

# **GENDER ISSUES: STUDENTS PERFORMANCE IN SENIOR SECONDARY SCHOOL MATHEMATICS EXAMINATION IN NIGERIA**

**Ibikunle O. Farajimakin (2010)**

**Faculty of Education, University of Leeds, Leeds, LS2 9JT, United Kingdom.**

**Email: farantutors@yahoo.com**

## **ABSTRACT**

*This study aims to find out the reasons why boys perform better in senior secondary school mathematics examination in Nigeria than girls. It will show the fundamental issues affecting the available facilities for girls in mathematics. The Nigerian society view of girls studying mathematical subjects and taking up careers in mathematics disciplines will be discussed with recommendation on how the differences can be reduced if not possible to remove totally. Implications for future teacher training in Nigeria will be considered.*

Key words: gender; performance; attitude; interest

## **1.0 INTRODUCTION**

In Nigeria, and perhaps the whole of Africa, gender bias is still very prevalent. Gender roles are somewhat rigid in Africa, particularly in Nigeria, where gender differences are recognised in the day to day activities of boys and girls. Arigbabu & Mji (2004) stated that gender generalizations are manifested in the type of vocations and professions which boys and girls are involved in, some fields such as medicine, engineering and architecture are traditionally regarded as male areas, while fields such as nursing, catering , typing and arts are regarded as female areas (Adegoke,1998; Aliyu, 2000). Gender differences persist even within the mathematics classroom. Research on gender in mathematics has generally indicated that boys perform better than girls (Wilson & Hart, 2001, as cited by Arigbabu & Mji, 2004), however, it has been noted that girls' performance tends to be better than boys' on tasks or problems with well defined procedures (Kolawole, 2007; Damarin,2002, as cited by Arigbabu & Mji, 2004). Actually, boys exhibit better

performance than girls on problems with less apparent problem solving strategy (Kolawole, 2007; Damarin, 2002, as cited by Arigbabu & Mji, 2004). Kolawole (2007) reported that there was not too much of a gap in gender differences in mathematics performance at the elementary school level (age 9 years) but there was a greater gap at the high school level (15 years), as older boys performed better than girls (Mullis, 2001, as cited by Arigbabu & Mji, 2004).

Gender differences in mathematics performance continue to be an issue in the Nigeria educational system. This has been an issue in United State of America (USA) since the 1960's and in United Kingdom (UK) since the 1970's (Iyiola, 1998). Nigeria's educational system integrated the British system (England) from the beginning of the school system till the 1990s when the American educational structure was introduced to produce a culturally adaptable system of education for Nigerian children (Ejeh, 2006). The whole English system was adapted at all Nigerian levels of education including text books from 1842 and it was later structured in 1984 according to United State of America patterns of Elementary school, 6- years of Primary, 6-years of secondary divided into 3- years of junior secondary school and 3-years of senior secondary school and 4- years of University education. Colleges offering A-level courses were cancelled and the lower 6 form syllabus was introduced to secondary school for the New Year 12 students (final senior secondary), while the upper 6 form syllabus was introduced to the University for the new 'prelim' or foundation year. This has made it possible for Nigerian mathematics educators to gain inspirations from research conducted on gender issues in mathematics performance in these two advanced countries, for example the Third International Mathematics and Science Study (TIMSS) report on gender differences in average mathematics and science achievement on TIMSS (TIMSS, 1995).

I would like to discuss this issue with respect to my personal involvement in the Nigerian educational system. I am an experienced mathematics teacher and counsellor in Nigerian secondary school spanning over a decade and half in the western region of Nigeria. I agreed with these authors when talking about Nigerian secondary school girls in general, but the performance of girls in a few elite single and co educational schools in Nigeria is very encouraging. According to the Kolawole (2007) study on gender in relation to mathematics performance in Ekiti State, girls in federal government colleges are performing better than boys in numeracy and other mathematical skills.

Table 1: Performance of students in Girls' schools and mixed schools in mathematical computational test items (Ekiti State).

Type of school	% of Students attaining grades C or above in SSCE Mathematics
Girls School	42.78
Mixed School Students	36.91

SSCE - Senior Secondary Certificate Examination

SOURCE: Kolawole (2007)

According to (Kolawole, 2007), students in girls' schools in Ekiti State perform significantly better than their counterparts in mixed schools (Table 1).

Table 2: Performance of Students in Boys schools and mixed schools in mathematical computational test items (Ekiti State).

Type of school	% of Students attaining grades C or above in SSCE Mathematics
Boys School	44.96
Mixed School Students	36.91

SOURCE: Kolawole (2007)

In Table 2, (Kolawole, 2007) reported that students in boy's schools in Ekiti State perform significantly better than their counterparts in mixed schools in mathematical computation test items.

The issue of gender differences in mathematics performance in Nigeria has some peculiarities in terms of regional differences, school standards, and location of schools. Looking at the country as whole the gender gap is very wide in favour of boys but, considering the western region of Nigeria where the Western education started in Nigeria with help of early missionaries the gender gap is very small in favour of boys (Shaibu & Mari, 1997). Also looking at the special funded government schools in the cities or major towns of Nigeria the gender gap is moderate in favour of boys (Adegoke, 1998). This was the case in the late eighty's when this research was conducted; I believe that situations might have changed over the years.

Hence, I will be focusing on this issue with regards to school standards and the location of schools. This study will consider the issue of gender and mathematics education in relationship to the following trends: Historical perspective, trend of gender differences in mathematics from the United State of America and trend of gender differences in mathematics from the United Kingdom.

Now I want to focus on the historical perspective of gender issues and mathematics education looking at the trends of gender differences in mathematics education in United Kingdom and USA societies in particular whose education policy and system have been imported to Nigerian society.

## **2.0 HISTORICAL PERSPECTIVE**

This research examines literature on research studies which have dealt with gender differences in mathematics performance. The low performance of girls at the senior secondary school mathematics examination and the gender generalization which is prevalent in determining the role of girls in later life are important issues for girls' educational development in Nigeria. This research makes use of literature from some Western countries, namely the United Kingdom and the United State of America where research on gender differences in mathematics performance has been considerable and influential (Odebode, 2003). The social and cultural contexts in these countries, differ from Nigeria in many aspects of development such as education, technology, economics and so on, but the resemblance of the present situation in Nigeria educational system which was built out of these two advanced countries' educational ideology, are very relevant in studying the gap between girls' and boys' performance in mathematics (Adegoke, 1998).

### **2.1 TRENDS OF GENDER DIFFERENCES IN MATHEMATICS FROM THE UNITED STATE OF AMERICA**

The literature reviewed covers a period of about forty years, from the 1970's when the USA took drastic steps in addressing the issue of gender differences socially and educationally. Available literature indicated that girls aged 9 to 17 years old were poorly motivated and their performance in mathematics is as bad as what

Nigeria is presently experiencing (Fennema, 1981; Ethington, 1990; Hanna, 1986). Busari (2002) focused on this age group within the compulsory school years from primary to secondary school levels; to show the trends and development in the intervention programmes adapted over the years which brought about a meaningful change in the gender differences in the USA.

One of the problems of gender difference is how to motivate girls in the classroom to have interest in mathematics which has been culturally accepted as a boys' subject (Reyes, 1983). Girls' motivation becomes very relevant to mathematics education in the light of recurring questions about how to get more girls interested or involved in the subject. Mathematics educators saw the need to reduce gender difference, they made recommendations and reported on research conducted on differences available to the policy makers and they also organised various conferences and workshops on gender difference to influence mathematics teachers and school administrators on the need to find a solution to gender difference (Ethington, 1990). Fennema (1981) stated that educators and campaigners proceeded to stop the significant high school dropout rates and declining interest in mathematics among the secondary school girls. Fennema (1981) reported that this helped the policy makers understand the need for encouraging girls' interest in mathematics with implications for future development and this was enhanced through putting policies in place to protect the girls' education. The use of mathematics as a filter for further education and career choices affects the girls, as they did not enrol for higher level mathematics (Busari, 2002). Hanna (1986) pointed out that from around 1970's, gender difference in favour of the number of boys taking mathematics, science and engineering are shown in the universities' yearly intake.

Later, gender differences refer to social or environmental differences that are observed between the sexes (Ogunjuyigbe, 2008). The literature reviews work by

leading researchers in this era of this new understanding of gender differences. According to Leder (1992) there were probably more research studies published on gender and mathematics than in any other area between 1970 and 1990 in the USA. There is evidence to support the existence of differences between girls' and boys' performance in mathematics, particularly in activities that required complex reasoning and gender differences increase at the secondary school level in the USA. Reyes (1983) stated that gender differences in senior secondary mathematics would have been reduced if females had participated more in mathematics at this level.

The importance of these factors (confidence, usefulness and male domain) and their long term influence and differences on the impact on females and males was confirmed by many studies such as those by Hanna (1986) and Fennema (1981). Ethington (1990) identified as critical boys' beliefs about the usefulness and their confidence in learning mathematics, while girls feel that it is a male affair. Wilson (2005) as cited by Aguele & Agwagah (2007) argued that young men did not just believe that mathematics was a male domain, but they believe strongly that they will make more use of mathematics in future career than women.

Leder (1992) found that girls lack confidence in themselves as mathematics learners, their perception of mathematics as difficult, and their view that mathematics is a male activity, all had an impact on girls' attitudes, achievement, and performance in senior secondary school mathematics. In studies conducted by Hanna (1986) on the sixth, eighth, tenth and twelfth grade, Hanna (1986) found that for girls, viewing mathematics as male domain affects mathematics performance. Girls in single sex schools, who did not see mathematics as an exclusive male domain tended to have higher mathematics success. Kolawole (2007) reported that girls' involvement and interest improved in all girls' school as a result of competition between girls in the same school.

Reyes (1983) has reported differences between boys and girls in the ability to visualize movements of geometric figures in one's mind, it was found that visualized movements of geometric figures ability shows a positive correlation with mathematics performance. Hanna (1986) suggested that an appropriate redesigning of mathematics curriculum could compensate for these weaker skills of the girls. Hanna (1986) also reported that boys outperform girls on the ability to draw inferences about properties of shapes in geometry. Gender differences in mental skill abilities and the problem solving strategies is reflected in the gender differences in arithmetic computation (Hanna, 1986). Boys will outperform girls in mental arithmetic and other mathematical problems which requires quick recalling skills.

The transferability of these findings in their entirety, based on the Western cultural concepts, poses a problem for Nigerian contexts. Social status indicators in Nigeria for instance are different from the USA model. Moreover, ethnic differences have been significant, especially between the south western part of Nigeria, where education is taken as important to every member of the family, and the rest of the country especially the northern Nigeria where women are not allowed to attend western education due to strong influence of Islamic culture. In spite of cultural differences, there are many factors in these studies which are common to Nigeria and these two advanced countries, issues such as girls' motivation, society interest in girls' education, and girls' attitude to mathematics. Studying the trend of gender difference in the USA will broaden Nigerian mathematics educators' knowledge of how researches on gender difference could be developed locally to address the issue in Nigeria education system.



