

## Enhancing Gender Equity in Mathematics through the Use of Gender Sensitization Strategy (GSS)

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### Abstract

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This research work was carried out in Ogoja Educational Zone, Cross River State. The researcher structured of Gender Sensitization Strategies (GSS) and investigated their benefits in enhancing gender equity among Mathematics students and also the effect of these GSS on students' achievement in Mathematics in Senior Secondary Schools Two (Ss2). The study was guided by two research questions and two hypotheses. Also two instruments were used: Gender Sensitization Strategy Questionnaire (GSSQ) and Mathematics Achievement Test (MAT). The population of the study was 2445 students from where a sample of 120 students was selected also 9 teachers were sampled from the 3 schools selected for the study. Means scores and standard deviations were used to answer the two research questions while t-test was used to test the hypotheses. The findings of the study among others include: that all the items listed in table one were accepted by respondents as benefit of Gender sensitization Strategies, that the GSS enhanced students' achievement in Mathematics, there was no significant difference in the achievement of Boys and Girls taught differently by male and female teachers exposed to GSS. Based on these findings it was recommended that among which is that Mathematics teachers should be enlightened on the benefits of gender equity in STM Education.

**Keywords:** *Sensitization, Enlightenment, Education, Gender equity*

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### **Background to the Study**

The free Encyclopedia (Wikipedia, 2004) associated gender equality with terms like gender equity, gender egalitarianism or sexual equality. In Wikipedia, world bodies define gender quality as related to human rights especially women's rights, and economic development.

UNICEF also in Wikipedia explains gender equality as leveling the playing field for girls and ensuring that all children have equal opportunity to develop their talents. Gender equity could also be explained as the standardization of opportunities (and resulting benefits) between male and females. It means fairness and justice in the distribution of benefits and responsibilities between women and men. It could also be explained as a situation whereby boys and girls, women and men are given equal opportunity in the utilization of personal capabilities to realize full human rights. Equity is about care fairness thus recognizing differences and accommodates it in prevention of the continuation of inequitable status quo. Okeke (2001) defines gender as social and/or cultural construct, characteristics behaviours and roles which any society ascribes to females and males e.g. women are submissive and men are assertive. She explained that this situation is a constant factor that has been militating against female enrolment in Science, Technology and Mathematics STM in schools and colleges. This has also matured to permanent stereotyped subjects or courses for girls and boys. Consequently, boys are raised and encouraged to enroll in Science Technology and Mathematics and they are exceptionally encouraged to perform well in them, girls are raised to be withdrawn and have negative attitude towards science, technology and Mathematics and any other hard subjects. The resultant effect is that there is serious gender disparity, beyond school enrolment, subject choice etc. and even in the labour market Okoli (2009).

Many researchers have identified cases of gender disparity in STM. Rufai (2009) noted that women are marginalized in Science Technology and Mathematics. Njoku (2009) also noted gender bias in STM curriculum materials. Presently, many studies have been carried out on gender in order to unveil sources of disparity in STM curriculum materials. Wasagu and Mohammed (2007) listed some of the major causes of gender disparity in STM curriculum as follows:

1. Socio-cultural factors such as traditional values and practices, cultural tradition translated into social norms, social status perception of women as subordinates.
2. Socio-economic factors which include: poverty, household size, parents educational background and attitudes.
3. Policy related factors which include lack of goals and inadequate monitoring of gender equity.
4. School related factors which include school location, inadequate facilities, lack of female role model and gender biased curriculum.

The existence of gender disparity has caused many nations stunted socio-economic development including Nigeria.

This situation has prompted serious global challenges in all the nation Blogger (2005). The challenge is on how to design a gender sensitive curriculum which will completely eliminate gender disparity among students in STME. The intensive wave of challenge is caused by the realization of the fact that female education is considered a powerful instrument of public action and a catalyst for economic and social change. Many nations have realized that investing in educational opportunities for girls yield perhaps the best returns of all investment in developing countries. In it also based on this that Nigeria partnered with United Nations in adopting the Millennium Development Goals which among others include to:

Promote gender equality and empower women. To eliminate gender disparity in primary and secondary education preferably by 2015 and at all levels by 2020 (Adikwu, 2008). Since this goal has to be achieved, Science Technology and Mathematics Education curriculum requires reformation as to remove all the traces of gender disparity from the curriculum. This is imperative because the corner stone of socio-economic and political development in Science Technology and Mathematics Education. It is on this premise that the researcher has pre-printed gender sensitization strategies as ways of enhancing gender equity in Mathematics as one of the key subjects in STM.

