

## Teachers' Perceptions of Causes of Gender Differences in Mathematics Achievement Among Secondary School Students

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### Abstract

The study investigated teachers' perceptions of the causes of gender differences in mathematics achievement among secondary school students. The study was carried in Owerri Education Zone I of Imo State Nigeria using descriptive survey research design. A sample of 150 mathematics teachers was used for the study comprising of 90 males and 60 females. A 21-item likert 4 points type of questionnaire titled *Causes of Gender Differences in Mathematics Achievement (CGDMA)* drawn by the researchers was used for data collection. The instrument had reliability coefficient ( $r$ ) of 0.81 determined using Cronbach's alpha method. The data generated were analyzed using mean and standard deviation to answer research questions while the hypotheses were analyzed using chi-square ( $\chi^2$ ) and  $t$ -test statistical tools tested at 0.05 level of significance. The result of the study revealed series of factors causing gender differences in mathematics achievement which are teacher, students and parent related. Based on the result, it was recommended that teachers should use innovative strategies in teaching mathematics to get both male and female students involved in classroom activities.

**Key words:** Teachers perceptions; Causes; Gender difference; Mathematics achievement

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### INTRODUCTION

Mathematics has generally been accepted as the foundation of science and technology and it is a very important subject in the secondary school curriculum, therefore, every nation needs it for sustained scientific and technological development (Udousoro, 2011). Mathematics literacy is the ability of an individual to formulate, employ and interprets in different contexts. In other words, an individual is able to use mathematics knowledge sources and tools for reasoning and predicting formulation deeply (Sengul, 2015). The knowledge of mathematics prepares an individual to be relevant in the society with respect to proffer solutions to environmental problems as its knowledge is applied in all facets of life. Gbolagade, Waheed and Sangoniya (2013) indicated that mathematics is more than a collection of techniques for getting answers and more than a collection of definitions, theorems and proofs. It is a richly woven fabric of connections that involve visualizing, imagining, manipulating, analyzing, abstracting and associating ideas. The understanding of mathematical concepts, improves students problem-solving abilities in other science subjects. For any nation to remain economically competitive and relevant in technical pursuit, its mathematics must be above bar especially in the current quest for entrepreneurship education. Mathematics has a great impact on the nations quest for Entrepreneurship education because, without the knowledge of mathematics

the series of measurement and precision needed to carry out production may not be realizable. The fast growing scientific and technological awareness of the society today is so much dependent on mathematics. Mathematics serves as the instrument through which exchange of currency between individuals, organizations, companies and even countries could be possible without barriers in the process of a phenomenon termed as globalization in another perspective (Tasfe, 2014). Nematullah, Mohammad, Allah and Khaliq (2015) stated that mathematics has always maintained a core position in curriculum and education as one of the “3Rs: reading, writing and arithmetic. It is considered as a critical filter in the social-economic and professional development of individuals. This all important subject has experienced poor performance more than any other subject at both internal and external examinations. This poor mathematics performance of students is further worsened by the gender imbalance leading to the problem which now constitutes a major research focus across the globe (UNESCO, 2003).

Gender is a cultural construct that distinguishes the roles, behaviours, mental and emotional characteristics between females and males developed by a society (Udousoro, 2011). Umoh (2003) in Udousoro (2011) defined gender as a psychological term used in describing behaviours and attributes expected of individuals on the basis of being born as either male or female. Gender is noted as a set of characteristics that are seen to distinguish between male and females. Okeke (2003) indicated that the study of gender means the analysis of the relationship of men and women including the division of labour, access to resources and other factors which are determined by society as opposed to being determined by sex.

Researches have been carried out to determine gender differences in mathematics achievement, some of the research results have shown significant differences while some did not show any difference. For instance, Zhang and Manon (2000) in Oluwatayo (2011) reported that males had a larger variance in mathematics scores than females, moreover females tended to outperform males among the low achieving students while males tended to outperform females among the high achieving students. Abiam and Odok (2006) reported no significant relationship between gender and achievement in number and numeration, algebraic processes, statistics and a weak significant relationship in Geometry and Trigonometry. Hyde, Fennema, and Lamon (1990) in Savitas and Akdemir (2009) through meta-analysis revealed that males tend to do better on mathematics tests that involves problem-solving while female tend to do better in computation, and there is no significant gender difference in understanding mathematics concepts. Akhateeb (2001) reported that females outperformed males in mathematics achievement.

Dolittle (1989) in Atovigba, Vershima, O’Kwu and Ijenkeli (2012) found that females performed less well than males on geometry and reasoning but females performed as well as males on algorithmic operations oriented items. Atovigba et al. (2012) revealed that male students performed higher in solving quadratic equations with the use of completion of squares method which implies that male students achieve higher in algebra than female students. Bassey, Joshua and Asim (2008) in a study concluded that there exists significant gender difference in rural students’ mathematics achievement. Oluwatayo (2011) reported that gender difference in mathematics performance did not exist though the similarity in performance of males and females in mathematics in the rural areas fell below average. The online analysis gives evidence that there exists gender difference in mathematics achievement.