## **2.2 TRENDS OF GENDER DIFFERENCES IN MATHEMATICS FROM THE UNITED KINGDOM**

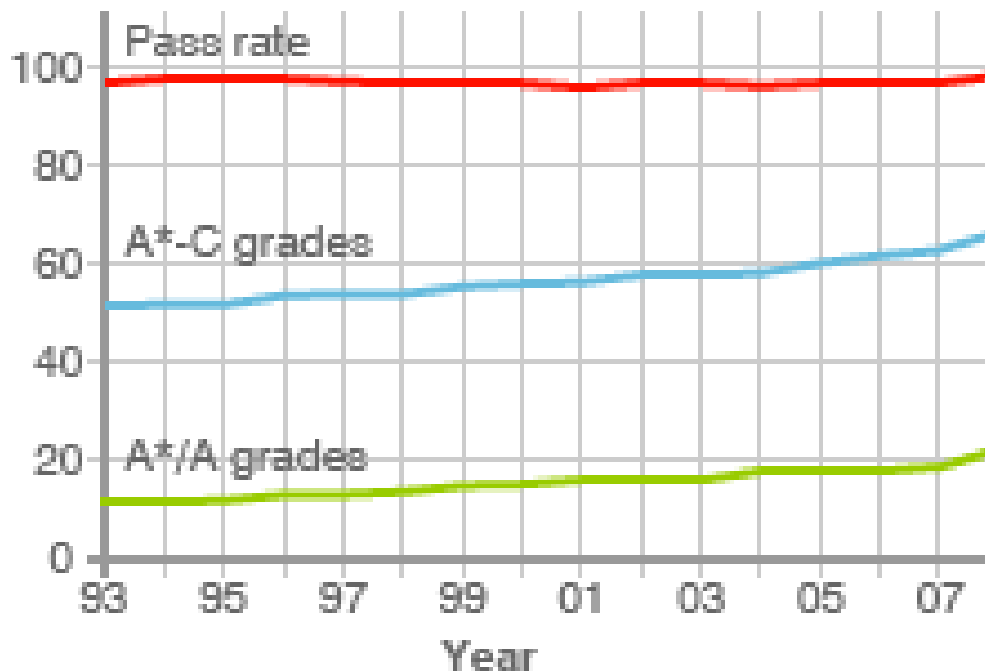
### **2.2.1 GENDER DIFFERENCES AND GENERAL EDUCATION**

Since early 1990's the gender gap in GCSE performance throughout the subjects in the United Kingdom has been shifting in favour of girls .In national curriculum tests and at higher level GCSE grades, girls outperform boys. For example, in 2007, 62.4% of female GCSE entrants achieved the top grades - A\* to C - compared with 53.4% of males (JCQ, 2008). According to JCQ analysis in the table below (Table 3), in the year 2008 about 65% of students that attempted GCSE in the UK scored grades A\* - C, showing that the students performance is generally improving. However, at the lower levels of GCSE attainment, the gender gap is smaller in percentage (DCSF, 2008; OGES, 2008).

Table 3

## UK GCSE RESULTS

% entries obtaining various grades



SOURCE: Joint Council for Qualifications

(2008)

In table 4 the number of boys and girls registering for GCSE in typical English school is roughly equal. So the gender gap shown in mathematics performance is obviously not due to difference in population of boys and girls. Research still needs to be done to determine whether methods of assessment, teaching, or expectations of society are responsible for the gap in boys and girls performance in schools.

Table 4: Percentage of Pupils Entered for Each GCSE Subject by Gender (2006)

Mathematics	% of pupils attempting the subject
Boys	94
Girls	96

GCSE and Equivalent Examination Results in England 2005/2006 (Revised), issued January 2007

Source: Source: DCSF (2007).

### **2.2.2 GENDER DIFFERENCES AND MATHEMATICS EDUCATION**

There are some paradoxes in gender and performance in the UK. In the 1990's boys gained most of the higher education top awards but the trend is for girls in general to do better in GCSE public examinations than boys. The DCSF (2008) report found that boys performed better than girls in mathematics in secondary schools in the 1990's. Research indicated that in mathematics the gender gap between boys and girls attaining level 4 and above at the end of Key Stage 2 was very small (Woodward, 2002). However, while fewer girls go on to take mathematics at A – level, in percentage term they outperform the boys, especially in the high grades (Table 5). The girls still perform better than boys in some literary based subjects. Many research studies have been conducted to find out why girls perform better in literacy subjects and mathematics in comparison to boys.

Subject	Gender	Number Sat.	% of Total No. Sat	CUMULATIVE PERCENTAGES by Grade					
				A	B	C	D	E	U
MATHS	Male	34093 (32719)	9.2 (9.1)	41.7 100.0 (39.0) (100.0)	62.3 (59.8)	77.9 (75.9)	89.2 (87.7)	96.5 (95.2)	
	Female	21889 (20178)	5.0 (4.8)	46.2 100.0 (43.6) (100.0)	68.1 (66.0)	83.1 (81.3)	92.3 (91.6)	97.5 (97.1)	
	Male & Female	55982 (52897)	6.9 (6.7)	43.5 100.0 (40.7) (100.0)	64.6 (62.2)	79.9 (77.9)	90.4 (89.2)	96.9 (95.9)	
MATHS FURTHER	Male	5106 (4238)	1.4 (1.2)	56.3 100.0 (57.2) (100.0)	75.7 (74.7)	87.2 (85.7)	94.3 (93.1)	97.9 (97.0)	
	Female	2164 (1695)	0.5 (0.4)						

				58.2	78.1	89.5	94.9	98.7
				100.0				
				(60.2)	(77.8)	(88.8)	(93.7)	(97.4)
		7270	0.9	(100.0)				
	Male & Female	(5933)	(0.8)					
				56.9	76.4	87.9	94.5	98.1
				100.0				
				(58.0)	(75.6)	(86.6)	(93.3)	(97.1)
				(100.0)				

Table 5: JOINT COUNCIL FOR QUALIFICATIONS

National provisional GCE A level Results – June 2006 (All UK candidates)

Cumulative percentages of subject Results by Grades and by Gender

The figures in brackets are the equivalent A level provisional figures for 2005

Source: JCQ (2008)

There have been changing patterns over the years. In mathematics, there has been a shift from a male advantage averaging 4 percentage points in GCSE mathematics attainment prior to 1991 to a slim female advantage of 1-2 percentage points in recent years (PISA, as cited in DCSF, 2007). Since late 1990's gender gap is narrower in mathematics, with, on average, girls performing better than boys at Foundation Stage, and at Key Stages 1, 3 and 4 (PISA, as cited in DCSF, 2007). There has been a long-standing gender gap at GCSE for those attaining 5+ A\*-C, a significant gender gap in favour of girls.

DCSF (2008) reported that girls outperform boys in mathematics up to the beginning of A-level, but that the differences are small, and are not consistent across all aspect of the mathematics syllabus. Attitudes to mathematics vary according to gender; there are significant differences in the expectations of boys and girls regarding their own performance in mathematics; also boys and girls differ in their

typical learning styles. This may depend on ethnicity or family social status influence on girls education.

In the early 1980's girls rated mathematics as a masculine subject and it was preferred by boys (DCSF, 2008). Girls rated English, humanities and music as feminine and were preferred by girls. The inclusion of mathematics as an important requirement for entry into business, marketing and applied science professions, is reflected in the recently observed smaller gender gap in GCSE mathematics performance (Table 6) between boys and girls (DCSF, 2008). Possibly, the gap has become smaller because some girls are more prepared to study mathematical disciplines after their GCSE, this may be due to encouragement received from parents, teachers, and the society irrespective of gender. This is an interesting trend in girls' education in the UK and presently girls are found in all professions but not equally represented as boys (OGES, 2008). In the 2005 and 2006 analysis of A/level results in England indicated that that boys and girls are now very close in scoring A grades in the A/level subjects (Table 5 & Table 8).

Table 6: JOINT COUNCIL FOR QUALIFICATIONS

National Provisional GCSE (Full Course) Results - June 2005 (All UK Candidates)

CUMULATIVE PERCENTAGES of Subject Results by Grade and by Gender

The figures in brackets are the equivalent provisional figures for 2004.

			% of	Cumulative Percentages by Grades

Subject	Gender	Number Sat	total No. Sat.	A*	A	B	C	D	E	F	G	U
ADDITIONAL MATHS	Male	366488 (367518)	13.0 (12.7)	4.2 (4.5)	12.9 (12.1)	29.7 (28.7)	52.5 (50.9)	70.2 (68.5)	84.0 (83.3)	92.4 (92.0)	96.1 (95.9)	100.0 (100.0)
	Female	374934 (374164)	12.9 (12.5)	4.0 (4.0)	13.0 (11.6)	31.3 (29.8)	54.4 (52.6)	72.5 (70.7)	85.7 (84.9)	93.2 (92.9)	96.4 (96.2)	100.0 (100.0)
	Male & Female	741422 (741682)	12.9 (12.6)	4.1 (4.2)	13.0 (11.8)	30.5 (29.3)	53.4 (51.7)	71.4 (69.6)	84.9 (84.1)	92.8 (92.4)	96.2 (96.0)	100.0 (100.0)
	Male	1732 (1650)	0.1 (0.1)	15.3 (14.9)	39.7 (39.3)	69.8 (69.1)	89.2 (88.5)	95.3 (94.1)	97.1 (96.8)	97.1 (96.8)	97.1 (96.8)	100.0 (100.0)
MATHS	Female	1524 (1555)	0.1 (0.1)	16.0 (15.0)	45.3 (44.8)	74.5 (77.6)	92.1 (92.0)	96.3 (96.5)	97.9 (97.4)	97.9 (97.4)	97.9 (97.4)	100.0 (100.0)
	Male & Female	3256 (3205)	0.1 (0.1)	15.6 (15.0)	42.3 (41.9)	72.0 (73.2)	90.6 (90.2)	95.7 (95.2)	97.5 (97.1)	97.5 (97.1)	97.5 (97.1)	100.0 (100.0)

Source: DCSF (2007)

More boys study mathematics courses in undergraduate and postgraduate level, and this is shown in the larger number of men than women working in mathematically-oriented fields (OGES, 2008). This means that although girls are doing better than boys overall across the subject areas in the UK, they still fall behind when choosing mathematics based vocations [Table 7]. Mathematics is still a criterion for entry into higher status areas of academia and employment (DCSF, 2007).

DCSF (2007) reported that some vocational areas were dominated by one gender [Table 7]. There are more females in professions such as hair and beauty, care and childcare and animal care areas. While male are more in professions such as construction, engineering and motor vehicles, manufacturing and land-based areas.

Table 7: Proportions of Pupils Taking Subjects in the Increased Flexibility Programme (IFP) by gender (2003)

Vocational areas	Boys (%)	Girls (%)
Hair & Beauty	2	98
Care & Childcare	5	95
Animal care	24	76
Construction	97	3
Engineering & Motor	97	3
Manufacturing	83	17
Land-based Industries	72	28
Administration & Business	58	42
Catering	52	48
ICT	61	39
Arts	42	58
Sports, Leisure and Tourism	47	53
Retails	39	61
Science	44	56

Source: DCSF (2007).

Table 8: A-LEVEL RESULTS 2004 (England)

	2003		2004	
	Boys	Girls	Boys	Girls
A grades	20%	22.9%	21%	23.7%



Total A-level entries: 766,247

69% of all results are A to C grades

40% of young people take A-levels

Sources: Department for Children, Schools and Families, (DCSF)

According to PISA (2007), the gap in mathematics performance at GCSE between boys and girls is relatively stable across the social class groupings (Table 9) that is the effect of gender is significant across social class (PISA, as cited in DCSF, 2007). Gender affects mathematics performance, the social class gap is a strong factor for some groups (PISA, as cited in DCSF, 2007).

