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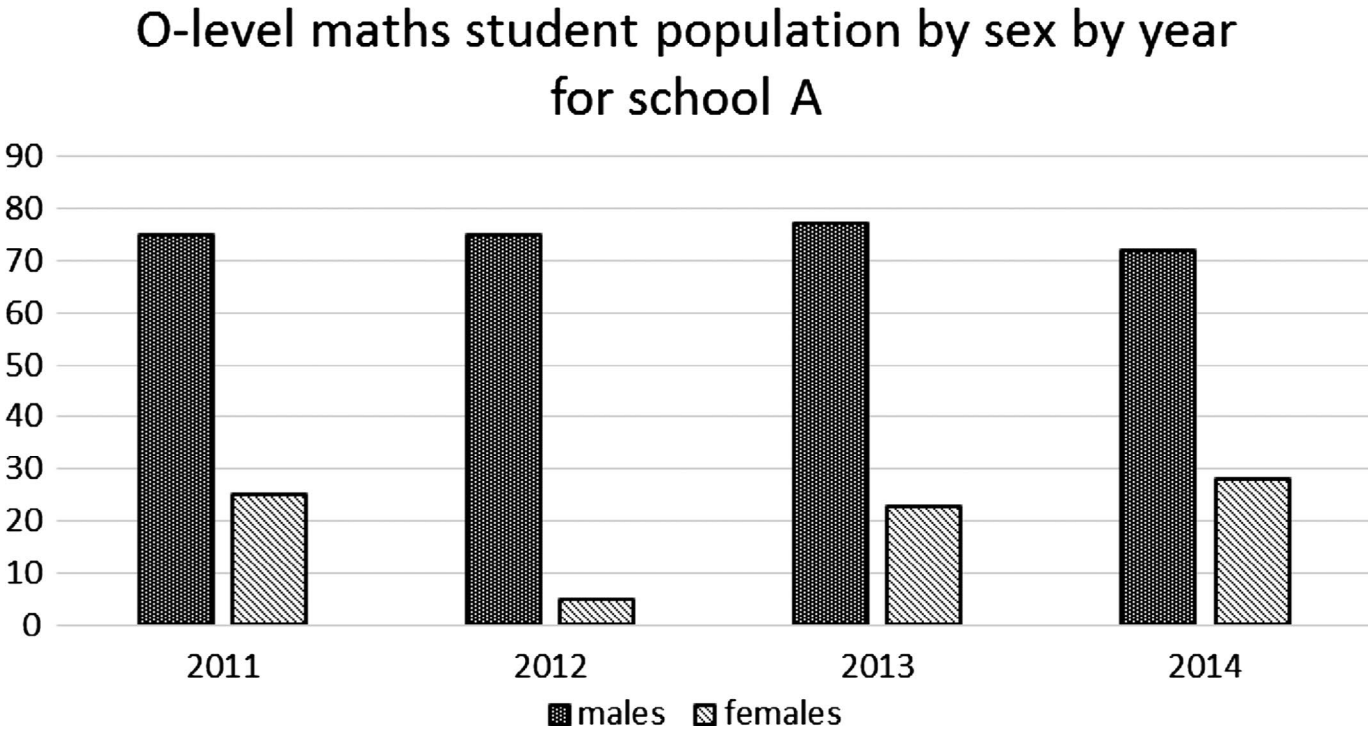

CURRICULUM & TEACHING STUDIES | RESEARCH ARTICLE

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Participation of rural Zimbabwean female students in mathematics: The influence of perception

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Abstract: The study was premised on the influence of perceptions on the participation of Ordinary Level rural African Zimbabwean female students in mathematics. Qualitative research design grounded in the interpretive paradigm was employed. Eighteen Ordinary Level female students and six teachers purposively selected from three rural co-educational secondary schools participated in the study. Data were generated through lesson observations and semi-structured question type interview guide. Findings revealed that rural female students perceived mathematics as a difficult subject, masculine and irrelevant to their future aspirations. Participants outlined that their perceptions were rooted in the prevailing cultural belief that mathematics is a masculine subject and negative stereotypes about girls' maths abilities. Further findings indicate that female students' participation in mathematics was highly influenced by their perception towards the subject. These perceptions result in the development of a general negative attitude to the subject that caused fewer female students to participate in mathematics in large numbers. We recommended parents and teachers to work hard to eliminate the negative gender and cultural stereotypes in order to enhance female students' confidence in mathematics abilities. Schools should employ female mathematics teachers and expose female students to female role models who have succeeded in life in order to encourage more participation of female students in mathematics. Schools are made

Anna Gudyanga

ABOUT THE AUTHORS

Anna Gudyanga's research interests are Gender Issues, HIV/AIDS Education, Curriculum Issues in Science Education, Education and Transformation, Socialization in Child and Adolescent Development.

