally between 15 years and 18 years old. Mathematics teachers' experience ranged from 3 years to 18 years of teaching in high schools.

As for data collection instruments, this study used questionnaires, semi–structured interviews and classroom observations. The questionnaire was prepared according to different research findings related to gender and mathematics education explored in the literature. The questionnaire reflected different attitudes and perceptions that students and teachers may manifest. Items in the questionnaire as well as in the interview protocol were accordingly divided as follows:

1. Perceptions about the nature of mathematics subject
2. Perceptions about girls' and boys' enrolment in mathematics subject
3. Perceptions about girls' performance in mathematics
4. Boys' and girls' attitudes towards mathematics class:
    i. Self-confident in mathematics subject
    ii. motivation towards learning /teaching mathematics
    iii. anxiety towards learning mathematics
    iv. interest in mathematics subject

The questionnaire and interview were independently revised by the supervisor (PI) for maintaining validity. Items of the questionnaire were evaluated using Likert scale with five levels scored respectively from 5 to 1. In addition to the questionnaire, video-recorded semi-structured interview was used in focus group discussions to get detailed information. Classroom observation methods and note taking were also used for getting real information and reducing some biased information from respondents.

Results

1. Students' responses from a questionnaire

Analysis of standard deviation was used to evaluate gender disparities on attitudes and perceptions about mathematics. It was found that students' attitude towards mathematics is differently affected by gender. Table 1 indicates some examples of students different responses classified in terms of attitudes and perceptions.

Table 1: Self Confidence in learning/teaching mathematics Subject

Items	Respondent's gender	N	Mean	Standard Deviation	Std. Error Mean
I understand more concepts I learn from teachers' notes than mathematics text books	Male	60	3.33	1.581	.527
	Female	84	4.00	.775	.234
I am confident that I can acquire the skills and concepts that are taught in mathematics	Male	60	3.44	1.424	.475
	Female	84	4.00	1.247	.394
I can do mathematics self study alone	Male	60	4.00	1.500	.500
	Female	84	2.82	1.168	.352
I prefer science materials that are quite challenging	Male	60	4.33	.500	.167

	Female	84	4.09	1.375	.415
I have no problem to use formulas and equations in	Male	60	4.00	1.500	.500
sciences mathematics	Female	84	2.82	1.168	.352
Overall		**144**	**3.68**	**1.22**	**0.39**

Source: Field data, 2014

Results from the above tables show that boys and girls are in general self-confident in mathematics (overall mean=3.68, std=1.22). However, more girls than boys (Mean=4.00, std=.775) understand mathematics concepts more from the teachers' notes than in the textbooks. Many boys (Mean=4.00; std=1.500) feel confident to work alone on any mathematics activity while few girls (Mean=2.82; std=1.168) feel confident to work alone on any mathematics activity. Moreover, fewer girls than boys (Mean=2.82; std= 1.168) have problems to use formulas and equations in mathematics class.

Table 2 : Motivation towards mathematics

Items	Respondent's gender	N	Mean	Std. Deviation	Std. Error Mean
Mathematics I learn relates to my personal goal	Male	60	4.22	1.302	.434
	Female	84	4.18	1.168	.352
I learn mathematics to become a mathematician	Male	60	4.18	0.603	.182
	Female	84	3.80	1.269	.400
The understanding of maths gives me a sense of my	Male	60	4.00	1.323	.441
future life	Female	84	4.36	.505	.152
Learning mathematics will help me develop	Male	60	4.33	1.118	.373
creative/critical thinking	Female	84	4.27	1.191	.359
I like to do better in mathematics tests than other	Male	60	4.38	.744	.263
students	Female	84	4.27	.905	.273
Overall		**144**	**4.20**	**1.01**	**0.32**

Source: Field data, 2014

Results from the above table shows that in general boys and girls are motivated to learn mathematics (overall mean=4.20, std=1.01). However, more boys (Mean=4.22; std=1.302) than girls (mean=4.18; std=1.168) study mathematics for their personal goal like becoming a mathematician [boys; mean=4.18, std=1.302; girls: mean=3.80, std=1.269)].

