Gender Orientation Perspectives Towards Learning of Mathematics: The Case of Senior High Schools in the Kumasi Metropolis, Ghana

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Abstract
This paper investigates the distinctive gender orientation perspectives toward mathematics Education. The study involved 188 students from 3 Senior High Schools (SHS) in the Kumasi. Metropolis in the Ashanti Region of Ghana. Questionnaires on attitudes toward mathematics were used to gather data. All descriptive factors were looked at using cross-tabulation, univariate, and bivariate statistical analyses. A logistic regression model was likewise performed to survey key factors that influence male and female appreciation toward doing mathematics. Percentage distribution and the relationship between the dependent and
independent factors were dissected using the Person's Chi-square test. The SPSS software version 22.0 was utilized for all data analyses. A p-value ≤ of 0.05 (2-sided) was viewed as critical in all analyses. Our finding suggests that female students that answer math questions in class tend to enjoy doing mathematics. Male and Female students agreed that mathematics is good for the development of our country.
Keywords: Attitude, , Discernments, Gender, Learners, Mathematics, Metropolis

1. Introduction

Mathematics is a subject found in each school's educational plan. In Ghana, all learners in fundamental and senior secondary schools must study the subject. Notwithstanding, the learning of the subject is as yet not good. Anamuah-Mensah *e*t al. (2004) revealed that over 80% of the learners in Ghana didn't get the low worldwide benchmark in mathematics, inferring that most of the Ghanaian learners have a whole lot of nothing to handle of information and calculated comprehension of basic numerical standards. Even though there was no critical distinction in the presentation of young men and young ladies in Mathematics in the 'Patterns in International Mathematics and Science Study' Anamuah-Mensah et al., (2004). Frempong and Ayia (2005) additionally found that female learners are less fruitful in learning mathematics. They credited this to their low premium and trust in learning mathematics and their low scholastic desire. Eshun (1999, 2000) found that in Ghana young ladies in mixed schools communicated the least achievement and trust in doing mathematics and had higher mathematics uneasiness. This is predictable with the discoveries of AAUW, (1992) that young ladies confidence, trust in their capacities, desires forever,

enthusiasm for testing courses and compensating vocations, and interests in mathematics and science decrease as they get older. According to Osman Kasimu and Majeed Imoro (2017), the private and public students' attitudes toward mathematics agreed with the finding of Khan and Rodrigues (2012) which stated that both private and public students show positive attitudes towards mathematics.

Accessible writing uncovered that reviews that thought about sexual orientation contrasts in mathematics are generally for young men (Muben *e*t al., 2013; Norton and Rennies,1998) whiles others, for example, Opolot-Okurot (2005) reveals for young ladies. For example, Muben et al. (2013) in an examination on the point "demeanor towards mathematics and scholastic accomplishment in mathematics among optional level young men and young ladies" uncovered that Girls accomplished better outcomes in mathematics when contrasted with young men. Opolot-Okurot (2005) then again finds that for all the attitudinal factors (tension, certainty, and inspiration), young men had higher mean scores than young ladies. That is, young men have a superior disposition towards mathematics than young ladies. Different scientists like Lindberg et al. (2010) saw no huge distinction between the mentality of young men and young ladies towards mathematics. During the previous quite a while, numerous significant examinations have been led by specialists trying to configure instruments to research the hidden components of attitudes towards mathematics (Baser, 2013; Parveen et al., 2014; Tapia and Marsh, 2004; Tripti and Mala Dutt, 2014; Wiebe et al., 2003).

In trying to accomplish quality mathematics that is important to create desired aptitudes for human development for ultimate economic development, it is essential to investigate learners' discernments and perspectives towards mathematics. Quality training incorporates an equivalent open door for young men and young ladies. Thus, sexual orientation contrasts in learning should never again be viewed as an issue and should target diminishing the holes in execution in mathematics. As of now, approaches, activities, and methodologies advancing young ladies' enrolment in mathematics and science subjects are being implemented in some countries such as the Rwandan training framework Kestelyn (2010). The systems set up to actualize these strategies incorporate reinforcing sex delicate and student-focused approaches and advancing governmental policy regarding minorities in society arrangements, where fitting, to guarantee equivalent open doors for young ladies MINEDUC (2011). Every one of these strategies and activities targets advancing correspondence in training where sexual orientation affectability is a key rule Kestelyn (2010). Prokop et al. (2007) demonstrate that recognizing students' sexual orientation-related mentalities towards a subject is significant in advancing their accomplishment and enthusiasm for that specific subject.

