



Gender Dimension in Students' Achievement in Arts and Science Subjects in Senior Secondary Schools in South East Nigeria

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ABSTRACT

The study assessed the gender dimension in students' achievement in Arts and Science subjects in senior secondary schools in South East Zone of Nigeria from 2011 to 2020. Four (4) research questions guided the study. The study adopted descriptive survey design. The population for the study comprised one thousand three hundred and ten (1310) public senior secondary schools in twenty one (21) Education Zones in South East States of Nigeria. All the schools were used; hence, there was no sampling. Secondary data were used in the study. The data on the Gender Gap in Teacher Supply in Secondary Schools were collected directly from the Post-Primary Management Board (PPMB) and Secondary Education Board of each of the States under investigation. There was no reliability since the data were secondary data. Frequency distribution and percentage were used to analyse the secondary data while the Chi-Square was used to test the null hypotheses with the aid of Statistical Package for Social Sciences (SPSS) at 0.05 level of significance. The study revealed, among other things, that male students achieved higher than female students in science subjects in secondary schools in South East Nigeria, and that female students achieved higher than male students in Arts subjects in secondary schools in South East Nigeria, that there was high disparity index of achievement of female students in Science subjects in secondary schools in South East Nigeria, and that there was high disparity index of achievement of male students in Arts subjects in secondary schools in South East Nigeria. Based on these findings, the study recommended among other things that more female teachers should be recruited for science subjects, and that more male teachers should be recruited to Arts subjects by the Ministry of Education for equity and equality in the teaching of science and Arts subjects in secondary schools in South East Nigeria. Based on these findings, the researchers recommended among other things that Teachers should utilize activity-based teaching methods in teaching science subjects to make it interesting to all students irrespective of gender, in order to promote high achievement and close the persistent gender gap in arts and science subjects in Nigeria.

Key Words: *Gender, Gender Gaps, Students' Achievement, Secondary Schools*

Introduction

The importance of gender characteristics in relation to students' achievement in secondary schools cannot be underestimated. Gender is a variable that plays an important role in different facets of life; hence, the role an individual plays in society is distinguished by his or her gender characteristics. In other words, men are expected to behave and to perform duties and show that they are men, while women behave and perform duties and show that they are females. Eugene and Ezeh (2016) defined gender as a psychological term and a cultural construct developed by society to differentiate between the roles, behaviours, mental and emotional attributes of males and females. Tim (2018) also maintained that gender characteristics, therefore result in cultural learning and socialization which continue throughout one's life. Seguino (2016) opined that gender is the array of socially constructed roles and relationships, personality traits, attitudes, behaviours, values, relative power and influence that society ascribes to the two sexes on a differential basis. Nevertheless, for men to choose to work as teachers of students in the early years of schooling, they must first overcome gender barriers. For example, gender expectations and stereotypes strongly influence why men shy away from teaching. For instance, Igbokwe (2016) maintained that teaching profession at early stage was usually considered as women as "women's work" and associated with the care and nurturing of young children. As such, men who teach young children may have their masculinity questioned or scrutinised, and may not be seen as "real men". Teaching young children, however, requires a balance of stereotypically feminine and masculine traits. Therefore, gender is the different perceptions of male and female teachers about teaching profession which imposes differences in the appointment or supply of teachers to secondary schools. The differences in perception and cultural role orientation of children could result to gender gap in teachers' supply in secondary schools.

Gender gap is the difference between women and men as reflected in social, political, intellectual, cultural, or economic attainments or attitudes (UNESCO, 2018). This shows that gender gap measures these differences irrespective of overall income level. According to Seguino (2016), gender gap is an important indicator of social and economic stratification and hence, create gap between people in the society. The gap in economics, for example, is the difference between men and women when it comes to salaries, the number of leaders and participation in the workplace. Gender studies usually examine the differences between how men and women are represented within decision-making in organizations. Therefore, the gender gap index aims at measuring four key areas: health, education, economics and politics (Sabine and Falk, 2019). According to Wright and Rogers (2009), gender gap, or in

other words, gender inequality refers to unfair rights between male and female based on different gender roles which leads to unequal treatment in life. Ellison and Swanson (2018) held that the concept of gender gap has been widely known in human history but not until the beginning of the 20th century when the transformation of gender relations became one of the most rapid, profound social changes. In relation to school, it is imperative to note that teachers are socialized to adhere to social and occupational roles that align with masculine and feminine gender stereotypical traits and behaviours. For example, women are still expected to be caring and to focus more on relationships than men which might have implications in the supply of female teachers as they are more attentive of their children's emotional needs at home (Eagly, Nater, Miller, Kaufmann and Sczesny, 2020). Power and higher social status is also inherent to the masculine gender role, paving the way for access to privileges in organizations or higher jobs that suit their status (Eagly and Wood, 2012). These inherent role differences as perceived in the society invariably influence occupational distribution of people especially in secondary schools. This inherent role differences therefore create artificial gender disparity in schools.