Victor Mandizvidza's research interests are Teaching, Maths education, curriculum issues in Mathematics education.

Ephias Gudyanga's research interests are HIV, Assessment and evaluation, Science and maths teaching, attitudes, child abuse, student violence, visual participatory.

PUBLIC INTEREST STATEMENT

Of the many crucial things humans can learn in life, unavoidably, one of them is school mathematics. Since we are now fully immersed in the era of technology, we therefore cannot afford the luxury of not having a background of simple mathematics. We will not be able to fit, live and operate comfortably well in our communities without basic mathematical skills. Simple mathematical machines like scientific calculators, adding machines, shop tills, mobile phones are at our disposal for everyday use everywhere, therefore mathematical knowledge becomes valuable.

Simple household accounts like budgeting, income and expenditure, selling and buying, profit and loss accounts require simple mathematical knowledge for computation. There is therefore a great need for both males and females to participate in basic and fundamental mathematics learning at school. Opting out of mathematics at school is not an option.

responsible for smoothing out difficulties generated by the prevailing culture. There is a gap in knowledge base pertaining to the Zimbabwean rural girls' participation in Mathematics.

Subjects: Curriculum Studies; Education & Training; Mathematics Education; Science Education; Secondary Education

Keywords: influence; perception; participation and mathematics

1. Introduction

Education continues to be central to a country's well-being and economic development. When a country educates its citizens (women as well as men), economic productivity rises, maternal and infant mortality rates fall, fertility rates decline, and the health and educational prospects of the next generation are improved Lopez-Claros et al., (2007, cited in Masanja, 2010). Education raises awareness "to be engaged as thoughtful citizen and to become meaningfully involved in the change process as co-responsible thinkers, actors and leaders" Mbilinyi (2000, cited in Masanja, 2010, p. 2). It is difficult in the present-day society to address the issue of national development without recourse to gender factor. Education statistics in sub-Sahara African (SSA) countries show that women continue to lag behind men in education in general and specifically in science, mathematics and technology education (Masanja, 2010). Development essentially has to do with improvement in human well-being, elimination of hunger and poverty, and gainful and productive employment for the entire citizen of a nation, hence we cannot afford to ignore women if we must attain meaningful development in our nation (Aguele & Agwagah, 2007). Apart from being more than half of the world's population, women have a huge influence on the well-being of their families and societies; the effect of women's education on population growth, economic growth and poverty is enormous especially when they study mathematics (Masanja, 2010). Ukeje (1997, cited in Aguele & Agwagah, 2007, p. 121) observes that:

> ...without mathematics there is no science, without science there is no modern technology and without modern technology there is no modern society. In other words, mathematics is the precursor and the queen of science and technology and the indispensable single element in modern societal development.

Therefore, if Zimbabwe is to develop economically, the study of Science, Mathematics and Technology (SMT) education should be given adequate attention in the various levels of the countries' education.

In Zimbabwe, all students in primary schools study the same subjects (e.g. English, mathematics, computer science and agriculture to name a few) and in secondary schools mathematics is a core and compulsory subject that students learn (Herald reporter, 2011). Masanja (2010) argues that primary level SMT should be sufficient to enable graduates of this level to master their surroundings and improve their lives. This is further enhanced when students enrol to study subjects at secondary school level. Worse situations are found in rural areas whereby even fewer females are found participating in science and mathematics at both learner and teacher level (Masanja, 2010).

2. Background and context

Despite the Zimbabwe Ministry of Primary and Secondary Education having made the teaching of mathematics and science compulsory up to Ordinary Level (O-level) (Herald reporter, 2011), many female students particularly at Ordinary Level withdraw their participation in mathematics (Herzig, 2004).

Of the total population which registered to write mathematics examination nationally at O-level in 2011 in Zimbabwe, girls comprised 29.3%, with national enrolment at O-level between males and females standing at almost 50–50 (UNESCO, 2012). Furthermore, male staff in science and mathematics was 89% and females was 11% in 2011 at national level (Zimstat, 2012). The participation of

female students in mathematics at secondary school level is low compared to males and it is worse in rural schools as shown by the data from the three selected schools, i.e. in Figures 1–3. Mandina, Mashingaidze, and Mafuta (2013) in their study to find out ways of increasing female participation in Advanced Level mathematics in Zimbabwe, found that participation of female students in mathematics is low and is a cause for concern. To highlight the problem, Figures 1–3 show the participation of female students in three secondary schools named A, B and C, respectively. In Figures 1–3, students who wrote the O-level mathematics examination were either below 30% and around or slightly above 30%.