Demack & et al (1998) reported that gender and social background (Table 8 & 9) are strongly associated with mathematics attainment at 16 and reflect a wide range of influences on pupils. Demack & et al (1998) emphasised that the relative failure of working class children living in poor inner city areas ( Table 9) has also become well known. Demack & et al (1998) pointed out that these findings are valid in an overall sense the generalisations but do not tell the whole story. More research is needed to examine whether these inequalities in mathematics attainment are changing over time.

Table 9: GCSE Attainment by Socio-economic Position

Professional – I

Managerial / technical – II

Skilled non-manual – III (N)

Skilled manual – III (M)

Partly skilled manual – IV

Unskilled – V

Armed Forces - Unclassified

Detailed classification of social – economic position is explained in Appendix I

---

---

<b>% 5+ A-C GCSEs</b>	<b>I</b>	<b>II</b>	<b>III(N)</b>	<b>III(M)</b>	<b>IV</b>	<b>V</b>	<b>Unclassed</b>
<b>1988</b>	58	40	26	17	13	8	11
<b>1990</b>	59	47	33	21	15	13	14
<b>1991</b>	67	49	34	22	19	12	14
<b>1993</b>	71	56	40	29	21	14	17
<b>Mean GCSE Score</b>							
<b>1988</b>	37	30	25	20	18	15	16
<b>1990</b>	39	34	29	23	20	18	19
<b>1991</b>	43	37	31	25	23	19	19
<b>1993</b>	46	40	34	29	25	21	21

---

---

Source: Demack & et al (1998)

DCSF (2008) pointed out that the gender gap in the UK mathematics performance was related to a variety of social issues including: parents' educational attainment, growing up dependent on an income support recipient and eligible for free school meals, council housing conditions, family structure and parental interest. These trends are different from the situation in Nigeria and applying this to the Nigeria context will involve consideration of the cultural background. The influences of these factors will be considered in the next section on gender and mathematics performance in Nigerian society.

### 3.0 THE NIGERIAN SOCIETY, GENDER AND MATHEMATICS

Gender differences in mathematics performance in a developing country such as Nigeria, is a critical area of research that needs further exploration. Asim (2005) reported that there is limited information about research on women and girls in senior secondary school in relationship to their mathematical performance. While a lot of gender programmes such as Millennium Girls Forum (An initiative which encourages girls to undertake professional courses at the college) and Education for All Girls (this initiative mandates parents to send all their girls to school) have been carried out, not much research has been done within the Nigerian classroom. Centre for Democracy and Development, CDD (2000) noted that most teachers' understanding of gender in classroom practices is most often based on what has been studied in United Kingdom and United State of America. There are emerging research efforts in the area of mathematics education as Nigeria begins to face the realities of gender differences in classroom practices. In the Northern region of Nigeria, the persistent cultural attitudes towards girls in Nigeria tended to prevent researchers from conducting researches on gender issue. For example, it is not culturally permitted for girls to speak out in public or report to strangers on situations facing them; instead they have to tell their parents or elders in their family only.

Table 10: Female Numeracy and Literacy rate across 4 zones

North East	32.18%
North West	31.17%
South East	53.31%

South West	60.34%
------------	--------

Sources: UNESCO (2008).

Obaji (2005) reported that the differences in mathematics and literacy attainment between boys and girls were very clear at all levels of education in Nigeria. And the situation varies in different zones of Nigeria as it can be seen in the table above (Table 10). Asim (2005) stated that many girls believed that they have chosen mathematics simply because of parental pressure or influence of friends studying it, or because their teachers instructed them to study mathematics. Some girls said that it was chance that is responsible for them taking mathematics as an area of study. They cannot accept the responsibility for studying mathematics. They even expressed their feelings that they are not good at mathematics, some fear their teachers whom they believe are too strict; they did not believe that mathematics is for all but they believe that it is for a particular gender (Adebayo, 1999).

Obaji (2005) stated that many girls are fed up with the subject and cannot be expected to continue with a subject that they were failing after Senior Secondary Certificate Examination ,SSCE (equivalent to former GCE O/level) and they do not even have interest in the subject as it demands too much work and time to study. (The SSCE replaced the former GCE O/Level in Nigeria, it is conducted by the West African Examination Council (WAEC) ; it is a summative evaluation at the end of six years of secondary education in Nigeria (Ejeh, 2006)). Ekwueme (2001) reported that boys saw much value in mathematics; girls in Nigeria dislike mathematics

because of the views of Nigerian culture, which undermines women performance in mathematics and is manifested in girls' attainment in mathematics.

The aim of the Nigeria education policy is to promote, among others, gender equity in access to all education levels and there are more males who benefit from this than females (National Policy on Education, NPE, 2004). Gender differences in mathematics attainment increases over the education levels and it is greater at the tertiary level and particularly in mathematics and its related fields. Obaji (2005) noted that there are significant differences between the patterns of attitudes towards mathematics expressed by boys and girls.

Boys were more confident in working in mathematics than girls, and girls believed that mathematics was a male subject (Obaji, 2005). Many researchers reported that girls believe that mathematics is more appropriate for boys than for girls. Both girls and boys were found to agree that mathematics was useful. In both respects, these findings are not greatly different from what has been reported in the USA and the UK research studies before 1990's (Leder, 1992).

The Onuka, (2002) studies have shown that both boys and girls do like mathematics at the SSCE level and would like to do well in it, but for girls' it is regarded as boys' subject. The consideration that mathematics is important for future jobs has increase girls interest in it. Zewide (1994) argued that students' personal goal in life is a compelling factor which is urging them to like mathematics and to do well in it. Zewide (1994) referred to this compelling factor in the goals and aspiration of students as the value of mathematics in the society. It seems, liking of mathematics was not as a result of interest, but driven by the urge to do well in the subject because of the need and importance it presented for their future careers (Zewide, 1994).

Shaibu & Usman (2001) noted girls in township schools in Nigeria seemed to spend more of out of school time on household chores, which could affect their studies, while school work was usually done at the end of the working day when they were already too tired to concentrate. This is a developing country problem where household chores in the house are kept for girls, which could affect the time they spend on learning and shape their vision for the future. Ekwueme (2001) stated that most of these girls in the township schools do not find time to complete their homework and, due to fear of their teachers, they would rather miss school and once they miss school, it becomes difficult to catch up, which will eventually lead to failure and possibly dropping out completely.

In my five years personal experience in Nigeria secondary mathematics classroom I observed that girls are generally not willing to take a lead in group mathematics projects. The girls assumed that boys are better in tackling mathematics puzzles. But in my day to day classroom teaching and learning experiences boys and girls are doing very well when it comes to answering questions in classroom and tackling mathematics problems collectively. This scenario is true of high schools in the largest commercial city of Lagos which the former federal capital of Nigeria till about fifteen years ago. Most of the embassies and international organisations are still more concentrated in Lagos. My experience is not the same when I was doing my teaching practice in a rural area of Western Nigeria a village called Igbotako in Okitipupa local government Area of Nigeria. In this community it is believed that girls education will end up in the kitchen this ideology made most girls not to have interest in mathematics and it contributes to the underperformance in SSCE Mathematics. The girls' lack of interest had made them not to contribute actively in mathematics classroom. The girls are not willing to answer questions and when given classroom exercises as they will be expecting the boys to do it so that they can look at it. No matter what effort teachers put in the lessons to explain key facts to them to

encourage them to understand the concepts they are not willing to listen. Most of the girls are always tired due to the distance they walk to school every day and their great involvement on family farms and family domestic activities such as washing and preparing food for a very large family of around average of 15 members due to polygamy practice. In the rural areas generally boys perform better in mathematics than girls.

Ejeh (2006) found that majority of students wanted mathematics to be made fun and to be related to life so they can see its usefulness. Girls in particular would like to see the content related to situations in life where these could be applied. Ekwueme (2001) stated some girls are shy and afraid to tell teachers that they did not understand, to avoid being ridiculed by fellow classmates or teachers. These are distinctive features of gender differences in Nigerian contexts which distinguish them from those of the UK and the USA society.

Ekwueme (2001) argued that mathematics performance and gender is a reflection of Nigerian society; it tends to give privilege to male interests and their privileged positions at the expense of female through the belief that boys' superiority is normal and schools tend to operate in line with this approach. As stated in the introduction, Obaji (2005) also argued that Nigerian girls, given proper upbringing as well as parental support, will go beyond the limitations of their present situations. These factors will make them believe in their abilities and have a love for mathematics. Closing the gender gap in mathematics performance can be encouraged or discouraged by teachers' through their positive remarks or negative gender expectations (Ejeh, 2006).

Over the years there have been efforts to address gender disparities in education in Nigeria, with a particular concern on the performance of girls, which for years has been very low (Asim & et al, 2004). The imbalance in boys' and girls' performance in mathematics was linked to the age-long belief in male superiority and female subordination (Shaibu & Usman, 2001). This situation was further explained as aggravated by cultural practices, which gave girls no traditional rights to succession and encouraged preference to be given to the education of a boy rather than of a girl (Obaji, 2005)

### **3.1 NIGERIAN CULTURE, GENDER AND MATHEMATICS**

Nigeria, unlike the USA and the UK where gender and mathematics literature is widely reported, is not a highly diverse ethnic society (Onuka, 2002). This is not to say that is made up of single culture, but that the social status and cultures are fewer and hence, the pattern of female differences in mathematics attainment varies across social status (Iyiola, 1998). That means variables such as social status and ethnicities need to be viewed differently by evaluating the prevailing social structures (Odebode, 2003). Efforts to study gender differences in Nigeria mathematics classroom have been gaining momentum (Onuka, 2002). The tendency, as it has been the case all over Africa, was to encourage girls' access to good quality education against the traditional attitudes that hindered their performance (Kolawole, 2007). Although this is still a problem in many African countries, the Nigerian government has been doing everything possible to overcome these difficulties (Odebode, 2003).

According to Kolawole (2007) girls enrolment levels actually exceeded that of boys by 0.5% and 0.3% at both primary and secondary levels respectively in some parts of southern Nigeria. Although the equality achieved in enrolments for learners



of both sexes in this part of the country is very encouraging, the classroom situation tells a different story, particularly in the study of mathematics (Shaibu & Mari, 1997). Ogunjuyigbe (2008) noted that only small numbers of girls continue with mathematics beyond secondary education and mathematics continues to be the criteria for entry into many areas of business, academic and science. Many studies pointed out the problem of gender differences in mathematics in Nigeria secondary schools by identifying three areas of concern. These are student's interest in learning mathematics, feelings in mathematics class and interactions in a mathematics class (Odebode, 2003). Studies done in Nigeria indicated that cultural expectations of society could give rise to differences in performance between girls and boys in school subjects and that such expectations could influence occupational choices between the two sexes (Omirin, 2007)

Ogunjuyigbe (2008) studies show that those who indicated low interest in mathematics complained of its difficulty. Still others felt that they needed more help in simplifying mathematics learning and others do not consider mathematics to be in their future careers. Boys felt more comfortable in mathematics classes while girls are worried. Girls discomfort in mathematics classes was attributed to being afraid of mathematics teachers and being shy in class. Some students have problems when studying with students of opposite sexes, girls laugh at their friends/peers when one fails to answer the question correctly in class (Busari, 2002). The girls believed that boys usually resorted to harassment and intimidation of girls in class. The use of corporal punishment by teachers during mathematics classes is another problem. The students' shyness and their tendency to laugh at each other's incorrect responses add more complexity. Such factors are not widely reported in the UK and the USA cultural research studies, which make the need to contextualise research on gender and mathematics in Nigeria more apparent (Odebode, 2003)

Asim (2004) argued that teachers have theories and belief systems that influence their perceptions, plans and actions in the classroom, which affect and shape classroom situation. Since behaviour is guided by a personally held system of beliefs, values and principles, there are signs that teachers' gender-related beliefs about children might influence teachers' classroom behaviour. This suggests that teachers' beliefs or expectations might directly influence their classroom behaviour and thus need to continually question how their belief systems affect learners in mathematics. Shaibu & Usman, (2001) noted that teachers interact more with boys, praise bright boys more, and they call on boys more than girls. Adegoke (1998) suggested that small differences in teacher behaviour combined with the organisation of instruction, made up a pattern of classroom organisation that appeared to favour boys. For example, in Nigeria classroom competitive learning activities encouraged boys' learning and had a negative influence on girls' learning, while cooperative learning favoured girls. Since competitive activities were much more prevalent than cooperative activities, it appeared that classrooms were more often favourable to boys' than to girls' learning .Generally, females enjoy participating in learning activities that enabled them to become independent learners of mathematics, independence in mathematical thinking may be learned through working in cooperation with others to solve mathematical problems (Onuka, 2002)

Omirin (2007) reported that in the USA and the UK, many intervention programmes were designed to help teachers recognise that boys and girls should be treated in the same way. Such programmes do not appear to have completely eliminated gender differences in mathematics attainment. Omirin (2007) believed that differential teacher treatment of boys and girls in Nigeria is one of the causes of gender differences in mathematics.

