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Effect of Gender and Location on Students' Achievement in Chemistry in Secondary Schools in Nsukka Local Government Area of Enugu State, Nigeria

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Abstract
The study investigated the effect of gender and location on students' achievement in chemistry in Nsukka Local Government Area of Enugu State, Nigeria. It was guided by three research questions and three hypotheses. The sample of the study was made up of 827 students comprising 473 males and 354 females. Eight secondary schools were sampled using simple random sampling techniques. A proforma was the instrument which enable the researchers to copy results from the school past records in the respective schools through the help of the school principals was used to collect data for the study. Means and standard deviations were used to answer the research questions and t-test statistics were used to analyze the hypotheses. The findings showed that male students achieved significantly better than the female students in both urban and rural schools. Also there was no significant difference in the academic achievement of student in urban and rural schools. It was recommended among others that adequate incentives from federal Government, parents and stake holders of education should be provided to female students to encourage them to achieve better.
Keywords: Gender, Location, Achievement, Chemistry, Science and technology, Sex, West African Senior Secondary School Certification Examination.

1.0 Introduction

Science has a major role in this modern era of technology worldwide. Acquisition of appropriate scientific and technological skills is necessary to cope with the challenges presented by the evolving needs of modern work place in the industries. Olagunju, Aesoji, Iroegbu and Ige (2003) stated that there is a great importance of scientific knowledge in boosting national income and international rating of the country. In Nigeria, science is so important that a lot of emphasis has been laid on its teaching and learning with the major aim of science education as contained in the National Policy on Education (NPE 2008).

It is against this background that science education has been accorded a prime position worldwide. Within the context of science education, chemistry has been identified as a very important science subject and its importance in scientific and technological development of any nation has been widely reported (Usman 2007). Contributing to the importance of chemistry, Israel (2005) stated that it was a result of the recognition given to chemistry in the development of the individual and nation that it was made a core-subject among the natural science and other science related courses in Nigerian educational system. It has been a pre-requisite subject for most science oriented courses in tertiary institution and this call for the need in teaching it very effectively.

Despite the prime position chemistry occupy in Nigerian educational system and efforts made by teachers and researchers to enhance achievement, students' still do poorly in chemistry. This agrees with Kola (2012) who finds that students' achievement and enrolment in theory and practical chemistry in Kwara State from 2005 to 2009 had been very low.

Ezeano (2002) reported that the poor achievement in chemistry in external examinations in caused by lack of laboratory materials which resulted to inadequate practical before the examination. Kissau (2006) and Bosede (2010) assert that gender of the student and location of school influence student academic achievement in some subject areas.

Okeke (2008) gave a broad analytical concept which draws out women's role and responsibilities in relation to those of men. According to Okeke, sex refers to those characteristics of males or females which are biologically determined such as possession of penis by males and vagina by females. To Okeke, gender refers to the socially culturally constructed characteristics and roles which are ascribed to males and females in any society. Gender is a major factor that influences career choice and subject interest of students. Okeke (2008) described the males attributes as bold, aggressive, tactful, economical use of words while the females are fearful, timid, gentle, dull, submissive and talkative. May be that is the reason Umoh (2003) started that more difficult works are usually reserved for males while the females are considered feminine in a natural setting. Thus in schools, males are more likely to take to difficult subject areas like science (chemistry) while the females take to career that will not conflict with marriage chances, marriage responsibilities and motherhood (Okeke 2008). This created fewer job areas available for women, which might be of low status and low income.

Gender role differentiations are also encouraged in pictorial illustrations in textbooks which usually portray males as doctors, lawyers, engineers, professors while the females are seen as nurses, cooks, mothers etc. this creates mental picture in the mind of the readers of the role expectation from the society (Umo, 2003, Babayide 2010). Teachers also encourage gender stereotype by giving different treatment to males and females in class. Teachers got further to give different career guidance to males and females. Homes are not let out as responsibilities are assigned differently to males and females; the society frown at seeing a male cooking or a female climbing a tree. The males are also assigned leadership positions and the females are to assist or to follow. Nigeria since she gained her independent had never produced a female president or governor.

