

Why do girls perform less well than boys in natural sciences in Zimbabwe? A case study of Makonde District.

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Abstract: Research has shown that there is a decline in the uptake of science, technology, engineering and mathematics (STEM) subjects all over the world. It is also even more worrying in the case of girls whose uptake in STEM is very low and the performance of the few is not as good as that of the boys in particular in Zimbabwe. The modern world demands that economic and social development be spearheaded by a STEM literate citizenry and the importance of gender equality in the development cannot be over emphasized. This paper focuses on the study that was done to explore the factors behind the low performance in natural sciences by girls in Zimbabwe. All the participants were day scholars in a co-education setting. A mixed methods research design underpinned by the micro, macro and institutional (MMI) theoretical frame work was used. Findings revealed that parental discrimination in terms of treatment and heavy workloads were among the top cited factors.

Keywords: ability, cultural beliefs, gender, natural sciences, performance, self-efficacySTEM, and stereotype.

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Introduction

In most African cultures right across the continent a very strong connection exists between culture and gender in many ways. There are diverse ways in which gender is stereotyped in households, communities and nations across Africa according to Bhusumane (1993) and Chipunza (2003). These findings are concurred by those of Kendall (2006) & Chinyani (2007). Gender stereotyping starts at childbirth right through life into old age and death. The 2013 Zimbabwe National Statistics Agency (ZIMSTAT) report for 2012 census reveals that only 6.9% of technical and science orientated skilled labor force represents females. According to the Ministry of Primary and Secondary Education (MOPSE) in 2015 female students who wrote O-level science subjects in the October/November examinations in Makonde district 26% of them passed integrated science, 42%, biology, with the highest pass rate in physical science at 67% but still below the male pass rate of 87% in the same subject. See table 1-1.

Table 1-1 Makonde District 'O' Level Pass Rates

YEAR				2015				
	Total	Male	Female	Male		Female		
SUBJECT	Frq	Frq	Frq	Frq	%	Frq	%	Ov %
Integrated Science	2918	1560	1358	522	33	358	26	30
Biology	325	183	142	108	60	59	42	52
Physical Science	216	133	83	109	82	56	67	76

Key: Frq =frequency, Ov =overall pass rate.Source: MOPSE (2015).

Both the Ministry of Education, Sport, Arts and Culture (MOESAC) (Education Medium Term Plan (EMTP) 2013:23) and the Ministry of Women Affairs, Gender and Community Development (MWAGCD) (National Gender Policy (NGP) 2013:17), acknowledge the need to have research based evidence to tackle the challenge of low performance and uptake of sciences and the related careers by females. That was the missing gap filled by this study.

Literature Review

Research done by Hill et al (2010) advanced that girls’ performance and persistence in STEM disciplines is influenced by both internal and external factors. Therefore self-efficacy beliefs describe a person’s choice of activities, including educational choices, thought patterns, persistence as well as one’s effort expenditure and reactions when resisted by barriers as affirmed by Pajares (2005) and Schunk & Pajares (2010). Many studies have generally concluded that girls have low self-efficacy than boys in STEM. Evidence has emerged that students’ achievement levels are much influenced by the school environment and, in particular, the daily management and organizational procedures of schools which are frequently reliant on gender as a management tool Eurydice (2010). Parental beliefs have a great impact on the child’s beliefs since the parents are the first educators of the child. Tomasetto et al (2011) premised that the performance of girls in math whose mothers were not math gender-stereotyped was not easily affected by stereotype threat conditions.

Methodology

This study adopted the mixed methods research (MMR) design underpinned by the MMI framework to explore the factors behind the gender-based performance that affect the learning experiences of students studying natural sciences in Zimbabwe. Questionnaires and

focus group discussions (FGDs) were used.. A total of 590 students participated in the survey questionnaire and 42 in FGDs. Data was collected using the explanatory sequentially research design. Its strength lies in its ability to study a problem in depth where solutions are very evasive. Quantitative data was analyzed using chi-square, analysis of variance and factor analysis (CAF) and presented in numerical analysis. Qualitative data was analyzed using qualitative content analysis (QCA) and presented in the form of narratives, themes and categories. Both quantitative and qualitative data findings were then compared and integrated.