In the USA and the UK, there were indications that while gender differences in mathematics performance have decreased; they still existed in tasks that required functioning at high cognitive levels (Leder, 1992). It also seemed that when tests measured problem solving at the most complex cognitive level, the noticeable results indicate gender differences in mathematics in favour of boys though the situation might have changed now (Leder, 1992; Isyaku, 2006).

The gender experience in the USA and the UK where policies are in place to guide teachers on equal treatment for both boys and girls in school have not totally removed the gender bias in term of girls taken up top executive positions and academic professions (Isyaku, 2006). This has led Ogunjuyigbe (2008) to emphasise that Nigerian classroom system favours boys' more, teachers interacting more or differently with boys than with girls is a major contributor to the development of gender differences in mathematics performance at the SSCE level.

From my experience of teaching mathematics in schools in Nigeria for over twenty years both at the secondary school level and teachers training College, Nigeria girls' performance in mathematics in comparison to boys differs according to regions. The interaction of teachers with students is as important as the facilities available in schools for girls and attitudes of the people in the local society. In Western Nigeria girls are performing very well when they are encouraged by their parents, the local society and the teachers. Teachers' interaction with students in school is likely to be an important factor of the gender gap in mathematics performance in Nigeria.

### **3.2 GENDER AND MATHEMATICS STANDARD**

Considering the standard of measuring boys' and girls' performance in Nigeria, the comparison is done by ranking students grades all over the country for five years in the common Senior Secondary School Examination (SSCE) which is an external examination (Isyaku, 2006). It is both for certification and prerequisite for higher education, hence it is an important requirement (Isyaku, 2006). It is a standard test taken in all English speaking countries of West African coast. It is referred to as General Certificate of Education (GCE) in most of the countries, and the advanced programme is called GCE A/Level (Isyaku, 2006)

The analyses of mathematics performance for the period of about five years are shown below (Table 11). Girls in secondary schools in Nigeria were about 55% of the secondary school student's population (Alonge, 2005). The ratio of boys and girls in elementary and secondary schools in Nigeria is fairly equal but there are more girls than boys in the physical population (Eta, 2000).

Table 11: Percentage passes in General Mathematics & Further Mathematics (1999 – 2003)

Subject	YEAR								
	1999			2000			2001		
	C	P	F	C	P	F	C	P	F

General	21.9	32.1	41.2	32.8	30.9	36.3	36.6	32.7	30.7
Maths									
Further	24.0	35.4	40.6	22.8	29.9	47.3	32.6	27.5	39.9
Maths									

Subject	YEAR					
	2002			2003		
	C	P	F	C	P	F
General Maths	38.4	41.0	20.6	36.9	35.8	24.8
Further Maths	35.6	21.1	43.3	36.9	35.8	24.8

C- Credit or Merit (50% - 100%)

P- Pass (40% - 49%)

F- Fail (0% - 39)

SOURCE: Asim & et al (2005).

In the table above (Table 11 & 12) performance in Mathematics and Further Mathematics are fair given that 100% of year 12 students are entered for the examination though the total credit passes is still below 50% of all who took the examination (Alonge, 2005). This level of performance indicates that few students are eligible for admission into mathematics and science related courses which requires a credit level performance in mathematics, and this situation is worse with girls in particular, since girls' population schools is above boys' population (Eta, 2000). With the requirement of credit in mathematics for admission into Nigerian universities, many may remain frustrated or go for out of school remedial programmes, which still do not give the basic prerequisite mathematics qualification Agwagah (2007).

TABLE 12: CANDIDATES PERFORMANCE IN SSCE 2000 OF WAEC IN MATHEMATICS BY GENDER IN NIGERIA.

	NO. ENROLLED		NO. PASSED AT CREDIT LEVEL AND ABOVE		% PASSES AT CREDIT LEVEL AND ABOVE	
	BOYS	GIRLS	BOYS	GIRLS	BOYS	GIRLS
	MATHS	353362	302887	121567	92922	34.40

Source: Omole (2001). WAEC Report

The summary of the candidate performance in SSCE in WAEC by gender in attainment in Nigeria is as shown in Table 12. The percentage of boys with credit and above passes is slightly higher than those of girls in mathematics.



Onuka (2002) reported that the analysis of May/June 2000 West African School Certificate result (Table 12) reveals the poor performance of students in mathematics, especially the girls. In the mathematics result reviewed in Table 12 less than 50% of the candidates passed at credit level. This is worrisome because the future of our children in studying technological, science or mathematics subjects in the tertiary institution is doubtful (Shaibu & Mari, 1997). In a system where teaching is done for examination, many more girls are likely to shy away from mathematics and further mathematics courses if nothing drastic is done to improve the teaching and learning in schools. Improved school practices may likely improve performance, and subsequently increase girls' access to and interest in mathematics in Nigerian Secondary Schools (Shaibu & Usman, 2001)

#### **4.0 GENDER AND FACTORS AMENABLE TO CHANGE**

This section looks at factors that may be responsible for gender gaps in student performance at the SSCE level and in particular factors amenable to change. Mathematics educators are concerned with factors that are amenable to change because findings on these will be a source of information to interest group on gender and mathematics. If appropriate steps are taken it may improve or reduce the barrier that is contributing to gender gap in mathematic performance.

Iyiola (1998) reported that studies on gender differentials with regards to mathematics in the UK and the USA indicated that gender differences in performance usually do not appear until sometime in adolescence when they are more often exhibited in complex mathematics tasks, particularly on tests of problem solving. The gender differences that were reported in Iyiola (1998) studies suggested that more

girls than boys in Nigeria do not really display an understanding the basic concepts of SSCE mathematics and this issue becomes more critical as students progress through school (Obaji, 2005). While it is possible to learn arithmetic at the surface level in the early grades without fully understanding the basic concepts, it becomes more difficult to learn advanced concepts of mathematics without a having good understanding of foundations (Obaji, 2005).

#### **4.1 DESIGNING FEMALE FRIENDLY INSTRUCTION**

In English high schools the intervention programmes (such as use of coursework in GCSE assessment) over the years have turned the gender difference in mathematics attainment in favour of girls which is different from the picture of the situation about a decade ago. Smithers (2004) argued that gender comparison in mathematics attainment according to Programme for International Student Achievement (PISA) report on UK high schools in 2000 (Table 13) shows that girls are conspicuously behind in mathematics. The results for gender show that the PISA mathematics is capable of capturing differences in gender mathematics attainment in UK. The overall pattern of results is consistent with psychological measures which show that from the earliest years girls tend to have the advantage on average, in verbal abilities and boys, in numerical and spatial abilities. They are also consistent with gender differences in subject choices, with females tending to the humanities and languages, and males to mathematics and the sciences.

Table 13: Gender Differences in PISA 2000

Country	Points Score in Favour of girls (Mathematics)
United Kingdom	-8

Source: Smithers (2004) England Education, PISA first Report, Paris.

Elwood (2005) reported that gender differences in performance are a major concern in the public examination system in the England which is undergoing major changes in both subject content and assessment technique. This is particularly so because the pattern of gender performance is also changing. The University of London Examinations Council (ULEAC) and The National Foundation for Educational Research (NFER) investigated the extent to which the structures and assessment techniques used within the General Certificate of Secondary Education (GCSE) actually amplify or reduce gender differences that exist in examination outcomes (Elwood, 2005). Evidence was collected which suggested that coursework may play a role in explaining differences in mathematics. Teacher and pupil expectations, entry policies and emphases within syllabuses are significant factors when accounting for the differences (Elwood, 2005). Williams (2005) reported that independent committee were formed in England which includes the mathematics educators, association of mathematics teachers and other interest groups; they suggested a flexible approach to summative evaluation student performance at the GCSE level. The mathematics curriculum in England retains many of the Cockcroft developments with some modifications which were influenced by the view of politicians and mathematics educators (EDUC 5765, 2008). The syllabus was built with more consideration for average students (EDUC 5765, 2008). Until very recently coursework which includes practical work, problem solving and investigation were an integral part of the GCSE examination process (EDUC 5765, 2008). Gender difference in mathematics attainment at the GCSE level that favour girls (Table 6) are likely to have been possible as a result of regularly intervention programmes such as introduction of

coursework in the final GCSE assessment. The innovation in the UK systems of education is likely to encourage Nigerian educators to introduce a more female friendly mathematics instruction to reduce the gender gap in mathematics attainment in Nigeria. The performance of Nigerian girls in mathematics is likely to improve if all the intervention programmes are properly implanted which includes the introduction course work as an integral part of SSCE assessment as it was done in UK which has brought about a great improvement in girls performance in mathematics.

Ekwueme (2001) stated that identification of women's life style and ways of thinking in order to design female-friendly instruction will help girls learn mathematics better. Such instruction should include such things as the greater inclusion of cooperation rather than of competition in classrooms, small group rather than individual work, more communication, and more socially relevant mathematics. Also single-sex schools oriented to the mathematics instruction of females will go a long way in helping girls (Adedayo, 1999). Adegoke (1998) studies shows that females learn differently and perform differently in mathematics than do males. This is supported by the view put forward by cognitive educational scientists, that every student learns in different way based on their age in relation to their cognitive development (Aliyu, 2000).

Earlier studies by Arigbabu & Mji (2004) reported that when the learning structure was changed to integrate girls and boys into team projects and to provide girls with an opportunity to select projects, girls began to express considerable interest. The change in classroom structure enabled girls to familiarise themselves with concepts and to develop the skills and confidence to explain the project and reflect on the problem solving strategies (Usman, 2001). This study demonstrates that ways of instruction in high schools have gender implications: girls prefer

problems with people content and girls do better in project-oriented assessment than in traditional timed examinations (Zewide, 1994).

## **4.2 BELIEF AND ATTITUDES**

Nigeria is the biggest country in Africa with regards to population which is about 130 million people. Nigeria is broadly divided into four regions and comprises the Northern, Southern Western and Eastern regions (Adedayo, 1999). Proper basic infrastructures are only found in the western part of Nigeria apart from the capital city Abuja which was built about twenty years ago. Adedayo (1999) reported that early missionaries and the white colonial master lived in the then western region with the capital in Ibadan and the commercial city in Lagos (first capital of Nigeria and still the largest commercial and industrial city in Nigeria and also the largest city in Africa). Education in the northern part of Nigeria follows mostly an informal method due to the influence of the Islamic culture in this area. Girls are predominantly kept indoors and they are not allowed to interact with strangers. Christian mission schools were not allowed to be established there because of religious intolerance in the northern part where many southern people, who are predominately Christian, have been killed in religious riots in the past two decade (Ekwueme, 2001).