Figures 1–3 show that female students are still significantly underrepresented in mathematics, where women in Zimbabwe constitute about 52% of the total population (National Gender Policy, 2013). Despite the fact that more than half the Zimbabwean population are women, fewer female students participate in mathematics at O-level. Mandina et al. (2013) in their study to find out ways of increasing female participation in Advanced Level mathematics in Zimbabwe, found that participation of female students in mathematics is low and is a cause for concern. In spite of the importance of mathematics being officially recognised in terms of the central place given to it in the Zimbabwean secondary school curriculum (Ministry of Education Sport Arts & Culture Policy, 2006), fewer female students register to write mathematics examination at O-level, despite the fact that all of them would have been attending the compulsory mathematics lessons.

In some countries like Pakistan, female students are often discouraged from mathematics work during their primary school years (Farooq & Shah, 2008). Additionally the authors argue that these female students end up disliking mathematics when enrolled in secondary schools. In this context, the idea of discouraging female students to take part in mathematics in the first level of education leads to a situation whereby female students drop mathematics in greater numbers than males at secondary level. As a result, very few women are employed in professions which require mathematical ability. Furthermore, Ethington (2006) says that poor mathematical skills in girls and women deprive them from a large number of professions because in some countries like Kenya, Pakistan and Zimbabwe just to mention a few mathematical background is a pre-requisite for entrance in any profession.

In Australia, few female students undertake mathematics at grade eleven which is the first point where students are granted permission to choose the subjects they want to study, implying that female students begin to opt out of mathematics at their very first opportunity (Vida & Eccles, 2003). Additionally, participation of female students and women in mathematics decreases as they progress to higher educational and professional levels, and hence at each successive educational level, female students are more likely than males to opt out of mathematics, science, technology and engineering (Gudyanga & Gudyanga, 2013; Herzig, 2004). In the same vein, Watt (2006) opines that

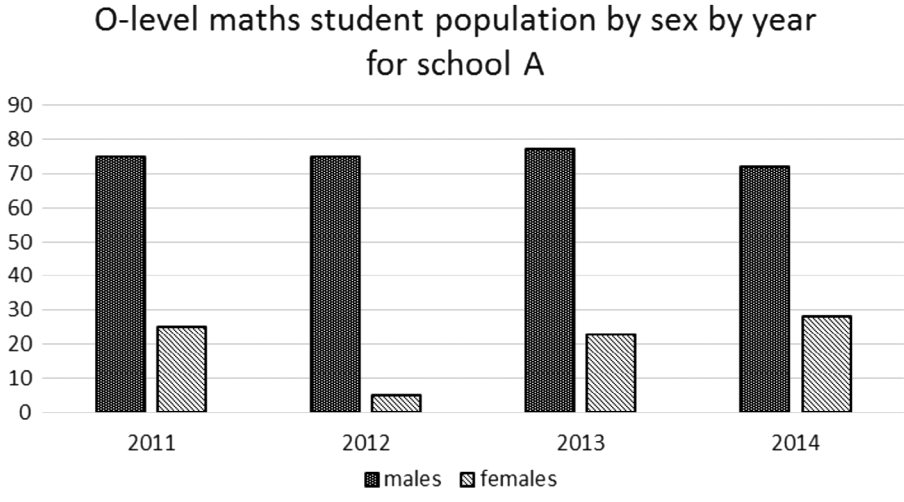


Figure 1. School A: Maths student population by sex by year.

Figure 2. School B: Maths student population by sex by year.