#### **Statement of the Problems**

There are many instances of gender disparity in many nations of the world including Nigeria. Research studies carried out in Nigeria, have shown that more boys enroll for Basic Science than girls in Senior Secondary Certificate Examination conducted by WAEC (Omole, 2005). Similar study was carried out Azikwe (2002). She appraised men and women participation and achievement in Science, Technology and Mathematics. She reported that women's participation is globally lower that that of men. Okebukola (2003) also reported that apart from arts subjects and education, female enrolment is less than half of men. He noted that gender disparity is more pronounced in engineering, technology and environmental design and veterinary medicine.

This has resulted to a conspicuous marginalization of women, denying them the opportunity in the utilization of personal capabilities to realize full human rights. It has been globally realized that promoting gender equality is an encouragement to greater economic prosperity and sustainable development (UNICEF, 2002). This assertion has sparked up global challenges on how to enhance gender equity in STM Education. Following this challenge, many research studies have been carried out on the effect of gender disparity on students' achievement in STM Education and on the strategies to enhance gender equity. However, many of the studies were not specifically on Mathematics and in Ogoja. It is based on this premise that the researcher wants to investigate the effect of gender disparity on students' achievement in Mathematics and the strategies to enhance gender equity among Mathematics students in Secondary Schools in Ogoja Educational Zone. The worry of the researcher can be stated thus: What is the effect of gender sensitization strategies positively change the attitude of students and enhance their achievement in Mathematics?

### **Objectives of the Study**

The study aims to examine the following:

1. To develop gender sensitization strategies for Mathematics teachers.
2. To determine teachers perception on the benefit of GSS
3. To determine the effect of these strategies on student's achievement in Mathematics.

### **Research Questions**

1. What is the perception of Mathematics teachers on the benefits of gender sensitization strategies?
2. What is the effect of gender sensitization strategies on student's achievement in Mathematics?

### **Hypothesis 1**

There is no significant difference between the mean score achievement of students taught Mathematics by teachers exposed to gender sensitization strategies and students taught by teachers who where not exposed to GSS.

### **Hypothesis 2**

There is no significant difference between the mean score achievement of girls and boys taught differently by male and female teachers who were not exposed to gender sensitive strategies.

### **Research Design and Procedure**

The researcher adopted quasi-experimental design as well as descriptive survey design. The quasi experimental design comprised of one experimental group and one control group.

### **Population**

The population of the study was 2445 students which comprised of all the senior secondary Mathematics Students (SS 2) in the nine public sector senior secondary schools in Ogoja Local Government Area.

### **Sample and Sampling Technique**

The schools were stratified into three categories: Boys' Secondary Schools, Girls' Secondary Schools and co-educational schools. One secondary school was selected from each of these categories by balloting. The simple random sampling technique was used in selecting 120 students from the three different categories of schools. In each of the three schools used, eight students were selected from each of the five arms of SS 2. This gave a total of 40 students from each school. These 120 students were randomly assigned to two groups. Also two teachers, were sampled from each of the three schools making a total of 6 teachers who completed the questionnaire while 6 of them participated in the teaching session.

### **Instrument used for Data Collection**

Two instruments were used for this study; the Gender Sensitization Strategy Questionnaire (GSSQ) and Mathematics Achievement Test (MAT). The questionnaire was structured by the researcher while the MAT has been used in Mathematics Test by WAEC in SSCE. The questionnaire comprised of 10 item Statements structured to determine Mathematics teachers' perception on the benefits of gender sensitization strategies. The Mathematics Achievements Test (MAT); comprised of 30 multiple and completion type questions which were based on the three topics used for the study. The three topics comprised of digestive system, respiratory system and the reproductive system.

### **Validation of the Instrument**

The questionnaire was given to experts in measurement and evaluation for necessary corrections which ensured the validity of the instrument. They screened the items for face and content validity. Through their critics, some items were expunged and some restructured, thus validity was ensured. The MAT was not subjected to any other screening for validity since it was selected from already standardized test.

### **Reliability of the Instrument**

The GSSQ was given to respondents that were not listed for the study. After one week interval the instrument was again administered to the same group of respondents. The two different sets of scores were co-related using Pearson Product Moment Correlation. The correlation coefficient obtained for the instrument was 0.75 which indicates a high reliability index.

### **Administration of the Instrument**

Before the administration of the instrument the two groups of students were pretested and their scores were analyzed. After one week interval, from the end of the training programme Mathematics teachers exposed to gender sensitization class were used to teach the treatment group while the control group was taught by the teachers who were not exposed to gender sensitization strategies. At the end of the teaching session post-test was administered to both groups. Scores were collected and analyzed. The questionnaires were administered to the nine teachers by the researcher and were collected after completion.

### **Method of Data Analysis**

Means scores and standard deviation were used to answer the two research questions while t-test was used to test the two hypotheses at 0.05 level of significance.

Gender sensitization strategies are as follows:

1. **Giving examples during class lesson:** Mathematics teachers' in his/her examples should always involve male and females. He should always cite examples with male and female in matters demanding such examples.
2. **Questioning in class lesson:** The mathematics teachers should balance the way he/she directs questions to students. The teacher should ask males questions in the same proportion or rate the females are asked.