Gender disparity is the differences or inequalities that exist between male and female in societal norms, education, politics and economics. The United Nation Education, Science and Cultural Organisation (UNESCO, 2016) defined gender disparity as the differences in women's and men's access to resources, status and well-being, which usually favour men and are often institutionalised through law, justice and social norms. In this study, gender disparity is conceptualized the differences in the ability, scores or grades of male and female students in various school subjects as a result of cultural orientation especially in Africa. Cultural orientation in African context portrays that males are stronger and must engage in heavy or strenuous tasks or disciplines like Mathematics, Sciences, Engineering and Woodwork, while females are weaker and must go for such Artistic and Linguistic subjects as English, Government, History, Commerce, Economics and Civic Education. These orientations begins at home and culminate in job selection or appointment positions as well as male and female students' liking or choosing subjects in terms of arts or science. Gender Disparity Index (GDI) is a composite measure, reflecting inequality in achievements between women and men in three dimensions of reproductive health, empowerment and the labour market. European Institution for Gender Equality (2017) maintained that GDI provides insights into gender disparities in health, education, empowerment and the labour market. This study analyses the GDI in male and female students' achievement in Arts and Science subjects particularly in secondary schools.

Secondary education is the level of education after primary education; it includes the final stage of compulsory primary education (Federal Republic of Nigeria, 2013). It implies that secondary education is received before entering into tertiary level. According to Oyoyo (2014), secondary school level is the bridge between the primary and tertiary levels. The importance of secondary education made the Federal Government to state the broad aims of secondary education to include preparation for useful living within the society, and for higher education. The underlining principle here is that the secondary schools must be able to provide quality secondary education to all those who can benefit from it. However, for decades now there has been an outcry from the general public on the poor performance as well as the high rate of examination malpractice in West African Examination Council (WAEC) and National Examination Council (NECO) examinations by students in various school subjects (Olasehinde and Olatoye, 2014; Oyoyo, 2015). This situation indicates that secondary schools are not living up to the expectations in discharging their obligations. This could be attributed to gender gap that might exist in the supply of teacher in science and arts subjects. However, Enyi and Ikenga (2021) attributed this to the appointment of females as principals. They noted that it is gender stereotyping that creates the persistent socio-cultural challenges that female principals face in the administration of secondary schools particularly in Enugu State, which sometimes lead to poor academic performance of students. Although gender gap is inevitable in human society, it could manifest in various activities like students' achievement in secondary schools.

Achievement is the intended learning outcomes expected from students at all levels of education. Fan, Odidi and Lucia (2016) defined academic achievement as competencies, knowledge, skills, and attitudes developed by students through active participation in teaching and learning activities. Korkmaz, Toklucu and Tay (2016) also added that academic achievement is the learning ability of students in relation to behaviours, skills, knowledge, aptitude, values and attitudes which must be permanent. This shows that achievement could be the learning outcomes in cognitive, affective and psychomotor domains. Moira, Siobhan and Rosmary (2019) defined academic achievement as the students' ability to attain the knowledge demonstrated in the classroom learning activities through assessment grades or scores. The authors added that the determinants of academic achievement of students include class participation, class assignments, home-work assignments, tests, examinations, and participation in competitions like debate, sports and riddles. Contextually, academic achievement is the extent to which students have achieved stated instructional objectives and long-term goals of education. It could be a procedural knowledge such as skills, values and behaviour or a declarative knowledge such as facts (Torsten, Philip and Heike, 2019). This knowledge according to Alaka and Obadara (2013) can be influenced by the quality of teaching and learning, gender of students, availability of resources among other things. This study focuses on the gender gap in students' achievements in secondary schools in South-East Nigeria. This is because the gender role expectations of people affect their perception and interest towards learning a particular subject or task (Alaka and Obadara, 2013).

Gender characteristics, if not controlled by teachers in the classrooms, might affect students' achievement in secondary schools. According to Baye and Monseur (2016), gender determines students' perception, thinking and disposition in learning. For instance, males were more frequently among the highest performing students in science subjects, but female students achieved higher in arts subjects. This is in line with the view of Onyekwelu (2019) that there are differences in the achievements of male and female students in science subjects. In addition, Amedu (2015) and Ezeudu and Obi (2013) held that males achieve more in Biology and Chemistry respectively than the females in Nsukka of Enugu State. However, girls might achieve better than male students in Science subjects. For instance, Ajai and Imoko (2015); Olasehinde and Olatoye (2014) pointed out that there is no gender difference in students' achievement in school subjects whether science or subjects in Ekiti State of Nigeria. Therefore, understanding the trend in gender gap in students' achievements would not only help to improve the standard of education but help to close the gap in employment ratio in labour market for rapid economic development. It is against this background that the present study is designed to analyse the gender gap in students' achievement in Arts and Science in secondary schools in South-East Nigeria from 2011-2020.