Results and Discussion

Four items soliciting for performance factors were asked in the questionnaire and the responses of the participants are indicated in table 1-2.

Table 1-2 N = 590

Key: U =unanswered, A=agree, DA =disagree.

Item Description		Males (Boys) n=352			Females (Girls) n=238		
		U	A	DA	U	A	DA
1	Girls are not as good as boys.	9	184	159	5	49	184
		3%	52%	45%	2%	21%	77%
2	Equal treatment of boys and girls both at home and school helps in subject choice and performance.	15	261	76	5	211	22
		4%	74%	22%	2%	89%	9%
3	House hold duties affect my school performance	25	127	200	6	116	115
		7%	36%	57%	3%	49%	48%
4	Science subjects are difficult.	27	74	251	5	62	171
		8%	21%	71%	2%	26%	72%

In this study both boys and girls participated in accordance with the theoretical framework which is holistic in nature and advocates for inclusion of both sexes in gender related issues. However this paper focuses mainly on the responses given by the girls. Table 1-2 shows that the girls (77%) refuted the perceptions that they are not as good as boys and that science subjects are difficult to them (72%). The findings suggest that the self-efficacy of the girls was high and this contradicted the earlier findings of (Ceci et al (2009) and Stuckey et al (2013).

However they agree with the findings of Christensen et al (2014). 89% of the girls indicated that equal treatment both at school and home enhanced their performance in the natural sciences. The majority of the boys (74%) agreed that equal treatment of both sexes assisted in doing well in the subject however 52% said that the girls were not as good as boys. In other words the boys had some doubts the ability of the girls in natural sciences. The margin of doubt was not very big as 45% of the boys endorsed that the girls are just as good as boys in the subject.

In tandem with the mixed methods approach the quantitative results were followed up with qualitative interviews during FGDs. The interviews helped to get the desired specific information from the participants through exploration and explanation of the issues at hand. At the end the researcher was able to comprehend and accept the participants' emerging world view and new ideas on the topic. The following selected extracts expose the views of the participants. The quotes are verbatim. RF1 means respondent female 1 and so on and the same applied to FGD numbering.

RF16 (FGD2): "Girls are as good as boys but just that girls are not getting enough time to study like boys do. Us girls when we get home we first do housework, boys just get home and change their clothes, at times their laundry is done by the maid. Girls by the time they wash the dishes and when you are done you dry the dishes as well you would be so tired and cannot study anymore".

RF12 (FGD1): "The way I see it physical science is not difficult but just because of fear people are told that it's difficult and they say they can't do it but boys they can manage physical science, that's what I think".

The message from the two respondents was clear that the girls did not attribute their performance to self –efficacy or ability alone but to some other factors like home chores. The notion that science was difficult to girls was dismissed but instead the lack of adequate time to study was raised. The qualitative results concurred with the quantitative findings. Girls raised the issue of parental discrimination as a factor that disempowered them academically and hence the low performance as cited in these quotes.

RF6 (FGD1): "I want to talk about the issue concerning our parents. Most boys can be allowed to study at the library at school, studying in groups and can even spend a week away from home while studying without getting involved in any mischief but with us girls if I were to ask for permission to go for group studies my parents would refuse so I just end up studying by myself. Some concepts are difficult to grasp and some require group discussions".

RF2 (FGD2): "Parents don't trust girls to go and have group discussions away from home citing mischief. School home works are many, some easier to do alone but others require group discussions with friends. Girls are denied this chance. There are other situations where you are given lots of homework and when you get home there will be a lot of work like washing the dishes, sweeping the house, cooking and also fetching water".

The lack of trust from parents emanate from their cultural beliefs. Zimbabwe is heavily a patriarchal society and women are viewed as not being able to economically and socially stand on their own. Somehow, there is this thinking or belief that a man's advice and support is indispensable to a woman's life. Most parents do not think that their girl child is capable of making informed independent decisions with regards to love relationships. Modern society and technology has done very little to change the mind set of parents when it comes to the distribution of household chores. The girl child is over burdened with work and the argument is that she is being prepared for a future wife's roles. The heavy work load takes its toll in terms of time management and concentration. The way the girls are treated both at school and home affect their school performance argued Mutekwe et al (2012).