Table 3: Anxiety towards learning mathematics

Items	Respondent's gender	N	Mean	Std. Deviation	Std. Error Mean
I always think about the usefulness of maths that I	Male	60	2.13	.835	.295
learn	Female	84	1.91	1.044	.315
I am worried that I will not be able to understand	Male	60	2.88	1.356	.479
maths concepts	Female	84	3.82	1.328	.400
I feel stressed when listening to maths instructors in	Male	60	1.38	.518	.183
class	Female	84	1.73	1.191	.359
Mathematics learning will not facilitate me to get good	Male	60	2.63	1.061	.375
job	Female	84	1.82	1.250	.377
I don't get nervous when I face challenges while	Male	60	2.57	1.272	.481
working on mathematics activities	Female	84	2.09	.944	.285
	Overall	**144**	**2.29**	**1.08**	**0.35**

Source: Field data, 2014

Results from the above table shows that boys and girls are anxious towards mathematics learning and understanding, in general, (overall mean=2.29, std=1.08). However, the level of anxiety is differently expressed

by boys and girls: whilst more boys think about getting a good job thanks to mathematics course (mean=2.63; std=1.061), more girls are worried about understanding mathematics concepts (mean=3.82; std=1.328).

Table 4: Interest in mathematics Subjects

Items	Respondent's gender	N	Mean	Std. Deviation	Std. Error Mean
Mathematical knowledge is useful for the development of our country	Male	60	4.00	1.549	.467
	Female	84	4.45	.934	.282
I think learning mathematics will help me in my daily life	Male	60	4.36	.674	.203
	Female	84	2.75	1.909	.675
Mathematics exists for the benefit of scientific courses	Male	60	3.14	1.773	.670
	Female	84	4.18	1.250	.377
I think that learning mathematics is about getting good marks because it is too difficult to understand	Male	60	2.75	1.909	.675
	Female	84	4.18	.874	.263
Getting a good mathematics grade is important to me	Male	60	4.13	1.356	.479
	Female	84	3.67	.516	.211
Mathematics dominates our lives and presents society with great opportunities and great challenges	Male	60	4.13	.354	.125
	Female	84	4.27	1.009	.304
	Overall	144	**3.83**	**1.18**	**0.39**

Source: Field data, 2014

The above results show that boys and girls have almost the same interest in mathematics subject in general (overall mean=3.83; std=1.18). For example, they have the same perception that mathematics knowledge is useful for the development of our country [boys' mean=4.00; std=1.549); girls' mean=4.45; std=0.934)]. However, more boys (mean=4.36; std=0.774) than girls (mean=2.75; std=1.909) think that mathematics is important to their daily life. Similarly, more girls (mean=4.18; std=2.75) than boys (mean=2.75; std=1.909) think that learning mathematics is about getting good marks because it is too difficult to understand.

Results from interviews and observations

32 students and 6 mathematics teachers participated in interviews and expressed their gender related attitudes and perceptions towards mathematics education. Data from the Focus Group Discussions (FGD) together with data from individual interviews were analyzed and presented together under common themes that emerged as follows:

1. Perceptions about the nature and importance of mathematics subject
2. Perceptions about girls' and boys' performance and learning in mathematics
3. Perceptions about girls' and boys' enrolment in mathematics

Perceptions and attitudes towards the nature of mathematics subject and how it is taught

From the findings, 84 boys and 60 girls' students as well as 6 mathematics teachers (men) were of the view that mathematics is a tough and abstract subject, time and energy consuming in the teaching and learning process; that it has many difficult formulas that requires more reasoning to be used and for students' understanding. They all agree that girls can potentially learn mathematics as boys do and that mathematics curriculum of secondary school should be revised as it has some units which are likely worth to be taught at university level.

However, girls' and boys' perceptions about learning some units were revealed to be different whereby more girls preferred algebra and calculus over geometry while more boys preferred geometry over algebra. One

of the girls said "I like algebra because it requires just application of formulas while geometry requires much reasoning". Another girl said: "I like trigonometry because it is only about application of formulas and, it does not require deep thinking". One of the teachers explained that although mathematics is a tough subject, it is tougher for girls than it is for boys, and the reason is that girls' reasoning in mathematics seems not to be as focused as boys'! On the other side, boys and girls pointed to some teachers' methods of teaching and gender attitudes towards mathematics subjects; as one of the factors that make mathematics more difficult to learn. Some of students' perceptions were explained as follows:

> "*There are teachers who give very few exercises or do not correct homework and exercises.."(Boy, senior 2)*
> *"…those teachers who do not like explaining but tell students to ask their classmates or others.."(Girl, senior 2).*
> *"…those teachers who only teach abstractly and restlessly without giving us opportunity to work"(Girl, senior 2).*
> *"Other teachers, like interns, do not have enough experience in mathematics teaching and make mathematics tough and boring to us…"(Boy, senior 5*).