Meyer and Fennema (1992) in Adeneye (2011) gave two reasons for gender differences in mathematics as internal and external; internal factors have been defined as biological, cognitive and affective factors while, the external factors are defined in terms of significant others and classroom interaction that directly influence learning. The significant others can be regarded as the peers, parents of the individual while the classroom factor may relate to the teacher with whom the individual interacts in the learning environment.

The need for sound education through mathematics achievement implies that male and female students should be in the same academic standard. The much talked about scientific and technological development of any nation will not be achievable if there is no equity in gender achievements in mathematics. UNESCO (1997) sought for the promotion of gender equity, the empowerment of women and the elimination of gender inequality at different levels of education.

#### **A. Statement of the Problem**

The brief review above is an indication that there exists gender differences in mathematics achievement among secondary school students. The quest for improved academic achievement of students to produce independent skilled manpower and problems solvers to enhance the developmental stride of the nation Nigeria requires equity in mathematics achievement between male and female students. However some factors are still considered to continually cause gender differences in mathematics achievement among secondary school students.

This study was therefore carried out to determine teachers’ perceptions of causes of gender differences in mathematics achievement among secondary schools students.

#### **B. Purpose of the Study**

The main purpose of the study was to determine teachers’ perceptions of causes of gender differences in mathematics achievement among secondary school students. Specifically, the study will determine:

- a) Teachers' perceived factors that lead to gender differences in mathematics achievement among secondary school students.
- b) If any difference exists between male and female teachers' perceptions of factors that causes gender differences among secondary school students.

**C. Research Questions**

The following research questions guided the study:

- a) What are the teachers' perceived factors causing gender differences in mathematics achievement among secondary school students?
- b) What is the difference between male and female teachers' perceptions of factors causing gender differences in mathematics achievement among secondary school students?

**D. Hypotheses**

The following hypotheses were formulated for the study:

**Ho<sub>1</sub>:** There is no significant relationship between teachers' perceived factors and gender differences in mathematics achievement among secondary school students.

**Ho<sub>2</sub>:** There is no significant mean difference between male and female teachers' perceptions of factors causing gender difference in mathematics achievement among secondary school students.

**1. METHODOLOGY**

The study adopted the descriptive research design to determine teachers' perceptions of the causes of gender differences in mathematics achievement among secondary schools students.

The population of the study consists of all mathematics teachers in Owerri Education Zone 1 of Imo State. The sample of the study consists of 150 mathematics teachers selected through stratified random sampling technique.

This consists of ninety (90) males and sixty (60) females. The instrument for data collection was a 21 item 4 points likert type of questionnaire structured by the researchers and titled, *Causes of Gender Differences in Mathematics Achievement (CGDMA)*. The instrument was made up of two sections. Section A dealt with respondents demographic variables while section B dealt with variables related to the objectives of the study. The face and content validity of the instrument were determined by two mathematics evaluation experts and a measurement and education expert. The instrument had reliability coefficient of 0.81 determined through Cronbach's alpha method and this was considered adequate for the study.

Before administering the instrument, the respondents were briefed on the purpose of the study and assured that any information given by them will only be used for the study. After that, the instrument was distributed to the respondents on face to face basis through the help of head teachers of the schools selected for the study. They were required to fill out copies of the questionnaire and return them on the spot. All 150 copies of the questionnaire given out were retrieved.

The result of the data collected were analyzed using mean and standard deviation to answer research questions while *t*-test and chi-square statistical tools were used to analyze the hypotheses tested at 0.05 level of significance. To answer the research questions any item with mean score within and above the instrument scale mean score of 2.50 was accepted while any mean score below it was rejected.

**2. RESULT**

**2.1 Research Question One**

What are teachers perceived factors causing gender differences in mathematics achievement among secondary school students?