The feminist theory was propounded by Charles Fourier in 1894. The word feminism was gotten from the latin word which means "femina" which means women. It arose as a result of the need for women education. Feminism was attempts to bring women into science education by removing sex based factors. The first feminist movement was held in New York in 1848. There, they raised the issue that all men and women are created equal. This movement led to women liberation. Feminist held it that by changing the science curriculum and how science is taught can lead to significant change in women participation in sciences. In 1960's, there was a great move to tackle the issue of low participation of women in science particularly in the upper levels of education. Series of conferences and workshops had been held on women liberation such as the Belgiun conference. The question now is, are boys still achieving better than girls in chemistry? This paper is set to answer this question.

With the World Declaration on Education for All (EFA) (UNESCO, 1990:4), it is expected that the learning experiences offered to the children in schools should not discriminate against males and females. There is the need to see that both boys and girls are given equal access to education especially in sciences (chemistry). Chemistry has been assigned as masculine subject and very difficult (Ekpo 2006). This is reflected on the analysis made by Onaen and Obiora 2001 in the enrolment and achievement of boys and girls in chemistry WAEC examination between 1994-1998 in Anambra state, it showed that out of 4,163 girls and boys that registered within the period, only 1,352 girls registered and only 9.30% of the girls had credit and above. Yet Udousoro (2003), stated that there is no significant difference in the academic achievement of male and female students in chemistry. But Jegede (2007) found that the female students show higher anxiety towards the learning of chemistry in secondary schools than male students. In another study, Okereke and Onwukwe (2011) showed that the male students achieved better than the female students. These show that the issue of gender in chemistry achievement is not yet been resolved. Hence the need for further study is required. Ejeabukwu (2002) observed that girls and women from Northern Nigeria and rural communities are affected by this poor achievement. The researcher attributed this to parents from rural communities who send their daughters into domestic labour as a source of income. It may be the reason why Bosede (2010) stated that sex and location of school influences students' academic achievement in some areas.

Location of schools could also be a factor that affects chemistry achievement. Ezeudu (2003) stated that schools location means urban and rural schools. Location is a particular place in relation to other areas (Quirk, 2003) Akpan (2008) indicated that schools in urban areas have electricity, water supply, more teachers more learning facilities and infrastructure. To support this Ezike (2001) stated that urban areas are those with high population density, high variety and beauty while rural areas are those with low population, subsistence mode of life, monotonous and burden.

Onah (2011), and Owoeye (2002) indicated that schools in the urban areas achieved more than schools in the rural areas in science subjects. Specifically Owoeye and Yara (2011) showed in their studies that schools in urban locations had better academic achievement than their rural counterpart in chemistry. Yet Ezeudu (2003), Bosede (2010) showed that location has no effect on students' academic achievement. These contradictory findings generated to the present study to see the effect of gender and location on students' achievement in secondary school chemistry in Nsukka local Government Area of Enugu State, Nigeria.

1.1 Research Questions

The following research questions guided the study:

1. To what extent does mean gain in chemistry in West African Senior Secondary School Certificate Examination (WASSSCE) scores of male and female students in chemistry differ.
2. To what extent does mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores of students in chemistry in urban and rural schools differ?
3. To what extent does mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores in chemistry of students from urban and rural schools differ given by their gender?

Hypotheses

The following null hypotheses guided the study and were tested at 0.05 level of significance.

HO_1: There is no significant difference in the mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores of male and female students in chemistry.

HO_2: There is no significant difference in mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores in chemistry of students from urban and rural schools.
HO_3: There is no significant difference in mean achievement scores of chemistry students in urban and rural schools given by their gender.