The issue of gender orientation distinction in mathematics training had been handled in different investigations (Amelink's, 2009; Hall, 2012; Kiptum et al., 2013, Owiti, 2011; OCDE, 2014). While the vast majority of these examinations were concentrating on sexual orientation issues in mathematics (Hall, 2012; Tang et al., 2010) or sexual orientation ridiculous in mathematics (Amelink, 2009; Masanja, 2006), hardly any investigations concentrated on learners' mentalities by sex (Owiti, 2011; LaFleur, 2011). Not many researchers investigate the gender orientation segment with regards to Ghana concentrated on young ladies' instruction without giving specific consideration to mathematics education. In African nations, gender orientation issues in mathematics instruction were investigated in nations like Kenya by Owiti (2011) and Tanzania by Masanja (2006). They were additionally investigated in other created nations like Canada by Hall (2012). These issues incorporate student enrolment, support, execution, generalizations, sexual orientation mainstreaming arrangements, and so forth. In 2011, the study uncovers that understudies' sexual orientation and their attitudes towards mathematics are related by Owiti (2011). As to learner's perspectives and support in mathematics class, guys significantly exhibited

increasingly inspirational mentalities towards mathematics Owiti (2011) and a more significant level of investment in no-obligatory degrees of science than females (Owiti, 2011; Hall, 2012). Sex distinction in attitudes had been seen as profoundly connected to the formative level Amelink (2009), to the instructive level Masanja (2006), and social patterns (Huggin and Randell, 2007). As (Masanja, 2006) has watched, sexual orientation uniqueness in execution at essential may exist, however, sex contrast is practically non-existent at grade school levels (Amelink, 2009; MINEDUC, 2011). It rather begins developing with puberty and increments at cutting edge levels of training Masanja (2006).

For the components behind female low enrolment in mathematics Amelink (2009) demonstrated that they incorporate fear of disappointment, sexual orientation one-sided study hall rehearses, young ladies' absence of trust in taking care of mathematics issues, generalizations by students themselves or impressive individuals, just as sex distinction in encounters in a similar observation. Conversely, in LaFleur's (2011) study, explicit study hall didn't show critical consequences for understudies' interest or attitudes about mathematics. In Rwanda, young ladies' training when all is said in done and mathematics instruction explicitly had been confronting difficulties for quite a while, because of a social picture of young ladies in the general public, which marked them as late starters informal instruction Uworwabayeho et al.,(2007). Because of arrangements and activities enabling ladies in training all in all Kestelyn (2010), young ladies' enrolment has altogether expanded since 2000. Be that as it may, much should be done on sex and mathematics accomplishment in Rwanda just as in all sub-Saharan African nations World Bank (2016). It is inside this foundation that this study analyzed sex contrasts as far as perspectives concentrating on young ladies and young men’s performance in Ghanaians secondary schools. The inspiration to conduct this investigation was incited by the number of fewer female students who are studying mathematics and engineering. There are still not many researches considers in mathematics training that centers around sexual orientation part in the Ghanaian instruction framework. It tries to add to a more profound comprehension of certain issues in mathematics instruction in Ghanaians with trust that the discoveries may realize attitudinal changes similar to mathematics programs and mathematics training techniques are concerned.

2. Methodology

2.1. Sample

A sum of 188 students comprising of 116 young men and 72 young ladies were randomly sampled from 3 Senior High Schools (a single-sex, that is, one only boys and other only girls and a mixed schools) without private Senior High School in the Ashanti Region of Ghana participated in this study.

2.2. Research Design

The study is both qualitative and quantitative using primary data for the analysis. It is also a micro-study that does not involve all Senior High Schools in Ghana but very few schools in the Ashanti Region of Ghana.

2.3. Research Instruments

Gender orientation perspectives towards the learning of mathematics questionnaires were used to collect data for this study. The instrument was created utilizing things chose from an assortment of built-up mathematics perspectives scales (Fennema et al. 1976; Tapia M. and Marsh G.E 2004; Majeed et al. 2013; Cohen J.W. 1988). The questionnaire had two areas. The principal segment of the questionnaire was utilized to gather information for demographical qualities. The subsequent

part inspired data about the mentalities of SHS students towards science. It comprised 24 things where everything was an announcement followed by a five-point Likert scale running from „strongly disagree‟ through „disagree „undecided" „agree" to, strongly agree''. Each dimension comprised of an assortment of the different things into a unit that highlighted an explicit part of perspectives towards Mathematics. For example, "Working math makes me nervous" suggests a sentiment of Mathematics anxiety. For an expanded inside consistency of the survey, a combination of positive and negative explanations was incorporated.

2.4. Data Collection

Information assortment was done in the Kumasi Metropolis in the Ashanti Region of Ghana. The survey was conveyed to the learners in their particular schools with the help of a portion of their instructors. Before overseeing the survey, the researcher clarified the motivation behind the investigation to the head educators, instructors, and learners. The polls were finished and collected back to the analysts that day they were managed.

