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ANALYSIS ON THE GENDER DIFFERENCE BETWEEN SECONDARY SCHOOL CHEMISTRY STUDENTS' ATTITUDE AND SOCIAL LEARNING ENVIRONMENT IN OGIDI EDUCATION ZONE

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ABSTRACT

This study investigated analysis on the gender difference between secondary school chemistry students' attitude and social learning environment in Ogidi education zone. Three research questions and three hypotheses tested at .05alpha level guided the conduct of the study. Correlation survey design was adopted for the research. Population of the study was 2840 SS 2 Chemistry students in Ogidi education zone. Fifty percent of (50%) the total populations (2840) were selected using simple random sampling technique. Multistage sampling technique involving different procedure at each stage was used to select 26 co-educational schools from the 40 schools in Ogidi education zone which amounted to 1,420 (530 males, 890 females) senior secondary two (SS2) Chemistry students which were used. The instruments used for data collection were Social Learning Environment Questionnaire (SLEQ) and Student's Attitude Scale (SAS) validated by two lecturers from Departments of Science Education and one lecturer from Education Foundations all in faculty of Education Nnamdi Azikiwe University, Awka. The reliability of the two instruments was established using Cronbach alpha. Coefficient of .71 and .73 were yielded showing that the instruments were reliable. The students were giving the instruments to respond to the questions which were used to collect the data. Pearson product moment correlation was used to answer research question while ANOVA was used to test the sole hypothesis at .05 level of significant. Findings of the study revealed that social learning environment is moderately positive in relationship with students' attitudes in Chemistry, male students social learning environment has a low positive relationship with their attitude and female students social learning environment is moderately positive in relationship with their attitude in Chemistry. More so, there is a significant relationship between students' perception of social learning environment scores and an attitude towards Chemistry, there is a no significant relationship between male students' perception of social learning environment scores and their attitudes in Chemistry and there is a significant relationship between female students' perception of social learning environment scores and their attitudes in Chemistry. From the findings of the study, recommendations and conclusions were made.

Keywords: Chemistry, Gender, Social Learning Environment and Attitude.

Introduction

Studies have repeatedly reported that Chemistry and other sciences are perceived as male domain. Some has it that scientists are predominately male thing. According to Regodic et al (2020) out of five hundred and sixty-five (565) persons that have visited the space, only the sixty-five (65) are women while the rest are men because the environment seems to favours men. That is to say those, five hundred (500) male astronauts have successfully travelled to zero-gravity domain as against the sixty-five (65) female astronauts. The author further stated that it is because of inferiority complex among the female astronauts that made it done majorly by their male counterparts.

In a related view, Makarova et al (2019) reported that gender issues like inferiority complex have been an issue in the study of science subjects like Chemistry, Physics, and Mathematics especially among female students. They further asserted that issues like environment affect female students' more than male students in Chemistry performance.

Chukwu (2015) differently reported that issues like social environment affect science male students than their female counterpart. The author was of the opinion that male as a gender has so many responsibilities that make them not to concentrate in learning science subjects than their female counterpart. Ezeriora and Obikezie, (2017) opined that female science students are more favoured in Chemistry and other science subjects than male because they have Wright attitude towards science subjects than their male counterparts. Also, class room environment favours female science students than the male science students that is while there is a high positive relationship between female science secondary schools students' attitude and their classroom environment.

According to Akpan (2020) classroom environment is the totality of the social learning environment. The author further asserted that social learning environment is an online destination where people come together to co-create content, share knowledge and learn from one another. According to Nubunga (2020), social learning environment combined social learning elements like networking, tagging, files sharing microblogging to create a safe space in which to work and learn collaboratively as in a learning environment setting or physical environment where people gather to share knowledge. As opined by Usman and Mandulili (2019), social learning environment encompasses learning resources and technology, means of teaching, mode of learning and connections to societal, global contexts including classrooms and classrooms facilities. According to Balog (2018), social learning environment acts as a composite of human practices and material systems, much as in ecology is the combination of living thing and physical environment. Physical learning environment therefore enables a learner to concretize ideas and knowledge when learning is taking place.