The other frequently cited reason for poor performance was what the girls termed 'social pressure'. The pressure manifested itself in various forms for example peers expected them to be more feminine and desist from behaving like tom boys by opting to do STEM subjects and to get involved in love relationships. Girls conceded that they take love relationships seriously at this stage and this distracted them from school work and it's a social pressure they find difficult to resist. Lack of empowerment in particular by parents was mentioned and the girls claimed parents do not encourage them as much as they do to the boys. They are denied the freedom to be independent and these actions militate against their performance. The following quotes represent some of the girls' reasons for poor achievement in natural sciences.

RF17 (FGD2): "I think girls have as much potential as boys, but some are disturbed by relationships but the other issue is of parents. Girls need empowerment that was mentioned earlier we girls need encouragement on the importance of sciences but then there is lack of trust from our parents. They don't really trust us, they think when girls mature they start engaging in relationships, they don't trust us, they won't allow us, you would hear a boy child saying they having a sleepover at a friend's place reading and also having discussions but if a girl child says the same the parents would start talking of mischief. We are not allowed sleepovers and also at school I will not find the time for discussions as we might be occupied most of the time. We come from different families maybe I am the only child. I have to first do housework, so we need empowerment".

RF9 (FGD1): “Okay, I would like to emphasize on the issue of the fact that girls are not much better than boys in terms of natural science, I think since natural science needs more concentration most of the girls usually during this adolescence stage, most of the girls lose concentration for school work so natural science it seems as if natural science is much more difficult, much more challenging to girls but according to me natural science is just a subject that needs a lot concentration so girls due to peer pressure that we experience during the adolescence stage we find that the subject at the end will appear as hard or difficult, it’s not(laughing), for example at our own stage now teenagers, we are falling in love, we are now being asked out (laughing), its the truth guys, boys are now proposing love to girls instead of concentrating on your books sometimes when the teacher is explaining on the board you are thinking of someone, yesterday he told me he loves me so much”.

The other common reason given was the impact of cultural beliefs. Girls who had very strong stereotyped cultural beliefs believed that they could not perform well in natural sciences because it was a male designated area. The girls acknowledged that they had embraced these beliefs because they are daily and constantly reminded by both the community and some of their teachers that STEM subjects are for males because their brains are more powerful than the female ones. Miyake et al (2010) posit that if a student’s social identity is erected negatively, the student will be liable to underachieve in a way that is consistent with the stereotype. These findings are also concurred by Fogliati & Bussey (2013) who found out that stereotypical negative comments made in class by teachers had more effect on the female’s performance in mathematics than males. One of the strong attributes of QCA is its ability to analyse qualitative data and concurrently quantify it and that is what was done as shown in figure 1.