2.5. Statistical analyses

All descriptive factors were looked at utilizing cross-tabulation, univariate, and bivariate statistical analyses. a logistic regression model was likewise performed to survey key factors that influence male and female appreciation toward doing mathematics. Percentage distribution and the connection between the dependent and independent factors were dissected utilizing Person's Chi-square test. Factors that fundamentally influence appreciation toward doing mathematics at the Chi-square test level were additionally broke down at the multivariate logistic regression model to reduce confounding elements that might interfere in distinguishing the key factors that influence appreciation toward enjoy doing mathematics. The SPSS software version 22.0 was utilized for all data analyses. A p-value $\leq$ of 0.05 (2-sided) was viewed as critical in all analyses.

3. Results

The socio-demographic characteristics of 118 students comprise 116 male students and 72 female students with the age from 15-22 years.

We used I enjoy doing mathematics as a dependent variable against other factors as an independent variable because our aim to find students' perception toward mathematics. To make the work easy we group the responses into two: that is, those who agreed and Strongly Agreed as Agreed and other factors such as Strongly Disagreed, Disagreed, and Undecided as Disagreed. We found out that only 8 factors have a significant relationship with enjoy doing mathematics. Both the (Females =93.5%, Male =79.3%) believed that knowing mathematics will help them earn a living. 83.7% of Male and 93.5% of the female agreed that mathematics is good for the development of our country.

(**Table 1.1**).

Table 1:1 Percentage distribution and the relationship between the dependent and independent factors were dissected utilizing Person's Chi-square test.

Factors			I enjoy doing math					
			Males			Females		
			Agreed	Disagreed	p-value†	Agreed	Disagreed	p-value†
			n(%)	n(%)		n(%)	n(%)	
Q7	I feel insecure about asking math questions in class.	D	13(52.0)	12(48.0)	0.004	7(28.0)	18(72.0)	0.152
		A	20(21.7)	72(78.3)		20(43.5)	26(36.5)	
Q9	Mathematical knowledge is useful for the development of our country.	D	19(76.0)	6(24.0)	0.268	15(60.0)	10(40.0)	0.001
		A	77(83.7)	15(16.3)		43(93.5)	3(6.5)	
Q11	Knowing math will help me earn a living.	D	13(52.0)	12(48.0)	0.008	14(56.0)	11(44.0)	0.000
		A	73(79.3)	19(20.7)		43(93.5)	3(6.5)	
Q13	I will need math for my future work	D	13(52.0)	12(48.0)	0.043	5(20.0)	20(80.0)	0.000
		A	67(72.8)	25(27.2)		40(87.0)	6(13.0)	
Q18	I feel comfortable working math problems	D	5(20.0)	20(80.0)	0.000	6(24.0)	19(76.0)	0.001
		A	65(70.7)	27(29.3)		30(65.2)	16(34.8)	
Q20	I have no problem using formulae and equations in mathematics	D	10(40.0)	15(80.0)	0.003	6(24.0)	19(76.0)	0.001
		A	67(72.8)	25(27.2)		31(67.4)	15(32.6)	
Q22	I can answer math questions in class.	D	12(48.0)	13(52.0)	0.001	4(16.0)	21(84.0)	0.000
		A	77(83.7)	15(16.3)		34(73.9)	12(26.1)	
Q24	I can solve math problem within a given time	D	12(48.0)	13(52.0)	0.020	4(16.0)	21(84.0)	0.084
		A	53(57.6)	39(42.4)		20(43.5)	26(36.6)	

% refers to percentage; Q refers to the question, A refers (Agreed and Strong Agreed), D refers to (Strongly disagreed, Disagreed, and Undecided), the †Chi-square test was used. p-value at p ≤ 0.05.

Attitude toward mathematics among respondents from females and males. Q11 (one Male: AOR=2.447, 95% CI: 0.723-8.280, p=0.150, Female: AOR=1.660, 95% CI=0.183,15.088, p=0.653), Q13 (Male: AOR=0.716, 95% CI: 0.208-2.461, p=0.596, Female: AOR=26.O76, 95% CI=4.211-161.448, p=0.000), Q18 (Male: AOR=7.686, 95% CI: 2.314-25.522, p=0.001, Female: AOR=1.893,95% CI=0.363-9.863, p=0.448), Q20 (Male:AOR=0.859, 95% CI: 0.223-3.307,

p=0.825, Female: AOR=0.84, 95% CI: 0.149-4.729, p=0.844), and Q22 (AOR=3.340, 95% CI: 0.915-12.187, p=0.068, Female: AOR=14.071, 95% CI: 2.182-90.749,p=0.005). (**Table 2.1**).

Table 2:1 Multivariable logistic regression by students.