Wordu (2014), indicated that social learning environment with qualified teachers influence, mechanical female student's performance recorded high positive relationship between their environments. The author further observed no significant difference relationship in environment

between the two genders. Iweka (2017) revealed that there was no relationship between social environment and students' attitudes in integrated science subject. Further, in a study designed to uncover social learning environment differences between academically weak and gifted students using the Social Learning Theory SLT, Akpan (2020) did not found differences in relationship of students learning environment and their attitude in Biology subject

According to Najdi (2018), students' learning attitude is the development of interest and positive character towards learning particular things or subjects. The author further stated that provided the social learning environment is profitable the importance of developing a positive attitude towards Chemistry and Physics learning will actually lead to high performance in the subject. Semukono et al (2013) revealed that learning environment has no effect on students' attitude in Physics. The researchers further revealed that no relationship between male and female secondary school students' perception of social learning scores and attitude towards Physics score. Authors like Samuel and Mangoting (2021) believed that social learning environment increases science students' attitudes at a moderate relationship especially among male students in science subject than their female counterpart who had very low relationship between their perception of social learning scores and attitude towards science subject. In contrary, Karpudewan and Chong Keat (2017) noticed a positive relationship that exists between female students' perception of social learning scores and attitude in Biology and other science. The authors further observed a significant difference in relationship between female secondary school students' perception of social learning environment scores and attitude towards science subjects' scores.

Sundawa et al (2020) indicated that, enterpreurship sustainability 4.0 mode on social learning environment influences female students' entrepreneurial attitude than their male counterpart in practical works. The result has it that a positive relationship exist between female students' perception of social learning scores and attitude in practical work. Samuel and Mangoting (2021) indicated that attitude have a very high extent, positive and significant influence on the intention of the accounting students in terms of increasing current knowledge and increasing accounting career provided the social learning environment is good and adaptable to male students than their female counterpart. It was revealed in the study that positive relationship exists between male accounting students' perception of social learning scores and attitude scores. Samuel and Mangoting (2021) further noted a significant difference between relationship in male accounting students' perception scores and their attitude scores in accounting subject.

Karpudewan and Chong Keat (2017) asserted that attitude towards learning science is positively correlated with both classroom learning environment and science laboratory learning environment are significantly predictor of attitude. In their study, they observed that attitude positively correlate with female students learning environment in laboratory work. The researchers further observed a significant different in correlation between female students attitude and learning

environment in laboratory work. Osaduwa (2018) revealed that there was a positive significant relationship between female students' social classroom learning environment and their attitude in Mathematics.

From the foregoing, it appears the question of whether there is gender difference in secondary school students' attitude and social learning environment in Chemistry and other science subjects has not been concisely answered because both the theoretical and empirical studies reviewed in this study have produced diverse and contradictory results. Similarly, most of the studies reviewed are done in other science subjects' areas than Chemistry, creating a vacuum for this investigation to be carried out in the subject. Consequently, there emerge three purposes in the present study: one the relationship between secondary school students' perception of social learning environment scores and attitude towards Chemistry scores. Second, the relationship between male secondary school students' perception of social learning scores and attitude towards chemistry score. Third, the relationship between female secondary school students' perception of social learning environment scores and attitude towards chemistry scores? In candor, the answers are unknown. Perhaps the outcome of this study would provide concise answers to the purposes raised.

Research Question.

The following research questions guided to the study:

1. What is the relationship between secondary school students' perception of social learning environment scores and attitude towards Chemistry scores?
2. What is the relationship between male secondary school students' perception of social learning scores and attitude towards chemistry score?
3. What is the relationship between female secondary school students' perception of social learning environment scores and attitude towards chemistry scores?

Hypotheses

The study tested null hypotheses at 0.05 level of significance:

H_{O1} There is no significant relationship between secondary school students' perception of social learning environment scores and attitudes towards Chemistry scores.

HO^2 There is no significant relationship between male secondary schools' perception on social learning environment and attitude towards chemistry scores.

Ho^3 There is no significant relationship between female secondary school students' perception of social learning environment scores and attitude towards scores.

Research Method

The design of the study was correlation survey. It is a correlation design because it investigated relationship between two variables without the researchers' controlling or manipulating any of them. Fifty percent of (50%) of the 2,840 total populations were selected using simple

random sampling technique. Multistage sampling technique involving different procedure at each stage was used to select 26 co-educational schools from the 40 schools in Ogidi education zone which amounted to 1,420 senior secondary two (SS2) Chemistry students 530 males, 890 females.

Instrument

Two (2) instruments were used for data collection. They are Social Learning Environment Questionnaire (SLEQ) and Student's Attitude Scale (SAS).

The SLEQ was adapted by the researcher from "What is happening in the classroom questionnaire" (WIHICQ), by (MyintSweKhine (2001). It consists of seven (7) clusters and 59 items. The clusters are: students' cohesiveness, teachers' support, students' involvement, investigation, task orientation, cooperation and equity. It also has reliability coefficient of 0.9. The following adaptations were made in SLQE. Section A elicits information from the respondents. Section B elicit responses from the respondents on perception of students' social learning environment. One cluster "investigation" was removed based on the recommendation of the supervisor. Thus, the total number of clusters was reduced from seven (7) to six (6) clusters and other clusters modified to contain 45 items with five point scale response format ranging from almost never (1 point), seldom (2 points), sometimes (3points), often (4 points) and always (5 Points).