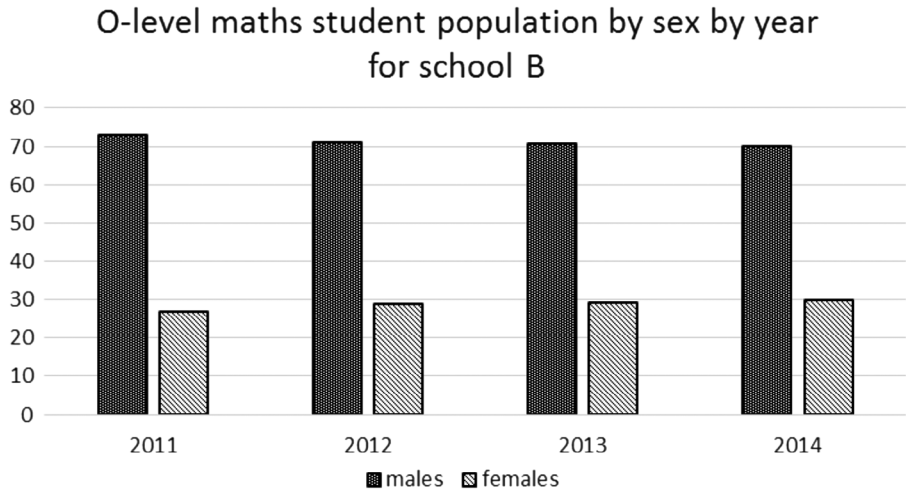
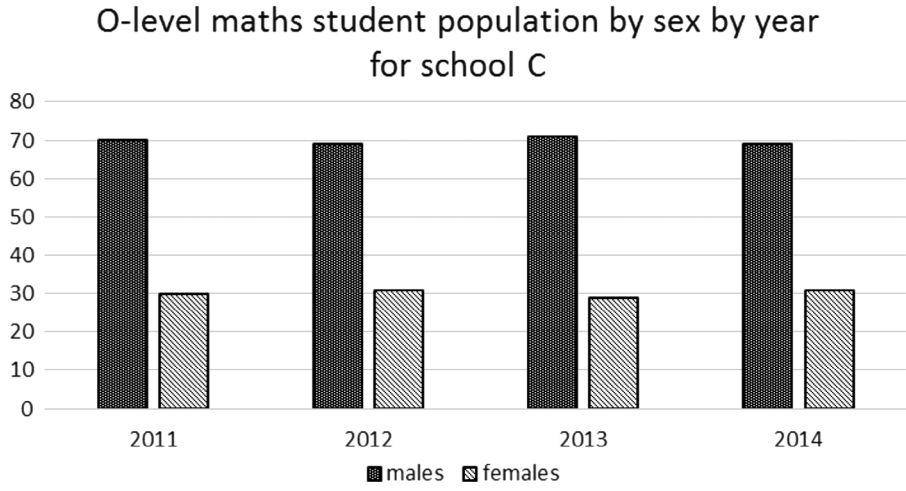


Figure 3. School C: Maths student population by sex by year.

Source: Data were sourced from the three selected schools.



female students and women are both less likely to choose careers in traditionally male domains and more likely than males to drop out if they do enter those fields.

It is important to note that the stereotyping of knowledge and skills given to female and male students at the introduction of formal schooling combined with marginalisation and discrimination against women continues to influence the gendered nature of education even today, thus, in a way, determining the occupation of men and women (Masanja, 2010).

In this study it may be prudent to furthermore illuminate the issues of perception towards mathematics. Researchers (Guiso, Monte, Sapienza, & Zingales, 2008) have established a link between the gender mathematics gap and female socialisation in society in that the way female students are socialised highly influences their decision to participate or to opt out in any mathematics related field. Worth noting is the culture of the Zimbabwean society which considers mathematics to be a masculine subject, not a suitable choice for female students (Gudyanga, 2013). Culture is "a system of shared beliefs, values, customs, behaviours and artefacts that the members of society use to cope with their world and with one another… the collective programming of the mind that distinguishes the members of one group or category of people from others" (Hofstede, 2011, p. 3). In this context, "… If the cultures of child-rearing practices are gender-stereotyped, then boys and girls will be brought up very differently from each other" (VanLeuvan, 2004, p. 249). Thus, female students are

socialised against studying mathematics. This discouragement of female students to study physics or mathematics seems to be culturally rooted in the fabric of society. In this context, Zimbabwe, being a gendered society (schematic) culture and traditional values, described by Mwamwenda (2005, pp. 374–375) as "inheritable from their parents" are therefore passed on from generation to generation through learning.

On the other hand, (Nosek, Banaji, & Greenwald, 2002) have shown that at national level, implicit gender stereotypes have an influence on national-level gender differences in science and mathematics participation and achievement at secondary education level. These gender stereotypes may communicate to female students that males are innately better than females in mathematics and science leading to males taking high-level mathematical linked subjects putting them at an advantage over females in almost all highly rated professions.

However it is a commonly held perception that doing mathematics is consistent with a male self-image and inconsistent with female self-image (Costello, 2007). This causes negative attitudes towards mathematics by many female students. This may be an indication that female students may be negatively influenced by their sex-role stereotypes.

Because male and female students in Africa are brought up under different environmental settings (Asimeng- Boahene, 2007) and due to the way they are socialised, males tend to be self-confident and independent while females are seen to be emotional, subservient and affectionate. This kind of grooming makes it easier for males than females to adapt to the important learning tools in science and mathematics which includes discussion, problem solving and laboratory exercises.

