SCHOOL LOCATION AND GENDER DIFFERENTIAL ON CHEMISTRY ACHIEVEMENT AMONG SENIOR SECONDARY SCHOOLS STUDENTS IN FEDERAL CAPITAL TERRITORY ABUJA

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Abstract
The study investigated school location and gender differential on Chemistry achievement among senior secondary students in the Federal Capital Territory (FCT) Abuja. The sample of the study composed 400 students, 275 males and 143 females selected from eight public senior secondary schools in urban, semi-urban, rural and semi-rural locations in FCT Abuja. Four research questions and four null hypotheses guided the study. The design adopted for this research was ex-post facto design. The data was analyzed using mean and standard deviation and the hypothesis were tested using ANOVA. The findings indicated that gender has no influence on students' achievement in Chemistry in the same location, but school location is a determinant on students' achievement in Chemistry.

Keywords: School location, gender differential, students' achievement

Introduction

Chemistry is one of the core science subject offered by both male and female students in the senior secondary schools in Federal Capital Territory (FCT) Abuja. It is a branch of physical science that is concerned with the composition of matter, the investigation of their properties and reactions to give useful products (Bagley, 2017). However, it is basically categorized into five main branches namely; analytical, physical, organic, inorganic chemistry and biochemistry.

Despite being rated as a cornerstone of modern science and technology, its role in economic and national development cannot be forgotten in Nigeria and in the public senior secondary schools in the Federal Capital Territory. It is a prerequisite to many scientific fields of studies in Nigeria such as agriculture, industrial chemistry, medicine, environmental sciences and chemical engineering. Any student who wishes to take up a career in any of these fields must have interest and record high level of achievement in chemistry right from secondary school. In the field of agriculture, it helps in the production of insecticides, pesticides and fertilizer. In the industry the knowledge of chemistry is applicable in the production of dye for cloths, lubricants, paints, soap and plastics. In the field of medicine, it enables researchers to produce drugs that interact effectively with the body to combat illness as stated by National Institute of General Medical Sciences. Furthermore environmental chemistry enables chemists to combat the problems of pollution and global warming which are created by the same chemistry. Chemistry generally helps us to understand the word around us (Anne, 2018).

School is one of the social institutions in Nigeria that is responsible for the training and development of skills and minds of students so as to be self reliant in the society. It also helps in the preparation of the students to face various challenges and responsibilities in the society. In both developed and developing Nations, the importance of Senior Secondary Schools' Education has been emphasized as a tool to liberate the minds of students for prosperity of a Nation (Kamal & Joel, 2014). It is the intermediary school level between the primary and the tertiary institution in Nigeria. It is as a result of this fact that the Federal Capital Territory Administration established 62 senior secondary schools in both quality and accessibility at

different locations; urban 31, semi-urban 14 rural 13 and semi-rural 4.Urban and semi-urban locations are cities and towns while rural and semi-rural locations are villages and hamlets. Furthermore an urban location can be classified as a human settlement with high population density and developed environment while rural location is with sparse population, underdeveloped, not civilized with little or no amenities. Semi-urban locations have some urban characteristics but not as much as that of urban location in terms of population. The semi-rural locations have both urban and rural characteristics but not in high proportion. Umar (2012) in one of his lecture describe an urban location as location that is thickly populated, presence of infrastructural facilities, easy and fast means of communication, high rate of pollution, different languages, custom and mode of dressing while rural location are sparsely populated ,poor infrastructural facilities, people mainly engage in agriculture, low rate of change because of lack of education and technology, low pollution and strong relationship of people.

Since senior secondary schools are located in different environment, it is expected that the students' achievement in chemistry should be different, but in what way is this difference and what are the factors that are responsible. School location, Gender differential, qualification and commitment of Chemistry teacher, classroom size, Government policy, commitment of Chemistry students and infrastructural facilities can affect students' achievement in chemistry. The urban and semi-urban schools have high population, more equipped chemistry laboratory, qualify and competent chemistry teacher, classroom congestion, electricity, pipe-born water, good road, equipped library and adequate supervision than the rural and semi- rural schools (Onuka & Emunemu, 2010). Some of these schools are located outskirt of towns and villages, this distance sometimes possess punctuality problem to the students especially during raining season and eventually affect students achievement in chemistry.