It appears that the teachers' experience in teaching, their teaching strategies and professionalism are among factors that cause students' poor understanding of mathematics hence, making it difficult for them. These findings were confirmed in some observed behaviors' in mathematics class, where the teachers' individualization strategy in teaching was more boy-oriented than girl-oriented and was influenced by students engagement (like students raising up their hands to answer a question), which was more boys-dominant than girls.

Perceptions about mathematics teaching, learning and performance

From the FGD results, all students share the view that girls' attitudes towards learning mathematics is likely to be dominated by lack of confidence in learning, laziness, anxiety , fear and extrinsic motivation. Apparently, they all find unusual when a girl outperforms a boy in mathematics. One of the boys explained it as follows: "*Normally it is not frequent to find many girls performing well in science and mathematics, only very few of them do. So when it happens, especially in mathematics, I find it unusual, unbelievable, and ask myself 'how does she manage to be ahead of me?' and we, boys, immediately consult each other on that strange event and set strategies to come back to our first position".* Boys explained further that a girl who is as good at mathematics as boys or even better than them has a masculine character. One said in Kinyarwanda that "aba ari igishegabo!" literally meaning 'that girl has a masculine character'!". Another boy said: "w*e, boys, find it strange. We cannot get angry against her, but we laugh at ourselves!" (Boy, senior 5).*

Boy students and male teachers were of the view that mathematics is for boys because girls' reasoning in mathematics is very poor as compared to boys. They indicated that most boys immediately feel free to ask for explanations in mathematics class or even outside; and they are the first to grab mathematics books from the library, in addition to the teachers' notes. Girls however hesitate to ask or even do not ask due to shyness or fear and that is why most of girls rely on the teachers' notes only.

Asked about how they learn mathematics after class, boys and girls shared the perception that they prefer to learn mathematics in groups whereby one of them who is good at mathematics and a fast learner leads

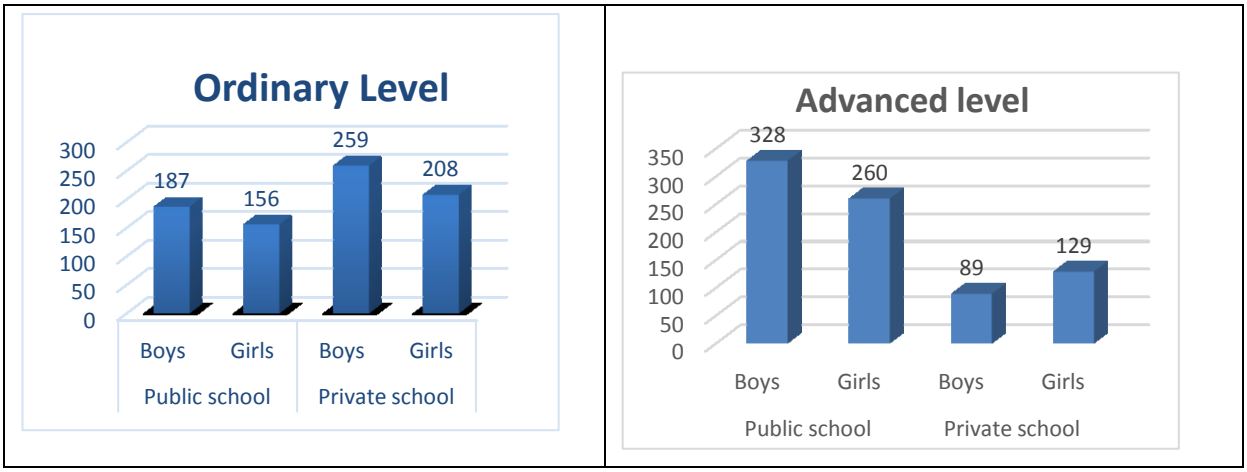
the group. They all said that most group leaders are boys but confirmed that some girls may also be good at mathematics and lead the group.