Asimeng- Boahene (2007) claims that generally, parental expectations are a disincentive for mathematics and science education for females who tend to be given time consuming domestic responsibilities which leave them with not much time for private study (Asimeng- Boahene, 2007; Gudyanga, 2013). This affects the female students negatively and causes them to lose interest in their studies especially in mathematics because of the challenging culture of the subject (Asimeng-Boahene, 2007). In this regard, Gutbezahl (1995 cited in Mandina et al., 2013) postulates that female students tend to internalise parents' negative expectations which become self-fulfilling prophecies. This is consistent with other studies where parental education and their children's attitudes towards science were found to be correlated (Gudyanga, 2014). If female students believe that they will not achieve in mathematics, then automatically they may not achieve simply because they may not invest enough energy in the subject. In their study of causes of poor performance in Maths at O-level in Nkayi rural district in Zimbabwe, Tshabalala and Ncube (2012) found out that apart from poor teaching methods and poor grounding in the subject at lower levels, female students have a phobia for maths. It is however not clear whether the fear is natural or environmental (Tshabalala & Ncube, 2012).

The rationale and research question of this study is based on the fact that the Ordinary Level examinations constitute a very significant component of Zimbabwe's education process as they determine the future employment prospects of the learners (Ndlela, 2012). It is the Ordinary Level Certificate that determines who proceeds to Advanced Level and who joins tertiary education institutions like teacher training colleges, nursing schools and others. It is therefore, not surprising that parents, teachers, students and government and other stakeholders attach greater significance to the Ordinary Level examinations. All the female students at O-level are taught mathematics since it is compulsory to learn it (Herald reporter, 2011). The unsettling factor is that very few students register to write O-level mathematics examination.

The theoretical framework that was used in this study is the Feminist Standpoint Theory (FST) which is concerned with exploring the nature of social experience of women with a view to explaining the mechanism through which power operates in order to bring about the emancipation of women (Delanty, 2005). FST further involves a commitment to the view that all attempts to know are

socially situated. Additionally, the premise of feminist standpoint theory is that the difference in the social experience of men and women give them different ways of looking at life and interpreting events, and hence different standpoints (Smith, 1987). This basic premise was applied by Harding (1998) to critique science (mathematics is a science subject). Thus, the FST was used as a lens during sampling and purposively selecting female students with different standpoints i.e. female students who had registered to write the O-level examination and those who had not registered.

The Zimbabwean government did put in place a policy that made mathematics, science and English (to name a few) compulsory at O-level but still the number of female students doing mathematics especially in the rural schools is still significantly low. The permanent Secretary of Education was quoted saying "Government has made the teaching of mathematics and science subjects up to Ordinary Level compulsory" (Herald reporter, 2011). In spite of such policies, we however agree with (Gudyanga, Kathija, & Kurup, 2015, p. 2) who say that "...simply constituting relevant policy is not enough to ensure participation". A consideration of the influence of perception could provide insights that may lead to increased female participation in mathematics. Hence, this study fills the gap as it focuses on the influence of perception as a contributing factor to female participation in mathematics.

The research questions guiding this study therefore are:

- How do Zimbabwean rural female students perceive mathematics?
- What is the influence of their perception on their participation in the subject?

While an attempt is made to address these questions from the perspective of rural female students, a brief overview of the research methodology is illuminated below.

3. Methodology

A qualitative research methodology was used for the purposes of this study. Qualitative data provides a greater depth of information that present a full picture of the influence of perception on rural female students' participation in mathematics. Qualitative research is an exploratory approach emphasising words rather than quantification in generating and analysing data (Creswell, 2014). It is the matter of the inductive and interpretive exploratory approach which stresses viewing the world with the eyes of the examinees. We situated this study within the interpretive paradigm which involved collecting the stories of lived experiences (Creswell & Maietta, 2002). An interpretive paradigm assumes that people's actions are meaningful and that these meanings have to be interpreted in the context in which they take place (McNeill & Chapman, 2005). Interpretivists believe that reality is multiple and subjective and focuses on social life interactions as perceived by individuals rather than objective reality (Blaike, 2007). Reality is socially constructed i.e. there is no single observable reality or interpretations to a single event (Merriam, 2007).

We obtained ethical clearance from our institution to carry out the study. We also got clearance from the Ministry of Primary and Secondary Education to allow us to visit the schools. The heads of schools also gave us clearance to interview their teachers and students. The participating teachers and students consented in writing to engage in interviews and class observation. Anonymity and confidentiality were granted to all participants. We fully explained the nature, purpose of the study openly and honestly, in an understandable manner to all participants. We also made it explicit on how the information from interviews and class observations were going to be used. The participants were told that they could freely withdraw from the study at any time if they so wished.