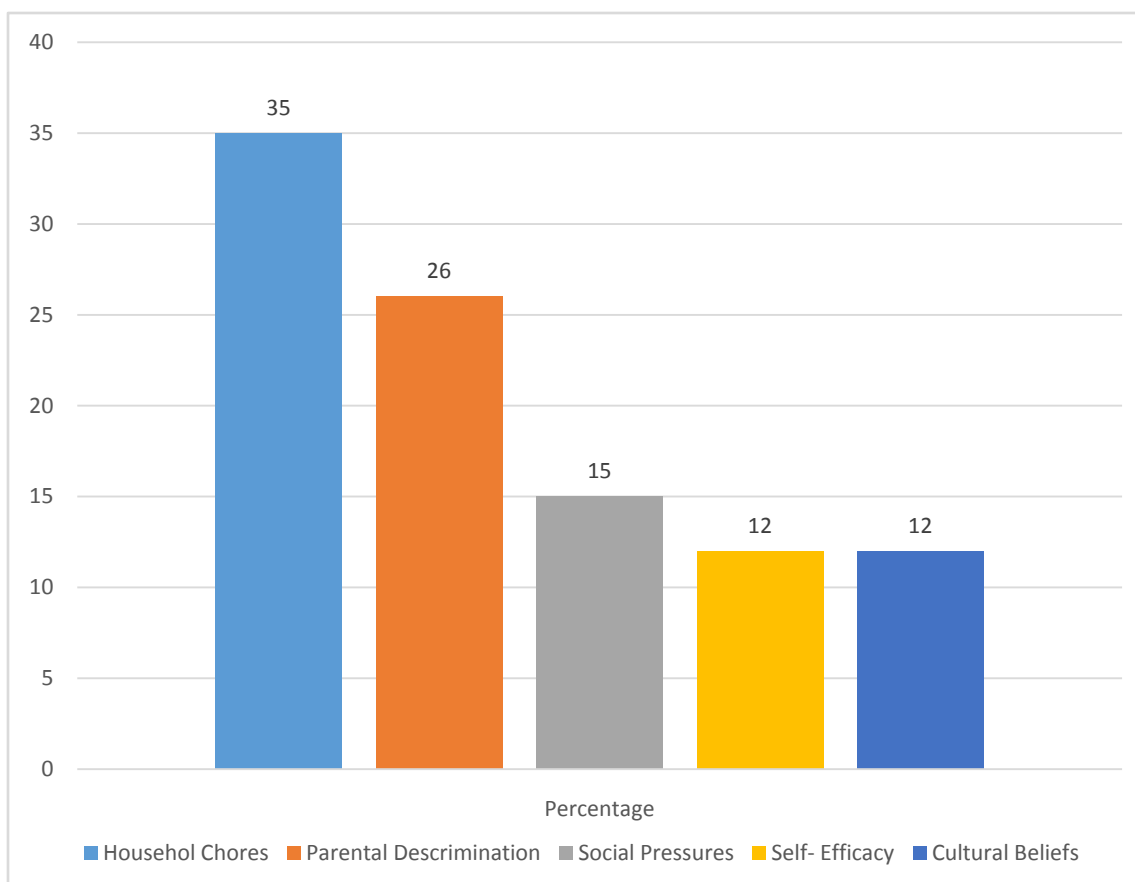


Fig 1 Performance Reasons

Conclusion

This study managed to identify some of the main factors which influence the performance and learning experiences of girls studying natural sciences in Zimbabwe. The importance of the findings is they highlight a paradigm shift in the thinking of the girl child and their perceptions towards natural sciences. Both parents and educationists stand to benefit from the findings. The limitation of the study is that the views are those of day scholarstudents from poor townships and rural areas and may not be a reflection of students from different settings and backgrounds. Based on these results, the researcher recommends that : (1) Schools should consider convening regular meetings with parents and engage them in robust debates concerning the challenges faced by the girl child both at school and home with regards to her education. (2) Community leaders like politicians and church leaders since they are very influential should be requested to be the school ambassadors in the spreading of the message.

Appendix A: Sample of an FGD Interview Process

Question 2. Research has shown that fewer girls than boys choose and pass natural sciences at O and A level in Zimbabwe. What do you think are the reasons?

- RF1. I think it's because of fear of failing them for example my personal example I did not take Chemistry because I thought I would not be able tackle it so therefore I did not take it, instead I took Food science, I thought that would be easier than Chemistry.
- RF2. It's because ummh many girls have just this feeling that science subjects they are difficult and that girls usually they tell themselves that they are inferior to boys as a result you find there are fewer girls doing these subjects, Maths, Physics, Biology and Chemistry because they have fear.
- RM3. I think girls just lose focus, they (laughing) don't understand better than boys, I mean boys they understand Engineering better than girls.