Statement of the Problem

Poor students' achievement in Arts and Science subjects in secondary schools in Nigeria has been a topic of discussion for many scholars, parents, educationist, government, researchers and even the general public. This is because the achievement index of students in schools is used as a parameter for measuring educational standards globally. However, for the past decades, there have been fluctuations in students' achievement in arts and science subjects in secondary schools particularly in South East of Nigeria as observed by the WAEC and NECO Chief Examiners' report between the periods of 2011-2020. These fluctuations in achievement vary according to gender of students. The UNESCO reports on secondary education in 2018 submitted that there is always gap in the students' achievement in secondary schools in varying capacities in Africa (Nigeria). This scenario could affect the global vision of equal access or representation of people in various works of life if something is not done urgently at early foundation of schooling.

The researchers' interactions with the some secondary school students show that students' ability and role expectations of the society could affect their performances or achievements in schools. However, there is still gap of literature on the extent of gender gap in students' achievement in public secondary schools in Nigeria. The thrust of this study therefore is to analyse the gender dimensions in students' achievement in secondary schools in South-East Zone of Nigeria from 2011 to 2020.

Purpose of the Study

The main purpose of the study was to analyse the gender dimensions in students' achievement in secondary schools in South-East Zone of Nigeria from 2011 to 2020. Specifically, the study was designed to;

1. Determine the gender gap in students' achievement in science-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020.
2. find out the gender gap in students' achievement arts-inclined subjects in secondary schools in South East Nigeria from 2011 to 2020.
3. ascertain the disparity index of gender gap in students' achievement in science subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020.
4. ascertain the disparity index of gender gap in students' achievement in arts subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020.

Research Questions

The following research questions guided the study

1. What is the gender gap in students' achievement in Science-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?
2. What is the gender gap in students' achievement in Arts-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?
3. What is the disparity index of gender gap in students' achievement in Science subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?
4. What is the disparity index of gender gap in students' achievement in Arts subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?

Methodology

The design of this study was a descriptive survey research design. Descriptive survey design is a scientific method that involves observing and describing the behaviour of a subject without the manipulation of any variable in the investigation. According to Nworgu (2015), descriptive survey is a type of design that systematically and accurately describes populations, situations, events, phenomenon without influencing any variable, but only observes and measures them objectively. The choice of this design is because the data collected were secondary type, and using this design helped the researcher to use statistical tools like percentages and chi-square for analysis. The study was carried out in all the public secondary schools in South East zone of Nigeria. South East Zone is one of the Six Geo-Political Zones in Nigeria. South East is geographically bordered to Cameroon to the East and Atlantic Ocean to the South, Benue and Kogi States to the North and Delta State to the Western Axis at Latitude 9.082⁰E and Longitude 8.6753⁰N of the Nigerian map. The Zone is made up of the following States: Abia, Anambra, Ebonyi, Enugu and Imo respectively. The area is made up of many public secondary schools in both rural and urban area. The choice of South East Zone of Nigeria in this study is because there has been a perceived low achievement of students which could be attributed to the different cultural role orientations of students towards Science-inclined or Arts-inclined subjects which could vary based on gender differences. Hence, the present study was designed to analyse the gender gap in teacher supply and students' achievement in science and arts subjects in public secondary schools in South East Nigeria. The population for the study comprised one thousand three hundred and ten (1310) public senior secondary schools in twenty one (21) Education Zones in South East States of Nigeria. All the schools were used;

hence, there was no sampling. Secondary data were used in the study. The data on the Gender dimensions in students' achievement in Secondary Schools were collected directly from the Post-Primary Management Board (PPMB) and Secondary Education Board of each of the States under investigation. The data collected covered the gender dimensions in students' achievement in Arts and Science subjects from 2011 to 2020 in each State of South East Zone. There was no reliability since the data were secondary data. Frequency distribution and percentage were used to analyse the secondary data while the Chi-Square was used to test the null hypotheses with the aid of Statistical Package for Social Sciences (SPSS) at 0.05 level of significance

Results

Research Question 1: What is the gender gap in students' achievement in Science-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?