We employed purposive sampling to select three co-educational secondary schools in Gutu district as well as the eighteen (18) O-level female participants who were in form four which is their final year of O-level. Three female students who had registered to write mathematics examination at the end of the year (Labelled A1, A2, A3; B1, B2, B3; and C1, C2, C3) and three who had not registered

(not participating in the subject, A4, A5, A6; B4, B5, B6; C4, C5, C6) from each of the three schools (A, B and C).

Six maths teachers were purposively selected, two from each of the three selected schools. The only other female maths teacher in school C was made part of the sample. Of the six teachers, three were interviewed and the other three had their lessons observed as they taught maths at O-level.

The goal of purposive sampling was to focus on particular characteristics of a population that were of interest, who could answer the research questions. We used semi-structured interviews and classroom observation schedules to generate the data.

Regarding interviews, a classroom was made available for use in each of the schools. We were given the opportunity to familiarise ourselves with participants prior to the interview sessions, both for teachers and students. Interviews were from both male and female researcher. To encourage acquiescence, the female researcher did most talking and was head of the team. One interview slot took place per every participant lasting for about 45 min each. Data were audio recorded. Some of the conversational questions for students were: What are your views towards O-level maths as a subject? Do you understand maths when your teacher is teaching? How does maths help you in life? For the teachers, we asked questions like: what are your perceptions of rural female O-level students towards maths? Is a rural female different from an urban female student in as far as they perceive O-level maths? Why do more females drop maths at O-level than males? Why is there a difference in performance between females and males in O-level maths?

Observation is a systematic process of recording the behaviour and patterns of participation without necessarily questioning or communicating with them (Nieuwenhuis, 2007). As a qualitative data generating technique, observation enabled the researchers to gain a deeper understanding of the phenomenon being observed (ibid.). They provided us with an insider perspective of the group dynamics and behaviours of female students in different settings and allowed us to hear, see and begin to experience (observation) and reflect (which is part of the interim data analysis) how setting is socially constructed in terms of "power, communication lines, discourse and language" (Nieuwenhuis, 2007, p. 84). Observational data are very useful in overcoming discrepancies between what people say and what they actually do and it helped us to uncover behaviour which the participants themselves may not be aware of (Green & Thorogood, 2004). To minimise the Hawthorne effect, we observed three lessons without collecting any data to enable the students to get used to our presence as we were building a relationship with participants in the setting. We therefore observed the other three teachers teaching maths at O-level.

Interviewing students and teachers, class teaching observations were all meant to validate the findings trough corroboration, if any.

Creswell (2013, p. 179) claims that the process of data analysis involves organising the data, conducting a preliminary read "through of the database, coding and organising themes, representing the data and forming an interpretation of them". Qualitative data analysis is heavy on interpretation and therefore, tends to be an ongoing and iterative process, implying that "data generation, processing, analysis and reporting are intertwined" and not merely a number of successive steps (Nieuwenhuis, 2007, p. 100). Generated data were analysed using thematic approach that is, one that looks across all the generated data to identify the common issues that recur and identify the main themes that summarise all the views (Charmaz, 2006). Thematic analysis required us to read and annotate transcripts, identify themes, develop a coding scheme and coded the data.

4. Results and discussion

After data transcription, reading and re-reading for familiarisation and coding, two themes were constructed, i.e. perception of female students towards mathematics were coded yellow and the

influence of female students' perception on their participation in the subject were coded blue, as outlined next.

4.1. Perceptions of female students towards mathematics

We aimed to find female students' perceptions towards mathematics which in turn influenced their participation in the subject. The nine female students who had registered to write mathematics examination all concurred that mathematics is a challenging subject perceived by most female students as a difficult subject. For example, some of their quotations are listed below:

Student A1: *Although I perceive mathematics as a challenging subject, I had to study it and register to write the examination because it is a pre requisite to what I intend to study at tertiary level.*

Student A3 said, *I am doing mathematics but it is a difficult subject. I am regretting my decision that I made.*

Student B2: *Mathematics is kind of hard and complicated, that most girls tend to shun away from writing the examination. This could be due to kind of socialisation that we are exposed to. Our parents always say that mathematics is to be done by boys who are more intelligent and not suitable subject to be studied by girls.*

Student C1: *I had to convince my parents to register me to enable me to write my O-level mathematics examination. They said that it is difficult subject that I was going to fail, hence they did not want to waste their meagre resources by giving money to register the subject. I admit that mathematics is a challenging subject which is a bit too involving.*

Student C2 also said: *I perceive mathematics to be very hard, and indeed it is really challenging. As a day scholar, working mathematical problems after the household chores is also a big challenge, because when you are tired physically, mentally you are also tired.*

The perceptions revealed by these female students are that mathematics is a difficult and challenging subject which is masculine. Our findings are consistent with what Hart and Saraswathi (2003) found that some students, especially female students harbour the belief that mathematics is generally a difficult subject.