- RF4. I think like what he said it's that kind of mind set that influences other girls to think that Sciences are not for them. There is this kind of rumor that actually boys are better in science subjects than girls so I think it's just mindset ye the person like let's say uumh if a girl right, really puts her mind on to something, she wants to do sciences and does them without that kind of mindset that boys are better than girls. I think they can do better, it's just the mindset and influences from other people that sciences are hard for girls and boys are meant for sciences.
- RF5. I think ummh girls right, they think that sciences are meant for boys because usually If you look at the past most of the scientists are male, fewer female and for that reason some believe that maybe it was just meant for the boys.(laughing)
- RM6. There is another problem, girls think that they are too smart (laughing) because sciences involve dirty chemicals what? (Laughing)
- RM7. Yah yah I get his point, let's say in terms of Engineering the past where you get, to work with metal and in Chemistry you get to work with Chemicals you know so they will be like I don't want to get my hands dirty. (Laughing)
- RF8. (Laughing) No it's not true, I think it's mostly based on misconception like girls are inferior girls should be lower than boys, girls shouldn't do this, girls shouldn't that, I think it's because they see themselves and feel inferior to boys, and generally it's kind of because of fear per say.
- RM9. It comes from long back, back in the time when parents would say the girl child should stay home and educate the boys, its useless to send the girl child to school because she will only get married after school so some are still living in that time, (laughing). Yes its different father daughter, mother son, fathers like daughters more than sons, mothers like sons more than daughters (laughing), when it comes to school they all support. Yah.
- RM10.Maybe that depends with the parents, it might differ sometimes but I think its quite the same how they take your education but only that they give preference to the one who seems more serious, like interest in the jobs that are more paying.
- RM11.The female, the girl, well we said due to the cultural beliefs and stuff that the girl is supposed to be doing the household chores and stuff like that so at home I wouldn't expect my dad to call me to come wash the plates, I would expect him to say go do the garden, go wash the car so we classify ourselves according to the chores we are expected to be doing.

- RM12. If you check the chores that are done by the males right, mostly the garden stuff, its hard work, it requires energy and stuff so if you are a guy doing those jobs let's say today you might be doing it for 2 hours, after those 2 hours you will be tired, you will go to sleep of which the female she might work for 5 hours, washing plates, sweeping the house and it would require that much of energy, the same as the guy if you get where I'm coming from, (laughing).
- RF13. It doesn't depend on how much energy it needs because you only rest one day and the next day you will be so active, for the girls you do it like regularly, each and every day, I don't know for how many hours. No it's not like that, if you have little siblings also you have to take care of them, supper you have to cook, lunch you have to so many things, you don't want to know, (laughing) and for you guys it's like for one day, once in week, once in a month you have to like wash the car or go to the garden, who has got fewer hours to read now?
- RM14. Girls are more confident than boys, (laughing), problem inoitika ndeyekuti vakomana vanonyara kudarika vasikana, (laughing) vanofunga kuti inoda simba rakawanda, (laughing), kusimudza like mentality iripo ndeyekuti engineering pane zvakawanda zvinoda kusimudzwa simudzwa and vasikana hana dzavo hadzina kusimba, havakwanise kuona munhu akauya kuchipatara, instead kuti arape munhu ndiye akutorwara (laughing), ndosaka vachizorapwa na doctor (laughing). (Girls are more confident than boys but they think that engineering involves a lot of physical hard work and energy. They also have weak hearts and are easily frightened.)
- RF15. I think in terms of confidence girls are less confident than boys because it's the girls naturally depend on other peoples opinion like in terms of everything like girls are supposed to be this. Most of the times you can't, people don't really say this boy is ugly but for girls you can say the girl is ugly (laughing) serious because for girls you have to be perfect, you have to be this and that, for boys it's to a lesser extend so I think for confidence girls have less because everything they do, they get commented but for boys it's not usually commented.
- RM16. Most of the negatives are from the girls, some of the reasons have been mentioned before, and we said girls want to be smarter, they think sciences are difficult, they just believe that boys are able to do it better than them, I can't remember all the points but these are some of them.
- RM17. Well bringing back the issue of household chores (laughing), okay basically the girls gives them excuses so because of that they get this negative attitude, no I can't do this, I can't do this if you get what I mean, they just makeup excuses, they get negative.

RF18. I think it depends on ambition, cause whether you are a guy or girl as long as you've got something to do in life, that depends on your attitude on a subject Science, Commercially or Art, lets just say someone wants to be an Accountant in life, you cant put 100% focus on Chemistry when you know that you want to be an Accountant, put 100% focus in Accounts so it depends, your attitude depends on ambition. Yes, true. Its not like that but its just natural that most of the girls don't, are not into science that much, they are really hard.

RM19. I wanted to say girls, generally are not serious, they have this mentality that men are supposed to go to work and they are the ones who are supposed to look after the family (laughing). Yes some.

RF20. For example they have still this belief yekuti they think that males are the ones who are supposed to educate, go to work and then girls are just of household chores, looking after the family but it depends on the person, some they just want to be as equals as boys.

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