Table 1: Percentage Differences of Students' Achievement in Science-Inclined Subjects in Secondary Schools in South East Zone of Nigeria by Gender

Sub	Students' Achievement in Science Subjects in Secondary schools in 2011-2020																			
	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Ch	55.	44.	61.	38.	51.	48.	60.	39.	55.	44.	50.	49.	59.	40.	51.	48.	56.	34.	52.	47.
	3	7	2	8	3	7	3	7	3	7	6	4	1	9	2	8	0	0	3	7
AH	59.	48.	52.	48.	52.	47.	53.	46.	56.	43.	51.	48.	55.	44.	49.	50.	59.	41.	55.	44.
	9	1	0	0	7	3	8	2	8	2	8	2	6	4	8	2	0	0	7	3
Bio	44.	55.	65.	34.	49.	50.	44.	55.	46.	53.	55.	54.	58.	41.	60.	39.	68.	31.	58.	41.
	2	8	1	9	8	2	4	6	7	3	0	0	3	7	3	7	7	3	5	5
Phy	58.	41.	48.	51.	60.	39.	61.	38.	48.	51.	54.	45.	51.	48.	51.	48.	57.	42.	49.	50.
	1	9	2	8	2	8	2	8	8	2	3	7	8	2	4	6	5	5	6	4
Geo	48.	51.	59.	40.	38.	61.	51.	48.	54.	45.	54.	45.	53.	46.	59.	40.	55.	44.	59.	40.
	3	7	3	7	3	7	7	3	4	6	8	2	4	6	2	8	2	8	2	8
Ag	50.	49.	56.	33.	50.	49.	65.	35.	55.	44.	51.	48.	54.	45.	58.	41.	59.	41.	54.	45.
	4	6	4	6	6	4	0	0	1	9	2	8	5	5	3	7	8	2	9	1
Com	50.	49.	55.	44.	50.	49.	55.	44.	56.	43.	59.	40.	51.	48.	61.	38.	56.	43.	55.	44.
	1	9	3	7	2	8	4	6	9	1	6	4	3	7	2	8	1	9	1	9
CT	318	341	397	292	353	343	391	308	374	326	377	331	384	316	391	308	412	278	385	314
%	.2	.7	.5	.5	.1	.9	.8	.2	.0	.0	.3	.7	.0	.0	.4	.6	.3	.7	.3	.7
Diff.	23.5%		105.0%		6.2%		88.6%		48.0%		45.6%		68.0%		82.8%		133.6%		70.6%	

Key: M= Male Students; F= Female Students; the differences are calculated by subtracting the total percentages of male students from female students.

N/B: Sub= Subjects; Ch= Chemistry, AH= Animal Husbandry, Bio= Biology, Phy= Physics, Geo= Geography, Ag= Agricultural Science, Com= Computers, Ttl= Total while GG = Gender Gap

The analysis of data presented in Table 1 show the gender gap in students' achievement in Science-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020. The cumulative percentage achievement of male and female teachers in subjects (Chemistry, Animal Husbandry, Biology, Physics, Agricultural Science and Computer) from 2011-2020 were 318.2% and 341.7%, 397.5% and 292.5%, 353.1% and 343.9%, 391.8% and 308.2%, 374.0% and 326.0%, 377.3% and 331.7%, 384.0% and 316.0%, 391.4% and 308.6%, 412.3% and 278.7%, 385.3% and 314.7% respectively. It also showed a percentage gender gap in students' achievement in science subjects in favour of male students from 2011-2020 ranging from 23.5%, 105.0%, 6.2%, 88.6%, 48.0%, 45.6%, 68.0%, 82.8%, 133.6% and 70.6% respectively. The data in the table further show that the percentage gap in students' achievement in Science Subjects mostly increased in 2012, 2014, 2017, 2018, 2019 and 2020 in secondary schools surveyed in South East Nigeria, although, the gap in achievement was low in 2013. Therefore, male students achieved higher than female students in science subjects in secondary schools in South East Nigeria.

Research Question 2: What is the gender gap in students' achievement in Science-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?

Table 2: Percentage Gap in Students' achievement Arts-inclined subjects in secondary schools in South East Zone of Nigeria by gender

Sub	Students' Achievement in Arts Subjects in Secondary schools in 2011-2020																			
	2011		2012		2013		2014		2015		2016		2017		2018		2019		2020	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Hist	44.	55.	44.	56.	44.	55.	44.	55.	45.	54.	55.	44.	46.	54.	44.	55.	53.	47.	48.	51.
	7	3	0	0	9	1	9	1	7	3	7	3	0	0	4	6	0	0	4	6