The other nine female students (not registered to write maths exam) who were interviewed clearly outlined that they still perceived mathematics as a masculine subject. They added that members of the rural society also perceive the subject as masculine as highlighted by the following quotations:

Student A6: *I do not have to be serious with a difficult masculine subject that I know I won't pass, because my parents tell me that I am not intelligent enough to do mathematics and to pass it.*

Student B5 told us that, "*our parents tell us not be worried about writing the mathematics examination because it is meant for boys. Specifically, my mother asked me to either register food and nutrition or fashion and fabrics which I would need later as a mother than mathematics hence I did not register to write mathematics examination. Although I will be in a maths lesson, I won't be very attentive and not serious when I do my homework because I will be aware that I will not write the exam. If it were not that mathematics is compulsory, I would not be attending mathematics lessons or doing my homework.*"

Student C4: *I do not want to be associated with a masculine subject which is too hard for me. Although it is a core subject, I will not write the final exam because I fear to fail it.*

Given the importance of the perceptions of the value of mathematics in shaping male students' and female students' course career decisions, socialisers should do all they can to point out both the real possibility of a career in a mathematics related field and the importance of this subject for a variety of adult careers (Eccles, 2005). It implies that parents/guardians and teachers should create a conducive environment for female students to participate in mathematics.

All the female students agreed that they were socialised at an early age to be care-givers and nurturers. During interview, the participants said that the way they are brought up in their families influenced them academically. Therefore family influences are correlated to academic performances (Gudyanga, 2014). What parents say and do to their female children about mathematics tend to reflect how they would perform in mathematics at school. Furthermore, female students are told by the community that mathematics is a masculine subject, and they tend to accept and believe it.

Information obtained from interviews also indicated that most parents believed that female students' core business was to perform domestic activities like washing, cooking, caring for the young just to mention a few. In addition, student A4 said, "*What role does mathematics play in giving birth and child rearing, which is our core business?*" This socialisation then shapes subsequent academic interests and career aspiration. However, the female teacher told us that by virtue of females being highly linked with domestic duties like preparing and sharing food, there is a great need for them to study mathematics because in those duties they unknowingly apply mathematical concepts. Thus, female students need to be reminded that there is a lot of mathematical principles applied when performing domestic activities, for example when preparing meals, in order to mix ingredients correctly, those preparing it need to know ratio principles.

Fifteen out of eighteen interviewed female students (83.3%) pointed out that they were not good in mathematics and they perceived it as a difficult subject. They regarded it as a waste of time to invest their efforts in a subject they knew that the probability of failing it was higher than that of passing. The other three teacher interviewees agreed with the girls' point of view. These teachers pointed out that they are yet to register a mathematics pass rate of above ten per cent. Information on subject percentage pass rate posted on the notice boards at all the three schools confirmed that for the November 2014 examination, pass rate was the lowest in mathematics as depicted in Table 1. At school A it was 4%, at school B it was 7 and 5% at school C.

Again, individual student participant interviews revealed that female students felt anxious during mathematics lessons. During lesson observations at school B, we noticed that students B4, B5 and B6, had unhappy facial expressions and their lips seemed to be tightly glued. The facial expressions revealed that the students were not enjoying the lesson. Anxiety and performance are inversely related (Gudyanga & Gudyanga, 2013). The more the students get anxious, the worse their performance. Anxiety must therefore be minimised in class as much as possible.

Table 1. Percentage pass rates by compulsory subjects by school in 2014

	English	Mathematics	Science
School A	10	**4**	9
School B	12	**7**	13
School C	11	**5**	11

Source: School notice boards.

4.2. The influence of female students' perception on their participation in mathematics

During lesson observation, we noted that student C6 did not raise up her hand to volunteer solving mathematical problems at the chalkboard. Surprisingly enough, the student had correctly worked out the problem in her exercise book. This indicated that the female student lacked confidence. This finding is in line with what Brown and McNamara (2008) and Vurayai (2012) observed when they claim that lack of confidence is one of the major reasons for female students' low participation in mathematics. Matthews and Pepper are of the same view when they contend that students' perceptions of their own competence is also an important factor, particularly for female students who are likely to underestimate their mathematical competence and therefore, less likely to participate in mathematics.

Student A3 was regretting doing mathematics. Student B5 was told by her parents not to get worried by doing mathematics. These findings indicated that female students were mathematically anxious and such anxiety may account for their limited participation in Ordinary Level mathematics. Mathematics anxiety, lack of confidence in mathematical ability, stereotype view of mathematics and encouragement can influence learners' participation in mathematics. Hence, anxiety and fear of mathematics may cause low participation of female students in mathematics (Frenzel, Pekrun, & Goetz, 2007).