The SAS was adapted by the researcher from Attitude measurement instrument by Salta, and Tzougraki, (2004). It consists of thirty (30) items and four (4) point scale response format ranging from strongly agree (4points), agree (3 points), disagree (2 points), and strongly disagree (1 point). It has a reliability coefficient of .73, seven (7) items were removed and six (6) items modified to suit the purpose of the instrument, thus reducing the items from 30 to 29.

SLQE and SAS were submitted to three experts, two from Science Education Department and one from measurements and evaluation department, all from Faculty of Education, Nnamdi Azikiwe University Awka for validation. These experts were requested to examine the items in terms of content, relevance and clarity as well as to ascertain if the items are related to the purpose of the study. They were also asked to check the clarity of the language and find out if all relevant areas were covered. To ensure that the instruments were reliable, the instruments were administered to a school in Awka education zone which is outside the place of the present study among sixty students. Coefficients of .71 for SLEQ and .73 for SAS were obtained respectively using cronbach alpha. Pearson product moment correlation was used to answer research questions as thus;

Ranges of scores	**Decision**
±0.80 – ± 1.00	High positive or negative relationships
±0.31 – ± 0.79	Moderate positive or negative relationship
±0.00 – ± 0.30	Low positive or negative relationship .

Regression of ANOVA was used to test the sole hypotheses at .05 level of significant.

Presentation of Result

The results of this study were presented in line with the research question and the hypothesis as follows.

Research Question 1: What is the relationship between secondary school students' perception of social learning environment scores and attitude towards Chemistry scores?

Table 1: Pearson's Product Moment Correlation Analysis of Students' Perception of Social Learning and Attitude in Chemistry

Variables	Mean	SD	N	r	R^2	Remark
Students' perception Of social learning Environment (SLEQ)	150.8	28.9	1420	.32	.10	moderate positive relationship
Attitude (SAS)	78.1	9.7				

R^2 = coefficient of determination

Table 1 reveals correlation coefficients of the relationship between students' perception of social learning and attitude in Chemistry as .32. This means there was a moderate positive relationship between students' perception of social learning and their attitude in chemistry. The coefficient of determination (.10) also known as the predictive value means that 10% of students' perception of social learning accounted for the variation in attitude of students in Chemistry. This is an indication that 90% of variation in students' attitude in Chemistry is attributed to other factors other than social learning environment of the students.

Research Question 2: What is the relationship between male secondary school students' perception of social learning scores and attitude towards Chemistry score?

Table 2: Pearson's Product Moment Correlation Analysis of Male Students' Perception of Social Learning and Attitude in Chemistry

Variables	Mean	SD	N	r	R^2	Remark
Male Students' perception Of social learning Environment (SLEQ)	155.4	27.3	530	0.05	0.002	low positive relationship
Attitude (SAS)	80.1	10.0				

R^2 = coefficient of determination

Table 2 shown correlation coefficients of the relationship between male students' perception of social learning and attitude towards Chemistry as 0.05. This means there was a low positive relationship between male students' perception of social learning and their attitude in chemistry. The coefficient of determination (0.002) also known as the predictive value means that 0% of male students' perception in social learning accounted for the variation in their attitude in Chemistry.

Research Question 3: What is the relationship between female secondary school students' perception of social learning environment scores and attitude towards Chemistry scores?

Table 3: Pearson's Product Moment Correlation Analysis of Female Students' Perception of Social Learning and Attitude in Chemistry

Variables	Mean	SD	N	r	R^2	Remark
Female Students' perception Of social learning Environment (SLEQ)	148.0	29.5	890	0.46	0.21	moderate positive relationship
Attitude (SAS)	76.9	9.3				

R^2 = coefficient of determination

Table 3 reveals correlation coefficients of the relationship between female students' perception of social learning and attitude towards Chemistry as 0.46. This means there was a moderate positive relationship between female students' perception of social learning and attitude in Chemistry. The coefficient of determination (0.21) also known as the predictive value means that 21% of female students' perception in social learning accounted for the variation in attitude in Chemistry.

Hypotheses

H_{O1}There is no significant relationship between secondary school students' perception of social learning environment scores and attitudes towards Chemistry scores.

Table 4: Regression Analysis of the Relationship between Students' Perception of Social Learning Environment Score and Attitude Score in Chemistry

Model	Sum of Squares	Df	Mean Square	F	Sig	Decision
Regression	13522.253	1	13522.253	160.75	.00	Significant
Residual	119279.107	1418	84.118			
Total	132801.360	1419				

a. Dependent Variable: SAS;
b. Predictors: (Constant), SLEQ

In order to test hypothesis 1 (H_{O1}), regression analysis was used. The result in Table 4 shows that an F-ratio of 160.75 with associated exact probability value of 0.00 was obtained. This exact probability value of .00 was less than .05 level of significance set as bench mark and it was found to be significant. The null hypothesis which stated that there is no significant relationship between secondary school students' perception of social learning environment scores and attitudes towards Chemistry scores was therefore rejected and inference drawn was that, there was a significant relationship between students' perception of social learning environment scores and attitudes towards Chemistry.