Gov	40.	59.	38.	61.	40.	59.	40.	59.	45.	54.	58.	41.	44.	55.	48.	51.	49.	50.	47.	53.
	9	1	3	7	1	9	1	9	2	8	5	5	1	9	9	1	2	8	0	0
CR	53.	46.	52.	47.	52.	47.	52.	47.	44.	56.	49.	50.	45.	54.	47.	52.	48.	51.	49.	50.
S	3	7	6	4	5	5	5	5	0	0	6	4	3	7	8	2	3	7	2	8
L.E	40.	60.	40.	59.	41.	58.	41.	58.	41.	59.	42.	57.	44.	55.	46.	53.	48.	51.	43.	56.
	0	0	9	1	6	4	1	4	0	0	2	8	6	4	2	8	8	2	7	3
CE	44.	55.	44.	55.	45.	54.	45.	54.	51.	48.	54.	45.	48.	51.	45.	54.	46.	53.	48.	51.
	6	4	3	7	4	6	4	6	3	7	9	1	9	1	3	7	8	2	9	1
Mk	44.	55.	43.	56.	53.	46.	50.	49.	42.	57.	35.	65.	47.	55.	48.	51.	53.	46.	50.	49.
	1	9	2	8	4	6	6	4	5	5	0	0	0	0	1	9	8	2	1	9
Eco	40.	59.	48.	51.	49.	50.	51.	48.	44.	55.	58.	41.	47.	52.	55.	45.	47.	52.	49.	50.
	7	3	8	2	9	1	8	2	8	2	4	6	2	8	0	0	5	5	6	4
C.T	30	39	31	38	32	37	37	42	31	38	35	34	32	37	33	36	34	35	33	36
	8.3	1.7	2.1	7.9	7.8	3.2	1.9	8.1	4.5	5.5	4.3	5.7	3.1	8.9	5.7	4.3	7.4	2.6	6.9	3.1
%																				
Diff																				
.	88.4%	75.8%	44.4%	56.2%	71.0%						8.6%				28.6%	5.2%				26.2%

Key: M= Male Students; F= Female Students. The percentage Gap in students' achievement in Arts Subjects is calculated by subtracting the total number of male from female students.

N/B: Sub= Subjects; Hist= History, Gov= Government, CRS= Christian Religious Knowledge, L.E= Literature in English, CE= Civic Education, Mk= Marketing, ECO= Economics, Ttl= Total while GG = Gender Gap

The analysis of data presented in Table 2 show the gender gap in students' achievement in Arts-inclined subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020. The cumulative percentage achievement of male and female teachers in Arts subjects (History, Government, Christian Religious Studies, Literature in English, Civic Education, Marketing and Economics) from 2011-2020 were 308.3% and 391.1%, 312.2% and 387.9%, 327.8% and 373.2%, 371.9% and 428.1%, 314.5% and 385.5%, 354.3% and 345.7%, 323.1% and 378.9%, 335.7% and 364.3%, 347.4% and 352.6%, 336.9% and 363.1% respectively. It also shows a percentage gender gap in students' achievement in arts subjects in favour of female students from 2011-2020 ranging from 88.4%, 88.8%, 44.4%, 56.2%, 71.0%, 8.6%, 55.8%, 28.6%, 5.2% and 26.2% respectively. The data in the table further show that the percentage gap in students' achievement in Arts Subjects mostly increased in 2011, 2012, 2013, 2014, 2015, 2016, 2017 and 2020 in secondary schools surveyed in South East Nigeria, although, the gap in achievement was low in 2016 and 2019. Therefore, female students achieved higher than male students in Arts subjects in secondary schools in South East Nigeria.

Research Question 3: What is the disparity index of gender gap in students' achievement in Science subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?

Table 3: Disparity Index of Male and Female Students' Achievement in Science Subjects in Secondary Schools in South East Zone of Nigeria from 2011 to 2020

Years Surveyed	Cumulative % of Students' Achievement in Science Subjects		Disparity Index
	Males	Female	
2011	318.3%	341.7%	0.93
2012	397.5%	292.5%	1.36
2013	353.1%	343.9%	1.03
2014	391.8%	308.2%	1.27
2015	374.0%	326.0%	1.15
2016	377.3%	331.7%	1.14
2017	384.0%	316.0%	1.22
2018	391.4%	308.6%	1.27
2019	412.3%	278.7%	1.48
2020	385.3%	314.7%	1.22
Grand Total	3469.882%	3162.0	1.10

(The index is calculated by the No. of males divided by the No. of females, UNESCO Standard)

The data in Table 4 show the gender disparity index in the achievement of male and female students in Science-inclined subjects in secondary schools in South East Nigeria. The data showed the disparity index between 0.93-1.48 for science subjects. The grand index of the data presented in the table was 1.10 which indicates higher disparity in favour of male teachers. The data in table 4 equally show that the disparity index was higher in the year 2012 and 2019 in favour of male students. The grand index of 1.10 indicates that there is high disparity index of achievement of female students in Science subjects in secondary schools in South East Nigeria. This difference was also exemplified in the graph in Figure 4.