Ekwueme (2001) argued that to change the existing beliefs and attitudes about mathematics and its learning involves engaging students in personal exploratory activities, experimentation and analysis. This will enhance personal knowledge and a new method of teaching and learning which would lead to change in classroom practice. Applying this innovative idea will require a careful study of the existing cultural and social status differences between developed and developing countries such as Nigeria (Adegoke, 1998). Teaching mathematics should enhance,

female values and it should be based on, identifying and recognising of relationships, connections, caring, feelings and human centred (Ekwueme, 2001).

Girls' mathematics performance in the SSCE in Nigeria is very likely to have been affected by assessment method and also probably girls' belief and attitude to mathematics.

#### **4.3 DEMOCRACY AND MATHEMATICS KNOWLEDGE**

Hanna (2003) reported that the International Association for the Evaluation of Educational Achievement (IEA) cross-national study's findings indicated that in US gender differences in mathematics attainment decreased considerably over the last thirty years and indeed are on the way to disappearing. In terms of representation gender equity is nearer to being reached with numerous policies and legal measures put in place to encourage it. According to Programme for International Student Achievement (PISA) and Trends in International Mathematics and Science study (TIMSS) over the last few decades the participation of women in higher education has increased dramatically across the board (Table 14). Women have achieved a considerable presence at all levels of education over the past few decades and indeed have made a substantial advance in the political arena.

Table 14: Percentage of women enrolled in US universities.

	1960	1967	1968	1975	1985	1995
Year						

%	38	39	40	40	55	55

Source: Hanna (2003)

Ahuja (2006) argued that gender equity is realisable in the US partly due to competency in mathematics, both in numerical manipulation and understanding its conceptual foundations, enhancing a person's ability to handle the more ambitious and qualitative relationships that dominate our day-to-day decision making. Ahuja (2006) emphasised that a powerful mathematics education system for girls would help in strengthening democracy by helping to create an informed adult population, empowering individuals and enabling them to develop toward their potential and providing a sound basis for continuing national prosperity. There is much Nigerian educators can learn from US initiatives on development of sound democracy through an effective mathematics education for all children.

Ogunjuyigbe (2008) reported that it is believed in Nigeria that knowledge of mathematics is an important feature of democratic competence and also as a means of empowerment. If empowerment and democracy are linked to numeracy, it is possible that innumeracy may cause lack of power and lack of democratic competence. Hence with the widespread public belief that women are less numerate, compared to men, women are by implication misrecognised as having less democratic competence and an objective reason is given for their being less powerful in society (Omirin, 2007). Although it is generally believed that numeracy does contribute to democratic competence, there are no studies to my knowledge that have established a positive correlation between level of numeracy or mathematics

competence and democratic competence (Onuka, 2002). Gender seems to act as a useful reminder about the ever-present issue of social status of Nigerian society, a perspective that enables differences to be understood. Studies have shown that the distribution of knowledge in the society means distribution of power and numeracy is considered not as a thing to be possessed, but as a capacity for action (Omirin, 2007). The knowledge of mathematics has been elevated to great heights in the recent past, and has even entered the political spectrum, due to technological development and advancement (Ogunjuyigbe, 2008). In the light of sustained Western research on gender differences it is assumed by Nigerian educators that some common solution to gender differences in mathematics has been found. Hence female participation in mathematics-related careers has increased over the years and gender differences existing in the learning of mathematics seem to be diminishing or that any differences that exist are unimportant (Shaibu & Mari, 1997).

Eta (2000) reported that research on gender and mathematics has deepened the knowledge of Nigerian mathematics educators on the likely causes of disparity existing between boys and girls. Studies about gender have provided some insight into possible inequalities that have existed and that have led to heightened awareness of gaps in Nigerians schools. Western studies have provided some guiding principles from which researchers in Nigeria can precede, though the differing social structures with their differing cultures and traditions must form part of the points of departure between the Western and Nigeria contextual research studies (Ango & et al 2003). The US education policy empowered the state and the regional educational authorities to regulate and control schools within their locality and gender differences is one of the issues that have been addressed over the years. In England the introduction of course work has probably reduced the gender disparity between boys and girls. There is a different social status in operation in the UK which may be due to differences in economic, political and educational developments



(Isyaku, 2006). Nigeria has succeeded over the years to bring the enrolments of girls at par with those of boys.

Bosse (2006) reported that National Council of Teachers of Mathematics (NCTM) reform literature emphasised the national focus of preserving democracy within the United States through ensuring equity within both educational experiences and occupational possibilities. NCTM (1989) as cited in Bosse (2006) pointed out that inequities in education and mathematical literacy would lead to a societal division between the literate and the illiterate which would eventually destroy democracy. NCTM (1989), as cited in Bosse (2006), noted that consequences of mathematical illiteracy and gender differences in mathematics attainment will provide a weakness for the survival of democracy in America. NCTM (1989) as cited in Bosse (2006) emphasised that America are at risk of becoming a divided nation in which knowledge of mathematics supports a productive, technologically powerful elite men while a dependent, semiliterate majority of girls find economic and political power beyond reach.

NCTM's movement was consistent with school reform efforts seeking to maintain democratic stability within the United States by diminishing existing inequities. All students are expected to have good mathematical knowledge for involvement in economic and scientific development through just democratic system irrespective of their gender. As in America society, a well structured democracy is enhancing through mathematical knowledge and equal opportunities given to all genders.

## **5.0 GENDER AND EXPECTATIONS OF INTEREST GROUPS**

In the Nigerian society the cultural background affects the view of boys and girls role within our society (Odebode, 2003). The way learners are treated in the different contexts means Nigerian based research has to consider these differences (Obaji, 2005). Since teachers' thoughts, their beliefs and knowledge, about girls and boys influence their instructional decisions, an understanding of these concepts from a Nigeria perspective is necessary for Nigeria research (Odebode, 2003). The differing social status and ethnic compositions are important points of contrast between Western and Nigeria research (Obaji, 2005).

### **5.1 TEACHERS' BELIEFS AND GENDER DIFFERENCES**

In this section teachers belief with regards to role of boys and girls in Nigerian society is considered .The aim of the research on gender issues in relation to teachers' beliefs is to increase our understanding of how gender differences develop and relate to teachers' beliefs. The term belief does not have a unique definition. But for the purpose of this study, the term belief is used as it is defined in Oxford English Dictionary. Oxford English Dictionary describe belief as a feeling or a psychological state in which an individual holds a proposition that something exists or is true, mostly one without a proof. Belief also means the existence of mental states and intentionality (Oxford English Dictionary).

Adedayo (1999) studies suggested that insights into teachers' beliefs and behaviours with regard to gender may lead to deeper understanding of gender differences in mathematics as we look into classroom interactions of teachers and students, and how this influences daily decisions about learning mathematics.

There are three variables to be considered with regard to teacher: teacher gender, beliefs and behaviour. Teacher behaviours are influenced and determined by

teacher beliefs (Onuka, 2002). These behaviours have implication for student beliefs and behaviours (Onuka, 2002). Teachers' beliefs about boys and girls, and the differences between male and female teachers' beliefs about the nature of the subject, curriculum and conceptions of their roles in the classroom, will affect their behaviours and that of their student (Omirin, 2007). Teacher beliefs affect student beliefs, their behaviours and eventually their performance. However, student beliefs, behaviours and performance respectively, may also affect teachers' thoughts and beliefs (Ekwueme, 2001). Also, students' achievement may cause teachers to behave differently towards the students, which then affects students' behaviours and, subsequently, their performance (Ogunjuyigbe, 2008). The behaviour of teachers' towards girls who are not generally performing very well in mathematics may discourage them from improving their performances.

## **5.2 TEACHER'S GENDER AND MATHEMATICS PERFORMANCE**

Teachers play an important role in implementing school policies, and in the mathematics classroom settings. Aguele & Agwagah (2007) studies pointed out that teachers are part of the causes of gender differences that exist in schools; they have the power to contribute to eliminate this inequality in practice. In theory, most teachers believe education should be a liberating and democratic influence, but in practice, mathematics teachers still seem to reinforce traditional behaviours in favour of boys' even in situations where there are interesting and talented girls' (Ango & et al 2003). Ejieh (2006) studies suggested that whether a teacher is male or female does make a difference for student performance. It was a general belief in Nigerian society that males are more capable than females in teaching mathematics and science, that is, it is believed that students with male teachers have better achievement in mathematics and science than those with female teachers (Eta, 2000). Teacher gender has a much stronger influence on the students' mathematics

performance than student gender (Isyaku, 2006). Students of male teachers scored significantly higher on mathematics tests than those of female teachers (Iyiola, 1998). Obaji (2005) studies examined teachers' grading on a geometry examination for evidence of teacher bias. Student responses to a state geometry exam were reviewed, and an examination paper was constructed that was reflective of a typical student. Secondary teachers were asked to score this examination (Obaji, 2005). No significant differences were found, there was some irregular grading behaviour (Odebode, 2003). It was observed that, the gender of teachers had no impact on their grading behaviours that is the scores given to students by male or female teachers showed no significant differences (Ogunjuyigbe, 2008). Also it was noted by Omirin (2007) that male or female teachers illustrated no bias on grading behaviours towards male or female students. The results were consistent with previous research (Omirin, 2007). Teacher gender, as an independent variable, though, may have some contribution to the gender differences in students' mathematics performance but other important variables cannot be ignore (Shaibu & Usman, 2001).

Teacher's gender as illustrated above did not affect their marking or grading, so it can be concluded that students' internal assessments is independent of teachers or student gender. Further if we accept equal ability at teaching and in marking then gender differences in student mathematics performance is not as a result of gender but student reaction to the teacher.

### 5.3 TEACHER GENDER AND STUDENT ATTITUDE

Considering female students from coeducational and girls' secondary schools in Nigeria, it was observed that there was a significant difference between the attitudes towards mathematics of females taught by male teachers and of females taught by female teachers (Ekwueme, 2001). It was found that the highest proportion of female students demonstrating positive attitudes towards mathematics was found

in all-girls' secondary schools where mathematics was taught by female teachers, while the lowest proportion was in coeducational secondary schools where mathematics was taught by male teachers (Adegoke, 1998). It shows that having male teachers could discourage females from studying mathematics (Adegoke, 1998). Furthermore, female mathematics teachers could serve as role models for females to pursue mathematics more actively (Aliyu, 2000).