When teachers were asked about how they find boys' and girls' learning in mathematics, they said that girls encounter many difficulties in learning mathematics. They added that they prefer to teach mathematics in a single sex class of boys over a single sex class of girls. One of them explained it as follows:"*Many girls memorize mathematics without reasoning. Sometimes, you can change some data of a mathematics question and a girl can immediately write what she had memorized without realizing that something has been changed. Sometimes many girls do not pay much attention to the question and understand it before working on it*". However, it was indicated that very few girls can outperform boys in the school evaluation, but boys outperformed them in the national examination due to the scope of the examinable objectives. For students, most boys and girls shared the same preference of a male mathematics teacher than a female, even if there are some few female mathematics teachers who may be better than the male ones.

Perceptions and attitudes towards enrolment in mathematics combinations

Observation was made on the list of students enrolled in ordinary level and advanced levels in all mathematics combinations in all the 4 schools that participated in the study and diagrams show the number of girls and boys as follows:

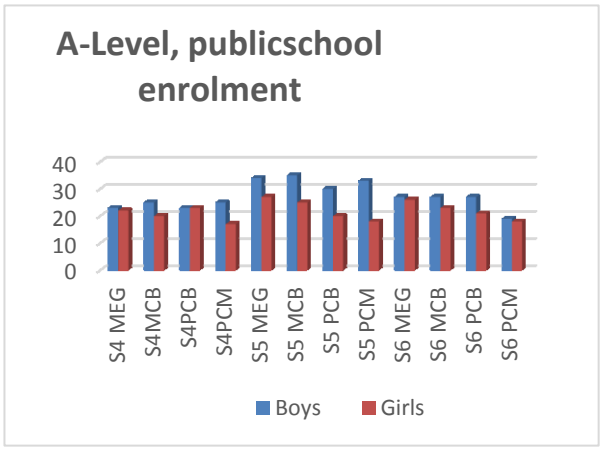
Table1: Boys' and girls' total enrolment in O-level and A-level (All 4 schools)

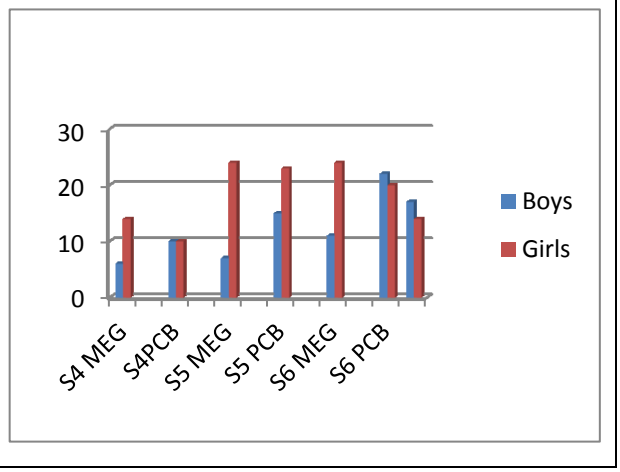


Source: Field data, 2014

The histogram shows that, in ordinary level in public school, the number of boys was 187 (or 55.6%) in while the number of girls was 156 (or 45.4%). Similarly, girls' enrolment in private school was also lower than boys': 259 boys (or 55.5%) and 208 girls (or 44.5%). The overall number of students in public schools (schools of excellence) with or without respect to gender is lower than in private schools. However, in advanced level, the histogram shows that the overall number of students with or without gender consideration was higher in public school than that in private school. The number of girls was 260 (or 44.20%) and the number of boys was 328 (or 55.50%) in public school while in private school, the number of boys was 89 (or 40.8%) and the number of girls was 129 (or59.2%)

Table 2: Boys' and girls' enrolment at Advanced level (all 4 schools)





Source: Field data, 2014

In advanced level, the histogram shows that generally, fewer girls than boys are enrolled in public school than in private school. Although it appears that girls enrolment is higher in MEG than in other combinations both in private and public school, the number of girls enrolled in MEG was higher than the number of boys in private school (for example in senior 5 MEG, there were 77.4% of girls, and in senor 4 MEG,70% of girls) while in public school, the number of boys enrolled in MEG is always higher than girls' (for example in senior 5 MEG, there were 44.3% of girls and 55.7% of boys). On the contrary, the number of girls enrolled in PCM combination was lower than boys in both schools. For example in Senior 5 PCM the number of girls was 35.3% in public school and in senior 6 PCM they were 45.2% in private school.