School location can be regarded as a community where school is located these locations do not have effect on students' achievement in chemistry (Bosede, 2010). On the contrary, Owoeye and Yara (2011) indicated in their studies that schools in urban locations had higher students' achievement in chemistry than students in the rural areas. Fredrick (2011) also affirmed that school location is a major factor that influences students' achievement in some areas (chemistry). Schools in urban and semi-urban enjoy more infrastructural facilities than rural and semi-rural schools, for this reason school location can have significant effect on the achievement of students in chemistry (Adeyemi, 2013).

Gender simply means being male or female. Eze (2013) elucidated gender as a description of behaviours, attitudes, values, personality traits, responsibilities and expectations that society attributed to the two sexes on a differential basis. Therefore does gender really determines students' achievement in chemistry? There is an erroneous believe that chemistry is a difficult subject and only male student can excel , but intelligences is not based on gender. The female student in the rural and semi-rural schools often face with too much domestic work, to the point of having little time to study chemistry. If equal opportunity is given, both will do well, as we have male chemist, we equally have female chemist.

Okereke and Onwukwe (2011) indicated in their studies that the male students' achievement in chemistry was higher than the female students. In a similar study in Kenya, Majere, Role and Mekewa (2012) indicated that the attitude of female students towards chemistry is more positive than that of the male. Furthermore, Tenaw (2013) investigated gender difference in his studies and indicated that male students' achievement was better than that of the female. Al-Mustapha (2014) showed that there is no significant difference between male students 'achievement in chemistry and that of the female.

Based on the above findings, this study seek to investigate the achievement of the male student in different location in comparison with the female student, it investigates the relationship of female students' achievement in Mock chemistry Examination in one location with another in FCT. It also investigates the relationship of male students' achievement in Mock Chemistry Examination in one location with another in FCT. Gender differential in this study is the differences among the students 'achievement in Mock Chemistry Examination in different locations in FCT. These differences in schools' location and its associated effects on students' achievement in Mock Chemistry Examination in FCT is one reason that necessitated the researcher to undergo this study.

Statement of the Research Problem

In the Federal capital territory, public senior secondary schools are located in urban, semi-urban, rural and semi-rural location in which teaching and learning of chemistry is not even. The schools in rural and semi-rural locations lack infrastructural facilities such as pipe-born water, good roads, electricity, hospitals, competent and qualified chemistry teachers, library, and well equipped chemistry laboratory for practical lesson. Some schools' buildings have structural defect or are dilapidated, enrolment in schools increases without commensurate provision of infrastructural facilities (Asiyai, 2012). On the other hand the urban and semi-urban schools have congested classrooms, which make teaching and learning of chemistry difficult because the teacher has large number of students to control. Atta, Jamil, Ayah, Shah and Shah (2011) showed that senior secondary class size, which is under 20 students have a positive impact on students' achievement in chemistry.

The Mock Examination, which is a preparatory examination for public secondary schools students in SS3 in the Federal Capital Territory, is being conducted by Education Resource Centre to measure the level of students' achievement in chemistry. The same test instrument is administered on the students at different locations even when the learning conditions in these locations are not even. When equal facilities and opportunities are not given to students at different locations, there will be the possibility of high variation in the level of students 'achievement in chemistry. The question is that to what extent has these differences influence the students' achievement in chemistry?

Research Questions

The study was guided by the following research questions:

(I) To what extent does the achievement mean scores in Mock chemistry examination of male urban students differ from that of female urban students in FCT Abuja?

(ii) To what extent does the achievement mean scores in Mock chemistry examination of male rural students differ from that of female rural students in FCT Abuja?

(iii) Does the achievement mean scores in Mock chemistry examination of male semi-urban students differ from that of female semi-urban students in FCT Abuja?

(iv) Does the achievement mean scores in Mock chemistry examination of male semi-rural students differ from that of female semi-rural students in FCT Abuja?

Research Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

Ho_1: There is no significant difference in the achievement mean scores in mock chemistry examination between male urban and female urban students in FCT Abuja.

Ho_2: There is no significant difference in the achievement mean scores in mock chemistry examination between male rural and female rural students in FCT Abuja.

Ho_3: There is no significant difference in the achievement mean scores in mock chemistry examination between male semi-urban and female semi-urban students in FCT Abuja.

Ho_4: There is no significant difference in the achievement mean scores in mock chemistry examination between male semi-rural and female semi rural students in FCT Abuja.

Methodology

The research design adopted in this study is descriptive survey of the ex-post facto type. The reason is that the existing mock results of the students were used as the data for the research. The population for this study is in two categories; population of schools location and population of students. The total population of Government senior secondary schools in FCT is 62 (31 urban, 14 semi-urban, 13 rural, and 4 semi-rural) 8 schools were selected from these 4 locations. The population for study is 3,113 in which 1,911 are males while 1,202 are females.