2.0 Design of the study

The research design used for this study was ex-post factor. This is because all the research variables (data) had already existed before the commencement of the study. The research neither controlled nor manipulated the research variables. Data were collected and used as they occurred naturally.

2.1 Area of the study

The area of the study is Nsukka Local Government Area in Enugu State, Nigeria. The area has thirty eight (380) secondary schools, in which chemistry is taught as a subject. Out of these 38 schools only public schools were chosen. Co-educational schools were used for the study and so seventeen (17) schools which are co-educational and which offer chemistry as a subject were used for the study.

2.2 Population of the Study

The population of the study comprised of 3,305 students who took chemistry examination in West African Senior Secondary School Certification Examination, between 2008/2009 to 2011-2012 academic sessions. This forms the number of students in the 17 schools chosen.

2.3 Sample and sampling technique

The sample consisted of 827 students. Eight schools were randomly selected using simple random sampling technique. Four schools from rural and four schools from urban made up the eight schools. From the four schools simple random sampling technique was used to pick the 827 students.

2.4 Instrument for Data Collection

The instrument for data collection was a proforma that enabled the researchers to copy the data from the students' past examination records in their respective schools through the help of the school principals.

2.5 Method of Data Collection

The grade point of students in chemistry in WASSSCE from 2008/2009 to 2011/2012 academic sessions constituted the data.

2.6 Method of Data Analysis

All the data collected were analyzed using mean and standard deviation to answer the research questions. T-test statistical analysis used analyzed the hypotheses.

Research Question 1: To what extent does the mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores of male and female students in Nsukka Local Governemnt Area differ in chemistry?

HO_1: There is no significant difference in the mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) score of male and female students in chemistry.

Table 1: mean percentage achievement scores of male and female students in WAEC in chemistry.

	COMMUNITY ISIEUN	G.T.C.	COMMUNITY UMABO	COMMUNITY AJOR UNO SEC	COMMUNITY OKPUJE	COMMUNITY OBIMO SEC	EZE BUNAGU	OPI AGU	TOTAL	MEAN	S.D	T CAL	T CRITICAL
Boys	81	72	78	76	62	61	68	67	565	70.63	7.37	3.02	1.76
Girls	46	45	45	49	34	36	31	55	337	42.13	6.31		

Table 1 above shows that male chemistry students achieved better than their female counterparts, 70.63 mean percentage against 42.13 mean percentage. The t-calculated (t-cal) is 3.02 which is greater than the t-critical which is 1.76, Ho is rejected. This shows that there is a significant difference in mean achievement scores of students in West African Senior Secondary School Certificate Examination (WASSSCE) in favour of the male students.

Research Questions 2: To what extent does the mean gain in west African Senior Secondary School Certificate Examination (WASSSCE) scores of students in urban area and those in rural area of Nsukka L.G.A. differ?

HO_2 : There is no significant difference in the mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores in chemistry of the students from urban and rural schools in Nsukka L.G.A.

Table 2: Mean percentage achievement scores in chemistry in urban and rural area.

	Boys	Boys	Biys	Boys	Girls	Girls	Girls	Girls	Total	Mean	S.d	Tcal	Tcritical
Urban	81	72	78	76	46	45	45	49	447	55.88	17.59	0.19	1.76
Rural	62	61	68	67	34	36	31	55	415	51.75	15.55		

Table 2 above shows that the mean score of urban differs a little from that of the rural. That is the mean scores for urban is 55.88 and that of rural is 51.75. Thus there is no significant difference between the achievement scores in urban and rural area. This is because the t-cal (0.19) is less than t-critical (1.76). So Ho is accepted.

Research Question 3: To what extent does the mean gain in West African Senior Secondary School Certificate Examination (WASSSCE) scores in chemistry from urban and rural schools in Nsukka L.G.A differ given their gender?

HO_3: There is no significant difference in mean achievement scores of chemistry students in urban and rural schools given by their gender.