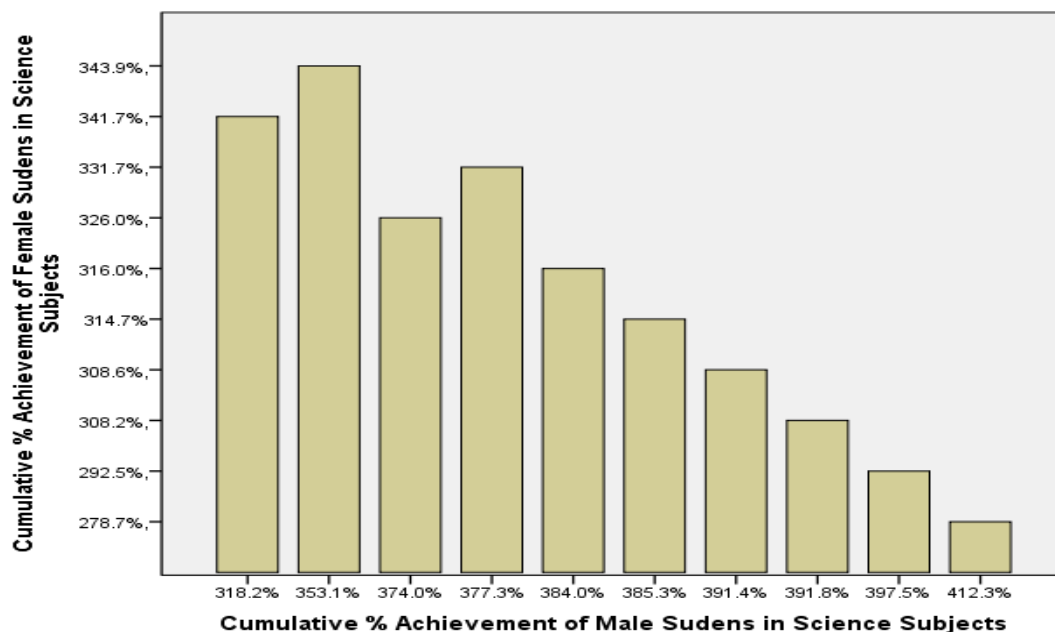


Figure 1: Students' achievement in science subjects

Data in Figure 4 show that male students had higher achievement index than female students in science subjects in secondary schools in South East Nigeria. The different sizes and shapes of bars show the years with the highest and lowest supply achievement rates of students in science subjects which vary in years. It indicates that while female students achieved 278.7%, male students achieved 412.3% cumulatively.

Research Question 4: What is the disparity index of gender gap in students' achievement in Arts subjects in secondary schools in South East Zone of Nigeria from 2011 to 2020?

Table 4: Disparity Index of Male and Female Students' Achievement in Arts Subjects in Secondary Schools in South East Zone of Nigeria from 2011 to 2020

Years Surveyed	Cumulative % of Students' Achievement in Arts Subjects		Disparity Index
	Males	Female	
2011	350.7%	449.3%	0.78
2012	357.2%	442.8%	0.81
2013	373.1%	426.9%	0.87
2014	371.9%	428.1%	0.87
2015	365.7%	435.3%	0.84
2016	403.4%	396.6%	1.02
2017	375.2%	426.8%	0.88
2018	386.9%	412.1%	0.94
2019	399.4%	400.6%	0.99
2020	383.1%	416.9%	0.92
Grand Total	3766.6	4235.4	0.89

The index is calculated by the No. of males divided by the No. of females, UNESCO Standard

The data in Table 4 show the gender disparity index in the achievement of male and female students in Arts-inclined subjects in secondary schools in South East Nigeria. The data showed the disparity index between 0.78-1.02 for Arts subjects. The grand index of the data presented in the table was 0.89 which indicates higher disparity in favour of female teachers. The data in table 8 equally show that the disparity index was higher in favour of male students in 2016. The grand index of 0.89 indicates that there is high disparity index of achievement of male students in Arts subjects in secondary schools in South East Nigeria. This difference was also exemplified in the graph in Figure 5:

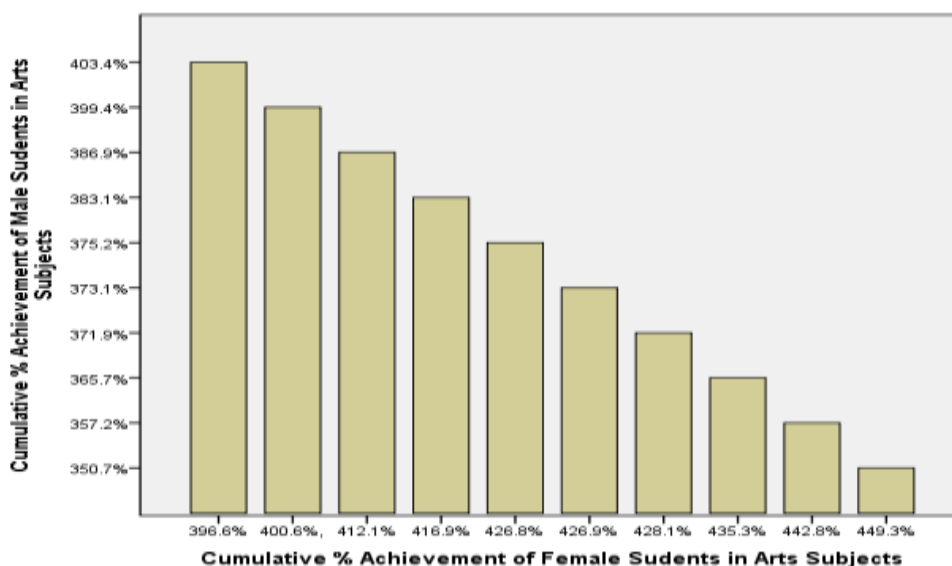


Figure 2: Students' Achievement in Arts Subjects

Data in Figure 5 show that female students had higher achievement index than male students in Arts subjects in secondary schools in South East Nigeria. The different sizes and shapes of bars showed the years with the highest and lowest supply achievement rate of students in science subjects which vary in years. It shows that male students while male students achieved 350.7%, female achieved 449.3% cumulatively.

Discussion of Findings

The finding of the study revealed that male students achieved higher than female students in science subjects in secondary schools in South East Nigeria. The analysis showed a gender gap in all the science subjects, although female students performed well in some areas. The finding is similar to Oludipe (2012) study on gender difference in Nigerian junior secondary students' academic achievement in basic science. The finding is also in consonance with the findings of Eseine-Aloja (2021), Charles, Paul and Jennifer (2021), Eze and Nnennaya (2013) that gender gap exist between male and female in the science classroom and achievement potentials. This finding creates awareness that gender gap in science and technology can be narrowed down by mainstreaming gender in science and technology classrooms, but they do not apply them in their lessons. However, the finding is slightly, different from the findings of Ogundola, Agboola and Ogunmilade (2020); Adigun, Onihunwa, Irunokhai, Sada and Adesina (2015) who submitted that even though the male students had slightly better performance compared to the female students, it was not significant in science subjects. This relationship in achievement might be attributed to the teaching methods adopted by teachers, which support gender differences in the science classroom. In addition, John and Benjamin (2015) submitted that male and female students, taught Algebra using PBL did not significantly differ in achievement and retention scores, thereby revealing that male and female students are capable of competing and collaborating in mathematics. In addition, this finding show that performance is a function of orientation and the nature of school attended and not gender. The finding of this study therefore suggests that in order to encourage more females into pure sciences, and science-oriented courses, interventions need to be designed that focus not only on the academic achievement of girls, but also on how to make science related occupations more interesting for low and high achieving girls. Enyi and Ijeoma had earlier suggested that one of such interventions should involve engagement of qualified teachers, who are knowledgeable in gender issues, in curriculum delivery in schools.

Another finding of the study revealed that female students achieved higher than male students in science subjects in secondary schools in South East Nigeria. The analysis showed a gender gap in all the science subjects, although female students performed well in some areas. This finding was in agreement with the findings of Usman (2015); Nnamani and Oyibe (2016) whose findings clearly submitted that female students performed better than the male ones and the results of the two genders in English language were generally poor. It was therefore, concluded that the mixed-gender streaming was less effective in enhancing better academic performance. However, this finding was not supported by the findings of Mwiigi (2014) whose study submitted that male students performed much better as compared to their female counterparts in arts subjects in secondary schools.

However, Attah and Ita (2017) submitted that gender has no significant influence on academic performance in English Language among senior secondary school students but quality teaching and conducive learning environment contribute to either low and high academic achievements of students in science or arts subjects. In addition, Amedu (2015) attributed this to difference in achievement to the school environment and programmes, and opined that prior to attending school, general intelligence of girls was higher than that of boys but the position gradually reversed with the findings. The apparent reversal, according to Enyi and Ijeoma (2010) is related to the traditional and gender stereotyping in the Nigerian society, which promotes gender discrimination against females with no intellectual justification. UNESCO Report (2018) observed that in most societies, gender has roles based on the women, preventing their participation in, and benefiting from development efforts This has created bigger psychological alienation or depression in the minds of female students (Joel and Aride, 2006). This has resulted in males dominating, Chemistry, Physics, Geography and Biology studies classes while the girls

go into reading languages and Arts. Nevertheless, it is critical to balance the achievement of male and female students in secondary schools as this might have potential effect on students' future careers and aspiration of young ones in Nigeria.