3. **Co-operative activities:** When students are to study in groups each small group should comprise equal number of males and females. Each student should be given chance to participate or make his or her own input. Males should not dominate females in the contributions.
4. The Mathematics teacher should rapour with females in the same way he rapours with males.
5. When use of posters, models and pictures etc. are involved, teacher should involve that of females and that of males equally. The teacher should teach students with male posters, pictures and models and also use that of the female.
6. **Class activities other than learning:** labour (sweeping). The Mathematics teacher should share the duties in the same proportion between male and female. Male should sweep, dust the board in the same way females do it.
7. Making use of gender selective language. The teacher should avoid using the "He" always of "She" always but to balance the way the pronouns are being used.
8. Textbooks, workbooks, journal and magazines should be written in gender sensitive pattern.
9. Laboratory activities. Every student should be encouraged and given the opportunity of participating and learning the science process skills.
10. Any unit of instruction involving Mathematical operation should be learned equally. Every student should try to solve the problem.

### **The Training Programme for Mathematics Teachers**

Then researcher organized training programme for the Mathematics teachers of the experimental group using the gender sensitization strategies developed. The training programme lasted for four hours days and was programmed as follows:

**First Day:** Creating awareness for gender balance and gender sensitization in the classroom teaching and learning.

**Second Day:** Discussion on the need for gender sensitization for Mathematics teachers and students.

**Third Day:** Discussion on how to write lesson note and how to teach in gender sensitive lesson.

**Fourth Day:** Practicing how to teach with gender sensitive lesson note on selected topics.

### **Data Analysis and Presentation of Results**

#### **Research Question One**

What is the perception of Mathematics teachers on the benefits of gender sensitization strategies?

**Table One (1): Means Scores and Standard Deviation of Mathematics Teacher's Perception on the Benefits of Gender Sensitization Strategies Developed. What are your Perceptions on the following as the Benefits of Gender?**

S/N	Sensitization strategies developed for mathematics teachers	Means (X)	SD	Deci
1.	Gender Sensitization Strategies (GSS) could remove gender bias among Mathematics teachers and students in Mathematics.	3.56	0.68	A
2.	It could result to serious curriculum review and innovations.	3.78	0.42	A
3.	It could result to development of gender balance curriculum in Mathematics.	3.56	0.49	A
4.	Development of human and material resources could be enhanced with equal participation of gender in Mathematics Education.	3.78	0.42	A
5.	It could encourage gender equity in key positions in public services and professions requiring the knowledge of Mathematics.	3.78	0.42	A
6.	Gender bias which exist in pictures and charts in Mathematics text would be discouraged.	3.78	0.42	A
7.	The sexist and language content of the curriculum would be completely discouraged.	3.89	0.43	A
8.	Educational career and employment opportunities of girls would be enhance.	3.89	0.43	A
9.	There would be gender balance in enrolment in Mathematics Education.	3.67	0.81	A
10.	Gender Sensitization Strategies could enhance achievement of boys and girls in Mathematics.	3.89	0.43	A

*Adapted from the commission of the status of women; "Gender Equality" (Wikipedia, 1994).*

The result of data analysis on table I show that the mean score of all the item statements are greater than 2.50 which indicates that the respondents generally agreed on the items as the benefits of gender sensitization development for Mathematics teachers.

### **Research Question Two**

What is the effect of gender sensitization strategies on student's achievement in Mathematics?

**Table 2: Means Score Achievement and Standard Deviation of Experimental and Control Group (Group I and 2) on the Pretest and Posttest in Gender Achievement Test**

Groups	Type of test	Strategy	N	Mean	SD
Experimental Group	Pretest	G.SS teaching	60	42.6	1.68
Control Group	Post-test	Strategy	60	62.17	5.34
	Pretest	Traditional approach	60	41.96	1.44
	Post-test		60	53.60	2.40

Result in table 2 revealed that the pretest mean achievement scores are much lower than the post-test means scores for the post-test means scores for the two groups of students (Experience and Control Group). Based on this observation, both of the group made some gain in achievement in the post test the higher score of the experimental group was as a result of the treatment given to them (GSS) ( $62.17 > 53.60$ ).

### Hypothesis one (1)

There is no significant difference between the mean score achievement of students who were taught Mathematics by teachers exposed to gender sensitization strategies and those taught by teachers who were not exposed to gender sensitization strategies.