The sample for this study consist of 400 chemistry students, 257males and 143 females from 8 public senior secondary schools located in urban, rural, semi-urban and semi-rural who wrote Mock Chemistry Examination in FCT from 2013 to 2018. Three (3) schools from urban, two (2) from semi-urban, two (2) from rural and 1 from semi-rural based on population of schools in each location. The sampling techniques adopted were stratified sampling to select the proportion of schools to be chosen in each location while simple random sampling was used to select the 8 schools and the students' achievement scores for 5 years. Random sampling was adopted here because it eliminates bias by given every individual student an equal chances to be chosen.

In the first week, the researcher visited Secondary Education Board Garki and Education Resource Centre (ERC) Wuse and informed them of his plan to carry out the research work. After the permit was granted, the researcher used the second week to collect the list of school location from the Head of Department, School Services; Secondary Education Board Garki-Abuja. In the third week the students' achievement scores in Mock Chemistry Examination from 2013 to 2018 was printed out and collected from the officer in charge of Mock examination data base of ERC, the only examination body that conducts Mock examination for all public senior secondary schools SS3 students in FCT-Abuja. The study lasted for three weeks.

Results

The achievement scores of students in Mock Chemistry Examination results collected from the data base of ERC, was analyzed by the researcher, using SPSS version 21.0 statistical tools. The mean and standard deviation of these scores were used to answer the research questions.

Research Question One: To what extent does the achievement mean scores in Mock chemistry examination of male urban students differ from that of female urban students in FCT Abuja?

Table 1: Mean and standard deviation of students' scores in urban location

Gender/Location	N	Mean	SD
Male Urban	73	43.37	8.458
Female Urban	47	45.17	6.562
Total	120	44.08	7.792

From Table 1, the achievement mean scores of the male urban and female urban students are 43.37 and 45.17 respectively, while the standard deviations are 8.458 and 6.562 respectively. The mean scores of female urban students is higher than that of the male urban with mean difference of 1.8. This implies that the female urban students' achievement in chemistry is

better than that of the male urban students in the Mock chemistry examination. Based on the standard deviation, the distributions of the scores of the female urban students are closer to the mean than that of the male urban students to the mean. This implies that more female students score higher on average than their male counterpart.

Research Question Two: To what extent does the achievement mean scores in mock chemistry examination of male rural students differ from that of female rural students in FCT Abuja?

Table 2: Mean and standard deviation of students' achievement scores in rural Location

Gender/Location	N	Mean	SD
Male Rural	59	41.00	7.976
Female Rural	21	40.10	6.848
Total	80	40.76	7.664

The analysis on the Table 2 shows that the achievement mean scores in Mock chemistry examination for the male rural students is 41.00 and that of female rural is 40.10 respectively, while the standard deviation are 7.976 and 6.848 respectively. The mean scores for male urban students are higher than that of the female rural students with mean difference of 0.9. The implication is that the male rural students recorded higher achievement in the mock chemistry examination than their female counterpart. The standard deviation of the distributions of the scores of the male rural students are closer to the mean than that of the female rural that are far away from the mean , it means more male students score higher mark than female students on average.

Research Question Three: Does the achievement mean scores in mock chemistry examination of male semi-urban students differ from that of female semi-urban students in FCT Abuja?

Table 3: Mean and standard deviation of students' scores in semi-urban location

Gender/Location	N	Mean	SD
Male Semi-Urban	80	42.58	8.783
Female Semi-Urban	50	43.50	8.605
Total	130	42.93	8.693

The result from Table 3 show the achievement mean scores of the male semi-urban students and the female semi-urban students are 42.58 and 43.50 respectively while the standard deviations are 8.783 and 8.605 respectively. The mean scores of the female semi-urban is higher than that of the male semi –urban with a mean difference of 0.92. This implies that the female students' achievement is better than that of the male students in chemistry. The standard deviation of the distribution of the scores of the female semi-urban students is closer to the mean than that of the male. This indicates that more female students score higher on average than the male students.

Research Question Four: Does the achievement mean scores in mock chemistry examination of male semi-rural students differ from that of female semi-rural students in FCT Abuja?