The finding of the study on disparity index, revealed that there was high disparity index of achievement of male students in Arts subjects in secondary schools in South East Nigeria. The index of students achievement varies in accordance with the years surveyed (2011-2020). This index is an indication that there is unfavourable atmosphere of learning which support male and female students for high propensity of achievement index. This finding was supported by the finding of Abdu-Raheem (2012) which submitted that there was a significant difference between the performance of male and female students in Science subjects, especially Mathematics, in favour of male students; and that there was high disparity index in Mathematics achievement in secondary schools with the index higher for female students. Similarly, gender disparity index exists in science achievement with high index for female students which indicates that female students had low achievement in sciences. The obvious implication of these findings is that male students would keep on dominating in science related discipline, vocation or careers in Nigeria if not balanced. However, balancing the gender, index of male and female students in sciences could be achieved by ensuring equal opportunities for learning for both genders, and using methods of teaching that encourage students to be learning science subjects irrespective of their gender roles or abilities.

The last findings of the study revealed that there was high disparity index of achievement of male students in Arts subjects in secondary schools in South East Nigeria. This finding was supported by the early findings of Wesley (1997) who substantially submitted that the rate of academic achievement, participation, and choice of syllabus were gender-oriented. Boys in comparison with girls were found to be less likely to take arts subjects, to choose less academically oriented syllabuses and to be out-performed academically in Arts when measured by index. Achievement, which is a measure of the knowledge and skills acquired by students, is necessary for basic Arts education. The most common indicator of success is a student's achievement in academic areas as measured by achievement tests (Cunningham, 2012). Therefore, for quality arts education to be obtained in secondary schools, both male and female students must close the gap of disparity index in Nigeria. The obvious implication of the finding of this study is that female students would continue to dominate in arts subjects in secondary school and this situation could have potential effect on Arts learning in teacher education programmes in Nigeria.

Educational Implications of the Findings

The findings of this study have obvious implications for students, teachers, educational administrators, parents and government at all levels. One of the findings showed that male students achieved higher than female students in science subjects in secondary schools in South East Nigeria. The implication of this finding is that male students would continue to dominate in science related discipline in tertiary institutions in Nigeria and this invariably would affect the contribution of women in the scientific revolution in Nigeria. Another finding showed that female students achieved higher than male students in Arts subjects in secondary schools in South East Nigeria. The implication of this finding is that female students will continue to dominate in arts related discipline in tertiary institutions in Nigeria and this would mar the attainment of the egalitarian society which is envisaged in Nigeria.

In addition, another finding of the study revealed that there was a high disparity index in male and female students' achievement in Science subjects and the same to male students in Arts subjects in secondary schools in South East Nigeria. The implication for curriculum planners is that the needs of the society would not be attained through the programmes of secondary education. This would also affect the attainment of equity and equality in job selection in Nigerian labour markets.

Conclusion

The study revealed that there is gender disparity in students' achievement in secondary schools in South East Nigeria. This study concluded that to achieve the Sustainable Development Goals-4 (SDGs.4) on education for the 21st century in Nigeria which explicitly demands elimination of all forms of gender stereotyping in education, the secondary school administrators must seriously consider the implementation of gender-friendly and supportive learning environment that could encourage equal participation in teaching and learning activities in school subjects (Science or Arts), although gender disparity in the society is inevitable.

Recommendations

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

1. Teachers should utilize activity-based teaching methods in teaching science subjects to make them interesting to all students irrespective of gender differences in order to promote high achievement and close the persistent gender gap in science subjects.
2. Teachers should utilize socially-based teaching models in teaching Arts subjects to make them interesting to all male students irrespective of gender differences order to promote high achievement of males in Arts Subjects and close the persistent gender gap in schools.
3. Science teachers should adopt methods of teaching involving cooperative learning, cognitive apprenticeship, field works, etc that are favourable to both male and female students in science instructions in order to reduce high gender disparity index in the achievement of students in Science subjects in secondary schools in South East Nigeria.

4. Equal educational opportunities related to finance, instructional materials, words of encouragements and moral supports should be given to all students, to reduce the high disparity index of achievement of students in Arts subjects in secondary schools in South East Nigeria.

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