From FGD, boys' and girls' perceptions about enrolment in mathematics depend on past performance, future career aspirations, influence of teachers, parents and relatives and educational policies. Boys and girls share the perceptions that girls' enrolment in mathematics reduces with adolescence because they start to spend much time on taking care of their body and that girls naturally like easy life while mathematics learning requires hard work. However, some girls challenge that perception like the following one: "*I chose mathematics combination to challenge the common belief that girls do not like mathematics and cannot perform well in it*". Some girls from non-mathematics combinations explained that they did not enroll in mathematics because the future of a mathematician is likely to become a teacher, which is the career that is least appreciated.

Discussion

The results from the questionnaires, FGD and observation show that mathematics tends to be perceived as a male-dominant domain, both in teaching and learning. According to Ernest (2004), this is a myth related to objectivity of mathematics, assuming that mathematics learning fits boys more than girls. On the one hand, such a perception may result from girls' skills in mathematics, as manifested in class, which seem to be dominated by laziness in using mathematics books, shyness and hesitation in asking questions, lack of confidence, fear and goal-oriented mathematics learning. On the other side, this may result from gender stereotype referred to as "unconscious sexism" (Ernest, 2004). Considering mathematics contents, the results revealed that girls prefer

mathematics units that require just application of formulas while boys prefer mathematics units requiring reasoning to strengthen their confidence. According to Amelink (2009), boys prefer mathematics activities that require visual spatial skills, problem solving and reasoning, while girls try to do better in mathematics activities that deal with direct application. It appears that girls' self-perception of mathematics is also boy-oriented.

Moreover, the results showed that some teaching habits and the nature of mathematics content are likely to be influenced by some students' attitudes towards mathematics, especially during adolescence period. According to Kiptum et al. (2013), gender differences [in mathematics] start to manifest at the onset of adolescence, resulting from socialization patterns experienced and other school related factors. As Li (2004), Mji and Mkagato (2006) and Samuelson (2007) argue, the teacher's poor teaching standard is the main factor, among others, of student attitudes and perceptions towards mathematics. As the findings have revealed even though girls in mathematics are negatively perceived by boys; some girls perform better in school mathematics examinations than in national examinations, when compared to boys. Some studies had found that girls are likely to outperform boys in matters requiring writing for understanding (OCDE, 2014), while males work better than females in mathematics activities that are connected with logic and in solving problem situations (Tantarinceva, 2009). Therefore, gender differences in performance may result greatly from how examinations are set and not on the scope of examinable objectives. This is because setting the national examination involves different people, while setting school examinations involves a limited number of teachers.

Implication to education and conclusion

The findings from this study imply that mathematics teachers need to be continuously trained in modern teaching methodologies as well as in assessment because the results have shown that girls perform better in school examinations than in the national examination. This may result from girls' frustration and anxiety about national examination, as well as negative attitudes towards mathematics. Therefore, this study suggests that harmonization in setting the school examinations and the national examinations in mathematics would yield the same results among boys and girls. Such practice may positively influence girls and boys in learning mathematics; and may contribute in improving the quality of mathematics education. Moreover, mathematics curriculum for high school should be revisited, especially in teaching methodologies and, if necessary, on the contents with respect to the profile expected from a high school student. This should go hand in hand with girls' change of mindset and self-perception about mathematics subjects as well as change in boys' perceptions about gender and mathematics education. Such a change will enable to compete and perform on equal basis.

Finally, this study recommends further research on teachers' gender related classroom practices, attitudes and assessments and their impact on students' performance with respect to gender. Such research may contribute to the improvement of quality mathematics education and performance, as well as to the subsequent increase of girls' enrolment in mathematics combinations. While considering the findings from this study as informative and not generalizable, the study suggests a more longitudinal study which can lead to generalization.

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