Isyaku (2006) reported that teacher gender usually influences teacher behaviours. For example, female teachers interact more with boys' than with girls' and male teachers interact more with girls' than with boys' (Eta, 2000). In other words, overall, female and male teachers are much more similar to each other than in terms of test assessment and classroom assignment evaluation (Arigbabu & Mji 2004). However, teacher's behaviour will involve modifications of the ordinary interaction situation in the classroom (Ogunjuyigbe, 2008). For example, female teachers tend to be more student-centred, indirect and supportive of students than male teachers (Omirin, 2007). The effect of teacher gender on his or her teaching ideology is also examined by Omirin (2007). Omirin (2007) observed that among these nine variables ; gender, academic discipline, professional age, academic rank, tenure, class level, class size, selectivity level of teachers' current institutional affiliation and teaching loads, gender is one of the most significant predictors of teachers teaching ideology. Particularly, female teachers tended to promote learning environments that are more student-oriented, facilitative and effective (Omirin, 2007). Also female teachers appeared to use class discussion more frequently through encouraging collaboration and affective learning techniques rather than other instructional behaviours (Omirin, 2007)

Shaibu & Usman (2001) studies have shown that the correlation between teacher gender and gender differences in students' beliefs and performance were

mostly observed in the northern area of Nigeria where the Islamic culture dominated. It appears that culture rather than teacher gender is more likely to contribute to the gender differences (Arigbabu & Mji 2004). While, generally speaking, there are many changes in the classroom which happens due to the effects of teacher gender on students' behaviours and the students' behaviour is a reflection of classroom acceptable norm in Nigerian society (Isyaku, 2006). In the Western part of Nigeria especially Ekiti State where girls' performance in mathematics is highly encouraging they are taught by male and female teachers. The findings on gender difference in mathematics performance in Ekiti State of Western Nigeria shows deviation from the situation in other parts of Nigeria especially the Northern part of Nigeria. There are many factors responsible for this which have been discussed in (1.0) previous section.

#### 5.4 TEACHER BELIEFS AND STUDENT GENDER DIFFERENCES

Ogunjuyigbe (2008) reported that in a study to investigate the effects of teacher beliefs in relation to gender and mathematics performance, female teachers in many schools were chosen. These teachers were asked to identify their two most and least successful male and female students in mathematics, to find out reasons for these students' successes and failures, and to describe their characteristics (Ogunjuyigbe, 2008). Teachers' choices of most and least successful students were then compared to mathematics test scores of their students (Ogunjuyigbe, 2008). It was found that teacher beliefs about male and female students in mathematics were different (Ogunjuyigbe, 2008). Teachers perceived male students as being their best students and were inaccurate when selecting their most successful male students (Ogunjuyigbe, 2008). They tended to explain males' success in mathematics in terms of ability more often than they did for females, whose success was described more often in terms of effort. This treatment of female students is widely believed to have

negative impact on students' performance (Ogunjuyigbe, 2008). Also most teachers thought their best male students, when compared to their best female students, were more competitive, more logical, and more adventurous, often solve mathematics problems, enjoyed mathematics more and were more independent in mathematics (Obaji, 2005). In general, differences in teacher expectations of female students and male students, which lead the teachers to overrate the males' mathematical capability and to underrate the females' ability (Obaji, 2005). Furthermore, when males fail in mathematics, teachers have indicated that it is because the teachers failed to help them (Odebode, 2003). In addition, teachers frequently have higher educational expectations for boys than for girls and believe that boys are better than girls at mathematics. They even became fearful that the females would fail and became emotionally upset if the females were unable to solve difficult mathematics problems (Odebode, 2003). The female students themselves feel that the teacher appeared to believe that mathematical problem-solving was not useful for them (Ogunjuyigbe, 2008). While there is no conclusive evidence that teachers believe that mathematics is more appropriate for males than for females, wherever evidence exists, it indicates that teachers tend to generalise mathematics as a male domain. Such characteristic result partially in differential treatment of males and females in classrooms and undoubtedly influences the development of gender differences in mathematics (Ogunjuyigbe, 2008).

Eta (2000) suggested that the important teacher beliefs that influence the development of gender differences in mathematics are their attitudes about the aptitudes of students and the appropriateness of their performance in high level mathematics that differs on the basis of sex. Teachers' beliefs are negative about females and the learning of mathematics and there are some negative consequences of what could be interpreted as negative teacher beliefs (Arigbabu & Mji 2004). Since gender differences have been found in all aspects of student mathematics learning,

and since teacher beliefs is such an important variable that has profound impact on student mathematics performance, it is necessary to find out the beliefs of male and female teachers with regards to students' performance in mathematics (Isyaku, 2006).

Isyaku (2006) has shown that male and female teachers differ in beliefs about the importance and difficulty of solving selected mathematics topics, such as geometry, problem-solving, and numbers and operations, which were typical in most secondary school syllabus, in general, male and female teachers were more similar than different with respect to their beliefs regarding the importance and difficulty of certain mathematics topics (Arigbabu & Mji 2004). However, minor differences appeared. Furthermore, gender differences found in teacher beliefs were more similar rather than different to the gender differences in student beliefs about importance and difficulty of some selected mathematics topics (CDD, 2000). Also, investigating the formulation of teacher self-concept in mathematics and the impact of such self-concept on students' mathematics performance ( the term self-concept here implies a person's perception of self formed through experience with the environment and influenced by environmental and other factors ), there are minor gender differences between male and female teacher beliefs and approaches to teaching mathematics (Adegoke, 1998).

Isyaku (2006) studies show that there is a gender differences in selected teachers' beliefs and their verbal behaviours among secondary mathematics teachers. Teacher verbal behaviour here is defined as an indirect behaviour such as teacher praise, acceptance of student responses or behaviours, and expanding upon student thoughts and direct behaviours such as directing students, correcting student answers or behaviours, and criticizing students (Eta, 2000). Male and female teachers did not differ in their beliefs about the responsibility they assumed for student success or failure. At the same time, teacher beliefs about their own



responsibility assumed for student success or failure had little to do with teachers' verbal behaviour. However, female teachers showed significantly higher incidence of indirect behaviours and combined indirect and direct behaviours (Isyaku, 2006).

Finally, gender difference in mathematics performance varies according to regions in Nigeria. In Ekiti State of Western Nigeria for instance, when gender differences are found in student mathematics performance there is no evidence that teacher's gender is a contributing factor reasons have been discussed in earlier session. While in the Northern part of Nigeria teachers' gender plays an important role in gender differences in mathematics performance (Isyaku, 2006). Cultural issue may contribute more to the generalised beliefs about male and female students in Nigerian secondary school (Isyaku, 2006).

## **6.0 GENDER ISSUES AND INTERVENTION PROGRAMME IN MATHEMATICS**

Governments, nongovernmental organisations (NGO's), international development partners and institutions have made many interventions in Nigerian schools and society in the form of programmes, policies and projects in order to increase the participation and performance of girls in mathematics, especially at the primary school level which is reflected in girls' performance at the senior secondary school level (Obaji, 2005). Universal Basic Education (UBE) was established in the 90's and mathematics is one of the core subjects that is compulsory for all children at the elementary level; the agenda on educational development providing access through the expansion of schools, leading to the provision of Universal Basic Education. Such provision, of course, has increased the overall number of girls enrolled in school for the last 10 years (Busari, 2002). Aguele & Agwagah (2007) reported that relaxed criteria were put in place in Nigeria to reduce admission qualifications for girls', for example; institutions were mandated by law to use lower

cut-off points for girls' admission into secondary and tertiary institutions. In the admission process into the federal government maintained institutions in Nigeria, quota policies or positive discrimination measures favouring girls at the secondary school level have been put in place, but they are used for only 10% of total candidates' admission in tertiary institutions. Furthermore, bringing schools closer to girls within a walking distance from their homes is frequently cited as a major factor of which has led to an increase in girls' educational participation and performance in mathematics (Aliyu, 2000).

Alleviating Financial Constraints (AFC) is another measure by the government. This includes, free education, scholarships, provisions of school supplies and so on, and these have been used to encourage girls' participation and performance in mathematics (Obaji, 2005). As well as educating parents and the community, since parents' resistance to girls' education is not limited to economic reasons, but also to a lack of appreciation of the benefits of girls education to society, measures have been taken in order to enlighten the community in this issue (Aguele & Agwagah, 2007). Using the media, making the community participate in the activities of girls' education and parental literacy are just some of the methods used to create awareness in the community (Busari, 2002). Obaji (2005) reported that Nigeria recognizes education as a fundamental human right and is signatory to the major conventions for the protection of the rights of children and women, especially, the Convention on the Rights of the Child (CRC), and the Convention on the Elimination of all forms of Discrimination against Women (CEDAW) . In 2003, the Government of Nigeria passed into law the Child Rights Act. This Act is aimed at facilitating the realization and protection of the rights of all children. In order to achieve the objectives of UBE, Nigeria also enacted the Universal Basic Education (UBE) law, which provides for a 9-year free and compulsory basic education to improve education interventions at the primary and junior secondary levels (Obaji,

2005). The Government of Nigeria has been working in active collaboration with International Development Partners such as the United Nation Children Fund (UNICEF), the United Nations Education Social and Cultural Organisation (UNESCO), the World Bank as well as Civil Society and NGOs to achieve the UBE goals. Gender equity in education has been one of the main goals targeted by Nigeria; this commitment has been renewed in several international fora, including the United Nations Decade for Girls' Education Initiative (UNGEI) (Obaji, 2005).

In Nigeria, there is a national gender disparity in basic education enrolment, retention and completion against girls (Aliyu, 2000). There are regional variations in gender disparity in education with girls and women from Northern Nigeria and rural communities generally at a disadvantage. Aguele & Agwagah, (2007) reported that Nigeria's Strategy for Girls Building on existing Child Friendly School Initiative which is supported by UNICEF, Nigeria has developed the Strategy for the Acceleration of Girls' Education, now being reinforced by the new Girls' Education Project (GEP). This is a joint project undertaking by the Federal Government of Nigeria and UNICEF to boost girls' schooling in Northern Nigeria and accelerate progress in building the gap with respect to gender equity (Obaji, 2005).

The major objectives of the Girls' Education Project (GEP) include:

- Raising national awareness on girl-child education and increasing political and financial commitment through advocacy and sensitization of policy makers at all levels, parents, school authorities, other leaders and girls themselves (CDD, 2000).
- Establishing child friendly school principles for effective schools, linked to community empowerment and development.
- Creating school management committees with community involvement and participation and building institutional capacity for

promoting girls' education and the capacity of stakeholders on gender sensitivity and collaborating with Government and other stakeholders in reviewing existing curricula and teaching materials for gender sensitivity (CDD, 2000).

- Also promoting the employment of more female teachers in the rural areas, where they are most needed to serve as role models and assist in the mentoring of out-of-school girls.
- Monitoring and evaluating girls' education programmes and mobilizing and strengthening the Inspectorate's role in this process (CDD, 2000).
- Improving service delivery with all stakeholders, providing more girls' only schools where appropriate, and improving facilities, including access to safe water and separate toilets for girls and teaching aids for the promotion of quality education (CDD, 2000). In pursuance of these objectives, inspection visits have been extended to six Northern States of Bauchi, Borno, Jigawa, Katsina, Niger and Sokoto states (CDD, 2000).

The federal inspectorate service has restructured through quality control, capacity building efforts in collaboration with international development partners like UNESCO and World Bank in order to address the falling standard in teaching and low learning achievements among pupils (Obaji, 2005). The Inspectorate service is therefore being enhanced to develop a framework to guide quality assurance at the primary and secondary levels of education. The National Commission for Mass Literacy, Adult and Non-Formal Education (NMEC) in collaboration with UNICEF, UNESCO and the Cuban Government provide support for adult literacy through education radio programmes and supportive materials. The use of radio is a key strategy in providing education to nomadic populations through Interactive Radio

Instruction (IRI) which is supplemented by print and audio-visual materials (Busari, 2002). The scheme is being implemented by the National Commission for Nomadic Education (NCNE). These initiatives have contributed to girls emerging interest in mathematics both Southern and Northern as it is seen in increasing number of girls application to applied mathematics course such as physical education and book keeping in colleges recently (Obaji, 2005).