**Table 3: T-test of No Significant Difference between Mean Score Achievement of Students Who Where Taught by Teachers that Received the Treatment and Those Taught by Teachers who did Not Receive the Treatment (GSS)**

Groups	N	X	SD	DF	T-cal	T-Crit	Deci.
Experimental Group	60	62.16	5.34	118	10.00	1.66	0.05
Control Group	60	53.66	3.77				

The analysis on table three above revealed that the calculated t-value (10.00) is greater than the critical value (1.66) at  $p < 0.05$ . Therefore, the null hypothesis was rejected for the alternative hypothesis.

### Hypothesis two (2)

There is no significant difference between the mean score achievement of girls and boys taught Mathematics differently by male and female by teachers who were exposed to GSS.

**Table 4: T-test 0o No significant Difference between Mean Score Achievement of Boys and Girls Taught Differently Male and Female by Teachers who where Exposed to Gender Sensitization Strategies.**

Teacher	Gender	N	X	SD	Df	T-cal	T-crit	Dec.
Male	Boys/Girls	3D	6.147	4.38	58	0.07	2.00	0.05

From the table 4 above, it was observed that there is no significant difference between the mean score achievement of boys and girls who were taught differently by male and female Mathematics teachers that received gender sensitization treatment; since t-cal (0.07) is less than t-table (2.00); the null hypothesis was not rejected.

### **Discussion of Findings**

The result of this study with respect to research question one showed that respondents generally are of the opinion that gender sensitization strategies listed if used on Mathematics teachers will enhance gender equity in Mathematics teaching and learning hence all the items have means score greater than 2.50 (see table I). This is in line with work of Njouku (2009). He listed strategies for meeting school based challenges in gender and STM Education. These gender strategies also agree with Nworgu(2005) listed in his study on gender. The findings are also inline with gender sensitization strategies listed by the commission on the status of women at its 34<sup>th</sup> session 1995. The data analysis in respect to research question 2 revealed that the mean score achievement of the students taught by Mathematics teachers who were exposed to gender sensitization strategies (experimental group) was better than that of the students taught by Mathematics teachers who were not exposed to gender sensitization strategies (control group, see table 2); hence the mean score achievement of the experimental group (62.16) is greater than that of control group (53.66).

The finding supports the assertion made by the commission on the status of women at its 34<sup>th</sup> session, 1995. The commission asserts that gender sensitive approach should be emphasized in the teaching processes in order to give boys and girls equal opportunities in education. The commission suggests that gender equity could be enhanced through gender-sensitive training courses for teachers and development to teaching materials etc. The result of this study is also in line with the work of Nworgu who studied gender equity in Integrated Science. It means that the way curriculum is interpreted by teachers and the way they select their instructional strategies and materials have crucial influence on students' achievement in Mathematics teaching and learning.

The result of data analysis in table 3 showed that the calculated t-value (10.00) is greater than the critical t-value (1.66) at  $p < 0.05$ . Hence the null hypothesis was not rejected. The implication is that there is significant difference between the mean score achievement of students who were taught by teachers that received the gender sensitization treatment and those taught by teachers who did not receive the treatment (see table 3). The finding of this study is in line with the work of the following people: Nworgu (2005), Asoegwu (2008), Njoku (2009) they studied gender discrimination in science classroom and discovered that gender sensitization strategies could be used to enhance gender equity in science classroom. This strategy was also suggested by the commission on the status of women at its 34<sup>th</sup> session in 1995.

With respect to research hypothesis two, the result of the study revealed that male and female students who were taught differently by male and female Mathematics teachers exposed to gender sensitization strategies performed equally well. There was no significant difference in their mean score achievement hence t-calculated (0.07) is less than table t (2.00) the null hypothesis was not rejected. The finding supports the assertion by Blogger (2005) that teachers provide role models and a sense of direction and encouragement to both boys and girls. He further stated that a gender sensitive curriculum will completely eliminate gender disparity among students in Mathematics classroom.

## Conclusion

The study investigated effective gender sensitization strategies and their benefits in enhancing gender equity in Mathematics classroom. The result of the study revealed that the respondents generally agree on the benefits of gender sensitization strategies listed in table one. It was also noted that gender sensitization strategies have positive effect on student's achievement. The result of the study also revealed that male and female students who were taught differently by male and female Mathematics teachers exposed to gender sensitization strategies performed equally well. There was no significant difference observed in their performances.

## Recommendations

Based on the findings, the following recommendations were made:

1. Mathematics teachers should be enlightened on the need for gender equity in Mathematics Education.
2. They should also be exposed and trained on various gender sensitization strategies through workshops, seminars and conferences. Mathematics teachers should be encouraged to adopt and practice gender sensitization strategies enumerated in this study in Mathematics teaching and learning.
3. Curriculum planners and designers should also try to develop curriculum materials that are gender friendly e.g. in production of models, posters, charts etc.
4. Textbook inters on Mathematics should also be enlightened on the importance of encouraging and practicing gender equity in Mathematics textbooks e.g. in the use of pronouns, pictures, diagrams, examples and charts etc.

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