Factors	Male		Female	
	AOR (95% CI)	p-value	AOR (95% CI)	p-value
Knowing math will help me earn a living.				
A	2.447 (0.723, 8.280)	0.150	1.660 (0.183, 15.088)	0.653
D	Reference		Reference	
I will need math for my future work				
A	0.716 (0.208, 2.461)	0.596	26.075 (4.211, 161.448)	0.000
D	Reference		Reference	
I feel comfortable working math problems				
A	7.686 (2.314, 25.522)	0.001	1.893 (0.363, 9.863)	0.448
D	Reference		Reference	
I have no problem using formulae and equations in mathematics				
A	0.859 (0.223, 3.307)	0.825	0.84 (0.149, 4.729)	0.844
D	Reference		Reference	
I can answer math questions in class.				
A	3.340 (0.915, 12.187)	0.068	14.071 (2.182, 90.749)	0.005
D	Reference		Reference	

Not included at the multivariate level because of non-significance at the bivariate level. AOR refers to adjusted odd ratio; A refers to Agreed, D refers to disagreed, Q refers to the question, CI refers to a confidence interval and p refers to the p-value at $p \leq 0.05$.

4. Discussion

Thi**s** study examined the gender orientation perspective toward mathematics. This is the very first time such a comprehensive study is been done among students in Kumasi Metropolis in the Ashanti Region of Ghana. The findings revealed that, Knowing math will help me earn a living, I will need math for my future work, I feel comfortable working on math problems, and I can answer math questions in class toward mathematics either positive or negative affect the male and females students as against that of Lindberg (2010) which found no huge distinction between males and females toward mathematics. Other factors did not correlate with an attitude I enjoy doing mathematics so they were ignored.

In our study, both male and female students agreed that mathematics is good for the development of our country which was also revealed by Khan and Rodrignes (2012) and Osman Kasimu and Majeed Imoro (2017). They agreed that they will need mathematics for their future careers which agreed with Osman and Majeed (2017).

The male disagreed that they do not feel insecure about asking math questions in class while the female agreed that they feel nervous about asking math questions in class which agreed with Amelik (2009).

Furthermore, we found out some of the factors only have a significant influence on the one-side which were also found by Frempong and Ayia (2005) that girls are successful in learning mathematics, Muben *et* al. (2013) found that girl accomplish better outcomes in mathematics whiles Opolot-Okurot (2005) revealed for males. The findings suggest that males feel comfortable working maths as compared to females. Our finding suggests that female that answer maths questions in class tend to enjoy doing mathematics as compared those who are not able to answer in class. Females that answer my questions in class have a positive attitude toward mathematics in contrast to what was revealed by Owiti (2011) that males exhibit a positive attitude toward mathematics.

We recommend that further research can be carried out to determine the effect of single parenthood on mathematics performance, how age affects students' performance, and socioeconomics and its impacts on students' performance in mathematics.

5. Conclusion

The researchers have seen that some of the factors affect both gender orientation. For the female and male students to develop more attitude toward mathematics. We recommend Ghana Education Service should add a free period to the mathematics curriculum so that students can come and ask questions, show their exercises. The researcher believes when this is done it will improve the enrolment of female students in mathematics and engineering.

6. Limitation

Lack of capital to undertake nationwide survey concerning gender orientation toward mathematics education. We suggest that further research should be conducted throughout the nation to help us understand gender orientation and perception towards mathematics education in Ghana. The research did not cover private Senior High School.

7. Competing Interests

The authors declare that they have been no competing interests

8. Funding

There was no funding

9. References

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APPENDIX

Questionnaire for respondent

This questionnaire seeks to obtain information about the Gender Orientation Perspective Towards Learning Mathematics**.**

As an academic exercise, the information volunteered would be treated confidentially.

Please tick [√] the most appropriate box or write a short note where necessary.

SECTION A

Demographic information

1. Gender Male [ ] Female [ ]
2. Age _____ (in years)

SECTION B

3. Working maths makes me nervous. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
4. Mathematics learning will not facilitate me to get good job Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
5. Learning maths is very frustrating. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
6. I get a sinking feeling when I think of learning mathematics. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
7. I feel insecure about asking math questions in class. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
8. I think learning mathematics will help me in my daily life. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
9. Mathematical knowledge is useful for the development of our country. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
10. Math is very necessary subject. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
11. Knowing math will help me earn a living. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]

12. Math improve my thinking capacity. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
13. I will need math for my future work. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
14. I enjoy doing math. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
15. Math is very interesting to me. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
16. I enjoy learning math with my friends. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
17. Learning math will help me develop creative/critical thinking. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
18. I feel comfortable working math problems. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
19. I understand more concepts I learn from teachers' notes than mathematical textbooks. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
20. I have no problem using formulas and equations in sciences mathematics.
    Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
21. I have self-confidence in learning math. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
22. I am able to answer math questions in class. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
23. I have confidence in asking math questions in class. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]
24. I can solve math problems within a given time. Strongly Disagreed [ ] Disagreed [ ] Undecided [ ] Agree [ ] Strongly Agree [ ]