## **6.1 RECENT ACHIEVEMENTS AND IMPACT ON GIRLS' EDUCATION**

As a result of increasing government commitment, greater awareness has been created nationwide on girls education; some states in northern Nigeria have already put some legislation in place to support the promotion of girls education (Obaji, 2005). For example, Kano State has prohibited the collection of all forms of fees in Girls' Secondary Schools. Similarly, Gombe State promulgated an edict against the withdrawal of girls from schools, while Niger, Bauchi and Yobe States have removed financial disincentives affecting girls enrolment in secondary schools (Obaji, 2005). Those who have dropped out as a result of early marriages or teenage pregnancy are encouraged to return to school (Aliyu, 2000).

The effort of Federal Government of Nigeria and UNICEF in promoting the African Girls Education Initiative (AGEI), which was funded by the Norwegian Government, recorded remarkable progress in terms of enrolment and retention (CDD, 2000). The AGEI Evaluation Report revealed a 28% increase in girls' education retention and 80% decrease in drop-out rate for Girls in pilot primary schools supported by the programme (Obaji, 2005). The gender gap in states that benefited from the AGEI reduced appreciably, for example Sokoto the gender gap fell from 41% to 38% (Busari, 2002).

## 6.2 PERSISTING CHALLENGES TO GENDER DISPARITIES

Aguele & Agwagah (2007) reported that the primary school net attendance ratio in the South-West (83 percent), in the South-South (82 percent), and in the South-East (80 percent), are nearly twice as high as the net attendance ratio in the North- West (42 percent) and North-East (44 percent). Literacy differences between the various geographic zones need to be addressed (Busari, 2002). In 1999, the national adult literacy rate was estimated to be about 50 - 58% for males and 41% for females. The overall literacy rate for urban males was 75% compared with 59% for females, while gender disparity was higher in rural areas than in urban areas with 51% of rural males being literate compared with 34% rural females. Access to formal schooling still poses a problem, it is estimated that 7.3 million children, of whom 60% are girls, are not in school (Obaji, 2005). Drop out is more pronounced at grade six level, where more than 17% of children drop out of school yearly. The drop-out issue has many dimensions, the most significant of which are: early marriage for girls in the North, boys and girls engagement in income generating activities to supplement household income in the South Eastern and North-Eastern parts of the country, respectively, as well as in major state capitals. Employment prospects for school and university leavers are also key factors affecting drop-out and low transition from primary to junior secondary schools (Obaji, 2005).

Numeracy is an aspect of mathematics dealing with the use of numbers in everyday life which every individual needs to have an average knowledge to carry out day to day activities in the society, is suffering from this society attitude. In fact, numeracy and literacy are important aspect of social life that enables individuals to function adequately in the large political, social and economic society.

Recent Monitoring Learning Achievement studies conducted on primary four and six pupils in the formal system, as well as adolescents and youths in post literacy classes in the non-formal system in Nigeria, revealed much weaker than expected

performance in numeracy for girls in both systems (CDD, 2000). This low level of learning achievement is attributable to poor teaching quality, scarcity and inadequacy of teaching and learning materials and a general absence of learner-friendly environment (Aguete & Agwagah, 2007).

### **6.3 NEW APPROACHES TO GENDER DISPARITY IN NORTHERN NIGERIA**

Aliyu (2000) reported that it is encouraging seeing that parents in some parts of the country, especially in the North, are willing to let their daughters participate in other forms of education and training which are of shorter duration, close to their area of residence and have flexible scheduling. These learning centres are perceived to be more compatible with their cultural beliefs, and more likely to give functional skills and assuring them of future employment (Obaji, 2005). The non-formal approach to education, which includes Islamic education, has found greater appeal in the northern part of Nigeria. Since 1997, UNICEF has been working with the Federal Government of Nigeria through the National Mass Literacy Commission and with other agencies to provide three forms of non-formal education Programmes: (i) Non-Formal Girls' Education, (ii) Non-Formal Education Quranic Education and (iii) Non-Formal Education Boys' Education. These three initiatives specifically target out-of-school children, adolescents and youth between the ages of 8-18 years, who are unable to complete formal primary education, or have never been to school (Busari, 2002). The Non-Formal Education Quranic education programme, which has a great appeal in the Northern states, especially Borno, Sokoto, Kano, Bauchi, has integrated four core subjects; mathematics, English Language, Basic Science and Social Studies into the conventional Quranic curriculum (Aguete & Agwagah, 2007). The Universal Basic Education (UBE) Law also makes provision for the integration of Non-Formal Education, including Quranic education, in order to ensure that the needs of disadvantaged and marginalized children are equally addressed (Aguete &

Agwagah, 2007). This probably is responsible for increase the attendance of girls in the UBE school scheme.

#### **6.4 EFFORTS OF INTERNATIONAL PARTNERS**

In support of Strategy for Accelerating Girls' Education in Nigeria (SAGEN), other major partners are also reinforcing their efforts for girls' education (Busari, 2002). UNESCO has commissioned researches in this area and the United Nations Populations Fund (UNFPA) has been supporting girls education to ensure that more girls remain in school longer (CDD, 2000). The Ambassador's Girls Schooling Programme (an initiative of USAID) provides US\$60 per child for poor families (CDD, 2000). A total of 13 states are targeted with two states per geo-political zone plus the Federal Capital Territory (FCT). Fifteen pupils per state are to benefit from the programme with the funds disbursed through NGOs (Aliyu, 2000). The effort of international collaborators in Nigerian education and in particular gender differences has changed the attitude of local people in Nigerian society about role of girls (Busari, 2002).

#### **6.5 EFFORTS OF THE CIVIL SOCIETY ON GENDER DISPARITY**

In Nigeria, UNICEF works in close partnership with education authorities in both formal and non-formal sub-sectors, including partnership with Civil Society Action Coalition on Education for All (CSACEFA), the Civil Society Coalition for Education – an umbrella organization encompassing NGOs around Nigeria (Aguete & Agwagah, 2007). As a result of this collaboration, the Nigerian Girls' Education Initiative was created in 2002. There is regular information sharing, participation in planning, capacity building and in monitoring and evaluation activities (Obaji, 2005). The NGO sector constitutes a good delivery alternative especially in some parts of



the country where access is not easy. Despite the above achievements, a major challenge remains as over 7 million school-age children (65% girls) still do not go to school, while at least 17% of those who go to school do not complete primary 6. Also, poverty has been a major factor in the chronic under-enrolment of all pupils, especially girls (Aguale & Agwagah, 2007). Many parents are so poor that they pull their children out of school for income generating activities, to sustain their families (CDD, 2000). In such cases, non-formal training can improve both literacy and employment prospects by providing second chance education to take care of drop-outs. Measures have been taken to ensure that more non-formal educational opportunities are made available to help girls' child escape the poverty trap (Aguale & Agwagah, 2007).

## **7.0 CONCLUSION**

Nigeria like most English speaking West African countries has realised the problem of gender disparity in the senior secondary school examination within the last two decades ago (Aliyu, 2000). Over the year's girls' education have been viewed differently by people in different parts of the country. In the western Nigeria where the western education started in Nigeria, most families appreciate the effort of training their girls' even to university level and most families have university graduates among them (Aguale & Agwagah, 2007). The Western culture has greatly influenced most people from this part of Nigeria. Most of them have, at one time or another travelled to western countries for education and business purposes hence they have learnt from the western culture which appreciates girl child rights in the society. Also, the fact that Nigeria was colonized by Britain gave the people in western Nigeria the opportunity of interacting with other British allies in Western Europe as well as the United State of America, Canada and Australia. This brought about early introduction of free and compulsory education for all up to university level

and subsequent increase in participation and performance of girls in mathematics (Aliyu, 2000). In the early 1980s' most of the secondary schools and tertiary institution where staffed with foreign teachers from Europe and India.

Nigerian society's view of girls' role is determined by the background of people within the regions. In the Western region Nigeria the gender gap is reducing probably due to influence of the early Christian missionaries and introduction of the western education. In the northern region of Nigeria influence of social cultural issues is still causing a wide gap among boys and girls in all levels of education. In the northern region of Nigeria girls goes to elementary schools before they are given out in marriage at early age. Hence, the gender difference is seen through cultural values which have been generally accepted. But the people in the Eastern part of Nigeria, encourage girls to go into petty trading rather than going to school, so most of them are found in trading sections of the economy. Few boy and girls pursue university education in this part of the country. The southern part of the country is the region where the oil is found in Nigeria and the community dependent so much on the royalty from oil more than other enterprises. So there girls are not encouraged to study , as they get benefits from oil royalty from major oil companies and the federal government of Nigeria, this region has a poor infrastructure, as their community leaders are not using the royalties collected for the benefit of the people in general.

In general, girls' participation and performance in the SSCE is very poor in Nigeria as a whole. This has brought about many intervention programmes in the last decades to enlightened the Nigerian society as a whole on the benefit of girls education (Busari, 2002)

In spite of the various actions and inputs by government as well as intervention by NGOs, religious organizations and international organizations, girls

still lag behind boys at all levels of education. They continue to avoid courses which lead to careers in mathematical fields, causing gender inequality in science, mathematics and technology professions in Nigeria (Aliyu, 2000). As observed in some studies the basic causes of gender discrimination towards girls involvement and performance in mathematics generally are deeply rooted in socio-culturally determined attitudes. The socio-cultural factors include society values which encourage and perpetuate discrimination against girls, sex generalisation, and division of labour in which domestic chores at home are assigned to girls. All these factors tend to discourage girls from good performance at the SSCE. For instance, in some homes, particularly of illiterate parents who still form the majority of Nigerian population, given the literacy level of less than 50%, education of boys is given priority and more prominence in view of the need to perpetuate family name in a competitive society (Aliyu, 2000). Consequently, the majority of girls with potentials for technical and scientific skills, are discouraged from pursuing mathematical subjects (Aliyu, 2000). It is not that girls cannot and do not have the ability to succeed in science, mathematics and technology courses, but rather that obstacles arise in recruiting and retaining girls. Studies have also shown that girls are facing many obstacles caused by societal ills such as poverty. Because girls are still largely under-valued by society, when family members become incapacitated by illness or old age, girls are often the first to be relegated to the care giver status and thus further hinder their chances of self-development and success. Since policies against gender imbalance in mathematical activities and access to educational institutions have just been put in place, many girls have not started to see the impact of the policies. In fact, causes of gender disparity have been addressed in this research, some of the reasons why girls are performing poorly in mathematics at the SSCE are stated as follows: poor attitudes of government and parents to female participation and performance in mathematics, the negative attitude of girls, the poor attitude of parents probably stemming from a bias of the traditional people in northern Nigeria,

men are better placed in society, sex segregation, male dominance and public posts are mostly controlled by men.

In conclusion, gender disparity can be closed in mathematics performance at the SSCE through what is called open days where parents are invited to see what happens in schools. Since parental behavioural expectations for their daughters have important implications for females' interest and performance in mathematics at the SSCE, parents have the greatest potential to influence their children (Busari, 2002). Teachers also need to be aware of the issues of gender disparity in mathematics performance at the SSCE and how to address them. Workshop and in-service programmes are possible avenue to increase teacher awareness of gender issues and possible intervention programmes to address the issue (Onuka, 2002).

Appendix I: Measuring the socio-economic position of a 16 year old.

S E G s	RG	Examples of Employment
3 - Professional workers (self-employed)	(professional) <b>I</b>	Judges, Chartered Accountants, Clergy, Medical Practitioners, Pharmacists Economists, University Academic Staff, Scientists, Engineers, School Inspectors.