The female student participants in the study outlined that they perceive mathematics as a masculine subject because of the way they were socialised. As a result the female students did not want to be associated with a subject inconsistent with female self-image (Costello, 2007), hence they do not participate in the subject in their large numbers. Female students did not bother to learn mathematics. The female students also stated that they did not have confidence in their mathematics ability because they were constantly told that they were not as intelligent as boys to study mathematics. This is consistent with (DeHaven & Wiest, 2003; Farooq & Shah, 2008; Watt, 2006) who indicated that female students' participation in mathematics is influenced by society that views mathematics as a male domain, resulting in the perpetuation of the idea that males are naturally more mathematically gifted than females. Female students may be persuaded to think of themselves as mathematically incompetent and therefore, females may avoid mathematics. By virtue of female students being highly conservative and reserved in nature (Forum for African Women Educationists, 2004), there is no reason what so ever for the increased participation of female students in the subjects with high chances of exposing their weaknesses.

In addition, results on notice boards showed that mathematics pass rates were low. Thus, low pass rates in mathematics caused female students to have negative attitude towards the subject. Once the attitude is negative, we would interpret this to mean insufficient zeal to study and practice solving maths problems. Furthermore, the students will develop external attributions like teacher effect, or inadequate resources towards their performance.

Among the six mathematics teachers who participated in the study, only one was female. Classes which were taught by that female teacher had the highest number of female students (twenty-three) who were doing mathematics. More so, the way the female teacher treated female students was totally different from what the male teachers were doing. Her teaching was neutral. This had been indicated by the number of both males and females students she granted permission to solve mathematics problems which were three apiece. Female students in schools B and C told us that since they had enrolled at those schools they were yet to encounter a female mathematics teacher. In 2011, Zimbabwe had male staff in science and mathematics standing at 89% and females was at 11% at national level (Zimstat, 2012). We concluded that lack of exposure to women role models in mathematics may be one of the reasons why there is a low participation of female students at Ordinary Level in mathematics. Role models are very critical in enhancing confidence and elevating aspirations of female learners (Vurayai, 2012). Thomas and O'Grady also found out that female students have fewer role models who encourage them to participate in mathematics and science.

5. Conclusion

The Zimbabwean rural female students perceive mathematics as a masculine subject which is hard or difficult and more involving especially after having spent time on the household chores. This is due to how they are culturally socialised when they are told that they are not intelligent enough to study mathematics which they view as a male subject. The female students also lack role models to inspire them to study mathematics.

The influence of female students' perception on their participation in mathematics is that most of them do not want to be associated with the masculine subject, resulting in their low participation in the subject. The few who participate are influenced by their career choice which require mathematics as a pre requisite. The persistently low pass rate in mathematics results, in the fear of failing, lack of self-confidence, mathematics anxiety and the belief that they are not as intelligent as the male students, influence their low participation in the subject. Poor pass rate in mathematics has portrayed the idea that mathematics is difficult.

There is need to introduce gender sensitivity (ability to perceive existing inequalities) and gender awareness programmes to pre and post-training teacher courses. However, it is important to note that training programmes raise awareness but may not necessarily encourage the level of criticality required to challenge their own 'taken for granted' beliefs. Furthermore, it is incumbent to sensitise academic staff to the gender dimensions of teaching and learning which is an important first step towards the transformation of the curriculum, including content, methodologies and processes. The teachers and parents may recognise the difficulties that the prevailing culture generates, but while engaging in critique, are also part of the culture in ways they both acknowledge or perhaps fail to see. Additionally, the teachers should also empower the female students and cause them to break away from the cultural norms by teaching them the importance of mathematics in order to develop a positive perception of the subject. Parents and teachers should also work hard to eliminate the negative gender and cultural stereotypes in order to enhance female students' confidence about their mathematics abilities. This could be done through schools development associations (S.D.A.'s).

For the reason that the methodology is interpretive, schools are made responsible for smoothing out difficulties generated by the prevailing culture. Next, schools should employ female mathematics teachers and expose female students to female role models who have made it in life in order to encourage more participation of female students in mathematics and finally, we noted the limitations of the study.

The schools attended by the female participants also catered for male students, hence the academic behaviour of mixed classes have a different dynamic than single sex classes. The number of participants was not large enough to warrant external validation. Furthermore, the dynamics of rural females are most likely different from the urbanites, hence the need for further research on a large randomised sample of urban and single sex school female students.

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Cover image
Source: An image for this purpose is a figure depicting percentages of females versus males by enrolment in Maths by year for a given school A.

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