**Table 1**  
**Summary of Teachers' Responses on Causes of Gender Differences in Mathematics Achievement**

S/N	Causes of gender difference in mathematics	Mean ( )	SD	Remark
1	Students attitude towards mathematics	3.12	0.72	Accept
2	Teachers instructional method	3.00	0.70	Accept
3	Gender stereotype	3.03	0.73	Accept
4	School location	2.32	1.24	Reject
5	Teacher-students relationship	2.84	0.72	Accept
6	Students interest in mathematics	3.01	0.61	Accept
7	Students mathematics self-concept	2.73	0.71	Accept
8	Teachers classroom management	2.42	1.02	Reject
9	School type	2.82	0.75	Accept
10	Classroom environment	2.71	0.72	Accept
11	Students classroom motivation	2.63	0.74	Accept
12	Mathematics anxiety	3.01	0.65	Accept
13	Students career choice	2.84	0.71	Accept

To be continued

Continued

S/N	Causes of gender difference in mathematics	Mean ( )	SD	Remark
14	Teachers quality	3.05	0.64	Accept
15	Students family background	2.73	0.70	Accept
16	Students peer group	2.70	0.81	Accept
17	Mathematical concepts	2.52	0.92	Accept
18	Parental choice of career for students	2.65	0.06	Accept
19	Class size	2.32	0.63	Reject
20	Parent socio-economic status	2.74	0.79	Accept
21	Mathematics curricula	2.51	0.70	Accept
Grand mean ( $\bar{x}$ ) = 2.75				

Table 1 shows that items 4, 8 and 19 were rejected as they had mean responses less than 2.50 while all other items had mean scores greater than 2.50 and were accepted as factors causing gender difference in mathematics achievement among secondary school students as perceived by teachers. Also, the items had

grand mean of 2.75 which indicates a positive perception among the teachers.

## 2.2 Research Question Two

What is the difference between male and female teachers' perceptions of factors causing gender difference in mathematics among secondary school students?

**Table 2**  
Difference in Mean Perceptions of Male and Female Teachers

Group	N	Mean ( $\bar{x}$ )	SD	Difference in mean
Male	90	2.85	0.71	
Female	60	2.65	0.75	0.20

Table 2 shows that a difference of 0.20 exists between the mean perceptions of male and female teachers on the

causes of gender difference in mathematics achievement among secondary school students.

**Table 3**  
Summary of Chi-Square ( $\chi^2$ ) Analysis

N	No of rolls	No of colum	Df	$\chi^2_{cal}$	$\chi^2_{0.05}$	P-value	Decision
150	21	4	60	213.441	79.982	0.000	Reject null

Table 3 shows that, chi-square ( $\chi^2$ ) calculated value of 213.441 is greater than the critical value (79.082) at 0.05 level of significance and degree of freedom 60, and  $P < 0.05$ . Based on the result, the null hypothesis is rejected and the alternative accepted. This implies that, there is a significant relationship between teachers' perceived

factors and gender difference in mathematics achievement among secondary school students.

**Ho<sub>2</sub>:** There is no significant difference between male and female teachers' perceptions of factors causing gender difference in mathematics achievement among secondary school students.

**Table 4**  
Summary of t-Test Analysis

Group	N	Mean ( $\bar{x}$ )	SD	df	$t_{cal}$	$t_{0.05}$
Male	90	2.85	0.71			
Female	60	2.65	0.75	148	1.429	1.645

Table 4 shows that calculated  $t$ -value of 1.429 is less than table value of 1.645 at  $df$  of 148 and 0.05 level of significance. Based on the result, the null hypothesis is upheld at 0.05 level of significance.

among secondary school students. These factors include: gender stereotype, students attitude towards mathematics, teachers instructional method, teacher-students relationship, students interest in mathematics, students mathematics self-concept, school type, students classroom motivation, mathematics anxiety, students career choice, teachers quality, students family background, students peer group, mathematical concepts, parental choice of career for students, parents socio-economic status and mathematics

## 3. DISCUSSION OF FINDINGS

The result of the study revealed teachers perceived factors causing gender difference in mathematics achievement

curricular while class size, school location and teachers classroom management were not perceived factors causing gender difference in mathematics achievement. Further analysis showed a statistical significant relationship between teachers' perceived factors and gender difference in mathematics achievement among secondary school students. This result is in line with Saritas et al. (2009), Meyer et al. (1992) in Adeneye (2011) as earlier reviewed.

The study showed that male and female teachers are of the same perception as no statistical significant difference was observed between their mean score responses to the factors causing gender difference in mathematics achievement among secondary school students. This result is in agreement with Saritas and Akdemir (2009) which revealed factors leading to gender difference in mathematics achievement.

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## CONCLUSION

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The study revealed teachers perceived factors that cause gender differences in mathematics among secondary school students. These factors can be categorized into, teacher, students, administrative and parents related.

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## RECOMMENDATION

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Based on the findings of the study, the following recommendations are made:

- a) There should be effective counselling units in secondary schools to give the female students re-orientation about mathematics and build their confidence.
- b) Mathematics teachers should apply innovative strategies in teaching mathematics to get both male and female students involved in classroom activities.
- c) Parents should allow students make their career choices.
- d) There should be reduced sex stereotype in mathematics classes through use of students-centered and activity oriented approaches of learning.
- e) More female students should be encouraged to take mathematics and mathematics related career through offer of incentives by the government.

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