Table 4: Mean and standard deviation of students' scores in semi-rural location

Gender/Location	N	Mean	SD
Male Semi-Rural	45	37.18	4.821
Female Semi-Rural	25	36.04	5.919
Total	70	36.77	5.226

Table 4 indicates that the achievement mean scores in mock chemistry examination for male semi-rural students and female semi-rural students are 37.18 and 36.04 respectively, while the standard deviations are 4.821 and 5.919 respectively. The achievement mean scores of the male semi-rural students are higher than that of the female students with mean difference of 1.14. This means the male semi-rural students' achievement is better than that of the female semi-rural students. From the standard deviation, the distributions of scores of the male students are closer to the mean than that of the female. This implies that more male students score higher on average than the female students.

Hypotheses Testing

Ho_1: There is no significant difference in the achievement mean scores in mock chemistry examination between male urban and female urban students in FCT Abuja.

Table 5: Analysis of variance (ANOVA) between male urban and female urban students

Group	Sum of squares	df	Mean square	F-value	p-value
Between groups	92.673	1	92.673	1.533	.218
Within group	7131,652	118	60.438		
Total	7224.325	119			

Table 5 shows the ANOVA comparison of the achievement of male and female students in urban area of FCT Abuja. The result: $F_{(1,118)}$ =p>0.05 shows there was no significant difference in their achievement, therefore the null hypothesis was not rejected.

Ho_2: There is no significant difference in the achievement mean scores in mock chemistry examination between male rural and female rural students in FCT Abuja.

Table 6: Analysis of variance (ANOVA) between male rural and female rural students

Group	Sum of squares	df	Mean square	F-value	p-value
Between groups	12.678	1	12.678	.214	.645
Within group	4627.810	78	59.331		
Total	4640.488	79			

Table 6 shows the ANOVA comparison of the achievement of male and female students in the rural area of FCT Abuja. The result: $F_{(1,78)}$ =.214 p>0.05 shows there was no significant difference in their achievement therefore, the null hypothesis was not rejected.

Ho_3: There is no significant difference in the achievement mean scores in mock chemistry examination between male semi-urban and female semi-urban students in FCT Abuja.

Table 7: Analysis of variance (ANOVA) between male and female semi-urban students

Group	Sum of squares	df	Mean square	F-value	p-value
Between groups	26.327	1	26.327	.347	.557
Within group	9722.050	128	75.954		
Total	9748.377	129			

Table 7 shows the ANOVA comparison of the achievement of male and female students in semi-urban area in FCT Abuja. The result: $F_{(1,128)}=.347$ $p>0.05$ shows there was no significant difference in their achievement, therefore the null hypothesis was not rejected.

Ho_4: There is no significant difference in the achievement mean scores in mock chemistry examination between male semi-rural and female semi-rural students in FCT Abuja.

Table 8: Analysis of variance (ANOVA) between male semi-rural and female semi rural students

Group	Sum of squares	df	Mean square	F-value	p-value
Between groups	20.805	1	20.805	.759	.387
Within group	1863.538	68	27.405		
Total	1884.343	69			

Table 8 shows the ANOVA comparison of the male and female students in semi-rural area of FCT Abuja. The result: $F_{(1,68)}= .759$ $p>0.05$shows there was no significant difference in their achievement, therefore the null hypothesis was not rejected.

Discussion

The findings revealed that the female students' achievement in chemistry was better than the male students' achievement in the same urban location but there was no significant difference in their achievement, and the null hypothesis was therefore rejected. This indicates that gender differential does not influence the achievement of students in the same location.

The findings also revealed that the male rural students' achievement was better than that of the female rural students but there was no significant difference in their achievement and the null hypothesis was not rejected. This also means that gender has no influence on the achievement of students in the same location.

Furthermore, the findings revealed that female semi-urban students' achievement was better than that of the male semi-urban students in chemistry but there was no significant between the achievement, therefore the null hypothesis was not rejected. This means gender differential has no influence on the students' achievement in chemistry in the same location.

The findings indicated that male semi-rural students' achievements was better than that of the female semi-rural in chemistry but there was no significant difference in their achievement and the null hypothesis was therefore not rejected. This means gender differential has no influence on the achievement of students in the same location.

Based on the findings of this study, the following conclusion and recommendations were drawn:

Conclusions

The following conclusions were made:

(i) In the same school location, gender of the students does not influence students' achievement in chemistry.

(ii) School location is a determinant in the achievement of students in chemistry.

Recommendations

Since school location determines students' achievement in chemistry, the factors that made the difference in the school location should be taken serious and proper provision should be effected by government and parents. The urban and semi-urban locations have infrastructural facilities like electricity, good road, conducive classroom for teaching and learning, competent and qualified chemistry teachers. All these factors associated with school location should be provided for chemistry students in both the rural and semi-rural location in FCT Abuja.

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