Table 3 a: Mean achievement scores of boys and girls in chemistry in urban schools.

	ISIENU	GTC	UMABO	ALOR UNO	TOTAL	MEAN	S.D	Tcritical	Tcal
Boys	81	72	78	76	307	76.76	3.27	1.86	7.80
Girls	46	45	45	49	185	46.64	1.64		

Table 3 above shows that the mean achievement scores of boys in urban schools with mean 76.75, S.D of 3.27 is more than that of girls in the same urban schools with mean of 46.64, S.D of 3.27. Also t-calculated (t-cal) is greater (7.80) than t critical (1.86). Thus there is a significant difference in the mean achievement scores in chemistry of boys in urban schools than girls.

Table 4: Mean achievement scores of boys and girls in chemistry in rural area.

Sex	OKPUJE	OBIMO	EZEBUNAGU	OPI AGU	TOTAL	MEAN	S.D	tcal	tcritical
Boys	62	61	68	67	258	64.50	3.04	2.42	1.86
Girls	34	36	31	55	156	39.00	9.41		

Table 4 shows that the mean achievement scores of boys in rural area with mean 64.50 and S.D 3.04 is greater than that of girls with mean 39.00 and S.D 9.41. Also t-calculated (t-cal) is greater (2.42) than t-critical (1.86) and thus the Ho is rejected. This implies that there is a significant difference in the achievement of boys and girls from the rural schools in favour of the males.

3.0 Discussion of the Results

As shown in table 1, there was a significant difference in the academic achievement of male and female students in West African Senior Secondary School Certificate Examination (WASSSCE) results in chemistry. The male students had higher mean scores than the female students. This is in line with the work of Okereke and Onwukwe (2011), Achor, Kurumeh and Orokpo (2005) and Ukozor (2011). However, it contradicts the findings of Jegede (2007) and Nbina and Wagbara (2012) who found the females achieving better than the males.

Table 2 showed that there is no significant difference in the mean scores of students in rural and urban secondary schools in chemistry as measured by their WASSSCE results. This means that geographical location of schools has no influence on the academic achievement of students. This finding agreed with that of Ezeudu

(2003) Kissau (2006), Bosede (2010) and Ugwuanyi (2012). This finding contradicts the works of Onah (2011) and Owoeye and Yara (2011) who reported that students in urban schools achieved significantly better than students in rural schools.

Table 3 and 4 indicated that no matter the location of school, male students achieved better than the female students. This report is in line with Agboghoroma (2009) and Igboegwu (2005), but contradicts that of Yusuf and Adigun (2010) who observed that there was no significant effects of gender in the academic achievement mean scores of urban and rural students.

3.1 Conclusion

The findings revealed that there was a statistically significant difference between the mean scores of male and female students in WASSSCE in Nsukka Local Government of Enugu State, Nigeria. This means that male students in Nsukka Local Governemnt Area of Enugu State, Nigeria scored higher than the female students in WASSSCE between 2008/2009-2011/2012 academic sessions. The study also showed that students in urban schools are not better than those in the rural schools. Factors such as role stereotyping, masculine images of science, female socialization process etc may be responsible for the females achieving less than the males. This has implications on parents, teachers, and the general public to encourage our females and to remove obstacles preventing females from being serious in their studies.

3.2 Recommendations

The following recommendations based on the findings of this work were made:

1. Adequate incentives from the Federal Government, parents and stake holders in Education should be provided to female students to encourage than to do better.
2. Parents should provide learning opportunities to their girls and should not discourage the girls from studying chemistry.
3. Parents should send their children to rural schools as well as urban schools as location had no effect on students' achievement in chemistry.
4. Chemistry teachers should direct more attention to female students to make them improve on their academic achievement.
5. Educational planners, administrators and evaluators should supervise, monitor and co-ordinate the activities of schools to discourage gender stereotype activities like textbooks.

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