1 - Employers and Managers of large establishments	(managerial / technical) <b>II</b>	Marketing and Sales Managers, Commercial Artists,
2 - Employers and Managers of small establishments		Journalists,
5 - Ancillary workers, artists, non-manual supervisors.		Pilots, Publicans, Headmasters, Matrons, Chiropodists, Systems
13 - Farmers (employers and managers)		Analysts,
14 - Farmers (own account)		Actors, Musicians, Clothes Designers, Hotel and Restaurant managers, Teachers, Farmers and Farm Managers.
6 - Junior non-manual	(skilled non-manual) <b>IIIN</b>	Driving Instructors, Shop Sales Assistants, Police, Fire-fighters, Receptionists, Estate Agents, Cashiers.
8 - Manual supervisors and foremen	(skilled manual) <b>IIIM</b>	Ambulance Drivers, Fishmongers, Bakers, Goldsmiths,
9 - Skilled manual workers		Builders, Bus drivers, Butchers, Knitters, Cobblers,
12 - Non-professional own account workers		Radio and TV Mechanics, Joiners, Pottery Decorators, Chefs, Nursery Nurses, Travel Stewards, Undertakers, Piano Tuners, Hairdressers.
7 - Personal service workers	(partly skilled manual) <b>IV</b>	Watering and bar staff, counter hands / assistants,
10 - Semi-skilled manual		Postal Workers, Gardeners, Fishers, Sewers, Hotel and Hospital Porters, Farm, Horticultural and Forestry Workers, Agricultural Machinery Driver.
15 - Agricultural workers.		
11 - Unskilled manual	(unskilled) <b>V</b>	Cleaners, Labourers, Dockers, Refuse Collectors,

16 - Members of the armed forces

(Armed Forces) **VI**

---

Source: Demack (1998)

Details of the employment of each parent is collected and coded as Social Economic Groups (SEGs). This was done for both parents (where two were available). These were then cross-tabulated and from this an overall 'household' measure created by selecting the employment of the parent in the higher status occupation.

## **REFERENCE**

Adedayo, O.A. (1999) *Differential Effectiveness by Gender of Instructional Methods on Achievement in Mathematics at Tertiary Level*, Educational Studies in Mathematics, 37,.

Adegoke, K.A. (1998) *The Challenges of Quality Public Education in the 21st Century, with Particular Reference to Nigeria*, World Teachers Day Document by Nigeria Union of Teachers.

Ahuja, O.P. (2006) *World-class High Quality Mathematics Education for all K-12 American Students*, TMME, Vol. 3, No.2, p.223. USA: The Montana Mathematics Enthusiast

Aliyu, M.S. (2000) Towards a better understanding of the Almajiri system of education in Nigeria, *The Nigeria Teacher Today*, Vol. 8, Nos. 1 & 2, A Journal of Teacher Education, National Commission for Colleges of Education, Kaduna, Nigeria.

Aguele, L.I. & Agwagah, U. N. V.(2007) Female Participation in Science, Technology and Mathematics (STM) Education in Nigeria and National Development, *Journal of Social Sciences*, Nigeria . Vol. 15(2), pp 121-126.

Alonge, M.F (2005) *Assessment and the Future of Schooling and Learning*, A Keynote Address Presented at the 31st Annual Conference of Educational Assessment, Abuja, Nigeria.

Arigbabu, A.A. & Mji, A. (2004) Is Gender a Factor in Mathematics Performance Among Nigerian Pre-service Teachers? *Sex Role*, Nigeria. Vol. 51, Nos. 11 & 12.

Ango, M.L. & et al (2003) *Quality of Basic Education in Nigeria: An Annotated Bibliography From 1992-2002*. Educational Research Network for West and Central Africa (E R N W A C A), Nigeria.

Asim, A.E. & et al (2005) *Trend analysis of West African Senior Certificate Examination Results in Science, Technology and Mathematics (STM): Implications for Learning in Nigerian Secondary Schools*. Being a paper presented at the 31st Annual Conference of International Association for Educational Assessment in Nigeria with the theme Assessment and the future of schooling and learning in Nigeria, Nicon Hilton Hotel Abuja, Nigeria.

Bosse, M.J. (2006) *The NCTM Standards from an Axiological Perspective*, Reston, VA: National Council of Teachers of Mathematics.

Busari, O.O. (2002) *Innovative Approaches towards Motivation of the Girl-child in Basic Science*, Children-in-Science and Technology Report, Ondo, Adeyemi College of Education.

Centre for Democracy and Development, CDD (2000) *Education in Nigeria Through A Gender Lens*, CDD Issue Brief To A Joint House of Representatives Committee (Appropriations, Education and Women Affairs & Youth Development). Public Hearing on Education in Nigeria. Heinrich Boell Foundation.

Demack, S. & et al (1998) *Myths About Underachievement: Gender, Ethnic and Social Class Differences in GCSE Results 1988-1993*, Belfast: British Educational Research Association

Department for Education and Skill, DES (2008) *Gender and Education: The Evidence on Pupils in England*, DCSF (2007) Report (online)  
<http://www.dcsf.gov.uk/research/data/uploadfiles/RTP01-07.pdf>

EDUC 5765 (2008) *Curriculum and Assessment Lecture Note*, University of Leeds

Ejeh, M.U.C (2006) *Pre-Primary Education in Nigeria: Policy Implementation and Problems*, Nigeria: Elementary Education Publication, Vol. 5(1), pp 58-64.

Ekwueme, L.U. (2001) *Emerging Issues in the Cultural Education of The Nigerian Child*, Ogbulogo, C. & et al. (Eds.), *Advances in African Languages, Literatures and Cultures*, Lagos: Sam Orient Publishers.



Elwood, J. (2005) *Undermining Gender Stereotypes: Examination and Coursework Performance in the UK at 16*, London: Assessment in Education: Principles, Policy & Practice, Vol. 2 (3), pp 283 - 303

Eta, F.E.E, (2000) Dimensions of Gender Crisis in Nigeria Education: A View from Colleges of Education, *The Nigerian Teacher Today*, A Journal of Teacher Education Published by the National Commission for Colleges of Education, Kaduna, Vol. 8, No.1 &2,

Giri, S.N. (2003) *High Achievement in Mathematics and The Girl Child*. Gender Issues in STME., All India Science Teachers Association, Kolkata, India.

Hanna, G. (2003) *Reaching Gender Equity in Mathematics Education*, Canada: Ontario Institute for Studies in Education.

Historical Geography of Nigeria, HGN (2008) *A Basic Chronology for Nigeria's Historical Geography*. (Online)  
<http://www.uni.edu/gai/Nigeria/Background/Standard17.html>

Isyaku, K.(2006) *Teacher Training in Nigeria*. United Kingdom National Commission for UNESCO, Educational Committee, Africa Working Group, London.

Iyiola, D.O. (1998) An Evaluation of the 6 – 3 – 3 – 4 System Using the Extended Information Recall Process Mode, *Nigerian Journal of Curriculum Studies*, Vol. 1, No. VII, 91- 100.

Joint Council for Qualifications, JCQ (2008) *Big Jump in Top GCSE Examination Grades*, The provisional statistics published by JCQ. London.

Kolawole, E.B. (2007) Gender Issues and Academic Performance of Senior Secondary School Students in Mathematics Computation Tasks in Ekiti State, Nigeria, *Pakistan Journal of Social Sciences* ,Vol. 4 (6): pp 701-704.

Leder, G.C. (1992) *Mathematics and Gender: Changing Perspectives*, in D.A Grouws (ed.), *Handbook of Research in Mathematics Education*, New York: Macmillan, pp 597-622.

Leder, G. C.& et al. (1996) *Research and Intervention Programs in Mathematics Education: A Gender Issue*, Boshop, A.J.& et al (eds), *International Handbook of Mathematics Education*, Netherlands: Kluwer Academic Publishers, pp. 945-985.

National Policy on Education (2004) *Federal Republic of Nigeria*, Lagos, NERC Press.

Obaji, C. N. (2005) *Nigeria's Experience with Girls' Education and Linkages with Action on Adult Female Literacy to Impact on Poverty Alleviation*, The United Nations Girls Education Initiative. Technical Consultation Beijing, China.

Odebode S. O. (2003) *Re-Examining Gender Balance Education in Agricultural Science, Technology and Mathematics in Nigeria: An Overview*, Gender Issues in STME, Ibadan, Nigeria.

Ofsted Gender Equality Scheme, OGES. (2008) Online:

[http://www.ofsted.gov.uk/assets/Internet\\_Content/Shared\\_Content/HR/ges2008.pdf](http://www.ofsted.gov.uk/assets/Internet_Content/Shared_Content/HR/ges2008.pdf)

Ogunjuyigbe, P.O. (2008) Gender differentials in science, mathematics and technology: Why do Fewer Females Participate in Science, Mathematics and Technology Courses in Nigeria? *International NGO Journal*, Vol. 3 (2), pp. 021-026.

Omirin, M.S (2007) *Gender Issue in The Performance of Students Admitted Through UME and Pre-Degree into the Nigerian Universities*, Educational Research and Review, Vol. 2 (3), pp. 46-48.

Onuka, A.O.U. (2002) *Implementation of the Universal Basic Education (UBE) in Nigeria: A Proposal for Funding*, Paper presented at the Sixth Annual Conference of National Association of Educational Researchers and Evaluators, at the Faculty of Education, University of Ibadan.

Omole, D.O.K (2001) *An Analysis of Candidates' Participation in SSCE conducted by WAEC in Nigeria*, National Association of Educational Research and Evaluation (NAERE), Federal College of Education, Abeokuta.

PISA (2005). *Programme for International Student Assessment*, Online:

<http://www.pisa.oecd.org>

(International); <http://nces.ed.gov/surveys/pisa> (national)

Ravitch, D. (2003) *Brookings Papers on Education Policy*, Project MUSE. Maryland: Brookings Institution Press. pp.1-6.

Shaibu, A. A. M. & Mari, J.S. (1997) Gender-Related Differences in the Understanding of Science Process Skills Amongst Junior Secondary School

Students in Some Nigerian Schools, *Journal of the Science Teachers Association of Nigeria*, Vol. 32, No.1 & 2, pp. 21-27

Shaibu A.A.M. & Usman I.A. (2001) The Relationship Between Students' Performance in Practical Activities and Their Academic Achievement in Integrated Science Using the NISTEP Mode of Teaching, *The Jos Journal of Education*, Vol. 6, No. 1.

Smithers, A. (2004) *England Education: What Can Be Learned By Comparing Countries?* London: Centre for Education and Employment Research.

The Third International Mathematics and Science Study (TIMSS), (1995) *Summary of Gender Differences in Average Mathematics and Science Achievement on TIMSS*, International Association for the Evaluation Achievement (IEA), Boston College, USA.

TIMSS (2005) *Trends in International mathematics and Science Study, Online:* <http://isc.bc.edu>  
(International); <http://nces.edu.gov/times> (national)

Woodward, W (2002) *GCSE Gender Gap Continues to Grow*, Education editor. Thursday August 22. (online) <http://news.bbc.co.uk/1/hi/education/3166295.stm>.  
[www.guardian.co.uk](http://www.guardian.co.uk)

Zewide, G. (1994) *The Situation of Girls' Education in Anglophone Africa*, Forum for African Women Educationalists (FAWE). Nairobi, Kenya.

Williams, P. (2005) *Assessment in 14–19 Mathematics*, Advisory Committee on

Mathematics Education (ACME). London: ACME/The Royal Society