H_{O2} There is no significant relationship between male secondary schools' perception on social learning environment and attitude towards Chemistry scores.

Table 5: Regression Analysis of the relationship between Male Students' Perception of Social Learning Environment Score and Attitude Score in Chemistry

Model	Sum of Squares	Df	Mean Square	F	Sig	Decision
Regression	116.216	1	116.216	1.160	0.282[c]	Not Significant
Residual	52889.801	528	100.170			
Total	53006.017	529				

a. Dependent Variable: SAS
b. Selecting only cases for which MALE=1 FEMALE=2 = 1.00
c. Predictors: (Constant), SLEQ

In table 5 the result showed that an F-ratio of 1.160 with associated exact probability value of 0.282 was obtained. This exact probability value of 0.282 was greater than 0.05 level of significance set as bench mark and it was found not to be significant. The null hypothesis which stated that there is no significant relationship between male secondary schools' perception on social learning environment and attitude towards Chemistry scores was therefore not rejected and inference drawn was that, there was no significant relationship between male secondary schools' perception on social learning environment and attitude towards Chemistry scores.

Ho3 There is no significant relationship between female secondary school students' perception of social learning environment scores and attitude towards scores.

Table 6: Regression Analysis of the relationship between Female Students' Perception of Social Learning Environment Score and Attitude Score in Chemistry

Model	Sum of Squares	Df	Mean Square	F	Sig	Decision
Regression	16212.665	1	16212.665	239.319	0.00[c]	
Residual	60157.511	888	67.745			Significant
Total	76370.175	889				

a. Dependent Variable: SAS
b. Selecting only cases for which MALE=1 FEMALE=2 = 2.00
c. Predictors: (Constant), SLEQ

Table 6 showed that an F-ratio of 239.319 with associated exact probability value of 0.00 was obtained. This exact probability value of 0.00 was less than 0.05 level of significance set as bench mark and it was found to be significant. The null hypothesis which stated that there is no significant relationship between female secondary school students' perception of social learning environment scores and attitude towards Chemistry scores was rejected and inference drawn was that, there was a significant relationship between female secondary school students' perception of social learning environment scores and attitude towards scores in Chemistry.

Discussion of Findings

The result on Table 1 is correlation coefficients of the relationship between students' perception of social learning and attitude in Chemistry as .32. This means there was a moderate positive relationship between students' perception of social learning and their attitude in Chemistry. Hence, there is a significant relationship between students' perception of social learning environment scores and attitudes towards Chemistry as shown in table 4. The finding of this study support the findings of other previous researchers such as Semukono, Orobia and Arinaitota (2013) who revealed that learning environment increases students' attitude in Chemistry at high extent. The finding in consonance with some authors who believed that social learning environment increases science students' attitudes at a moderate extent (Samuel & Mangoting 2021; Karpudewan & Chong Keat 2017). Also the result of the findings in line with Karpudewan and Chong Keat (2017) who asserted that attitude towards learning science is positively correlated with both classroom learning environment and science laboratory learning environment are significantly predictor of attitude. The result is not in line with Samuel and Mangoting (2021) who reported that attitude have a very high extent.

Also not in line with the findings of Akpan (2020) who opined that there was no significant influence in class size, school location which makes up social learning environment of students on academic attitude

of SS 2 students in Biology. By virtue of this finding, this research has joined the school of thought that relates student perception of social learning significantly to students' attitude.

Table 2 shown correlation coefficients of the relationship between male students' perception of social learning and attitude towards Chemistry as 0.05. This means there was a low positive relationship between male students' perception of social learning and their attitude in Chemistry. Hence, there is no significant relationship between male secondary schools' perception on social learning environment and attitude towards Chemistry scores as shown in table 5. The finding of the study in not in consonance with the finding of Semukono et al (2013) who revealed that there is no relationship between male and female secondary school students' perception of social learning scores and attitude towards Physics score. Also the finding is not in line with Samuel and Mangoting (2021) who reported that social learning environment increases science students' attitudes at a moderate relationship especially among male students in science subject.

In significant differences as shown in table 5, the findings is not in line with Samuel and Mangoting (2021) finding who noted a significant difference in relationship between male accounting students' perception scores and their attitude scores in accounting subject. By virtue of this finding, this research has joined the school of thought that relates male students' perception of social learning not significantly different in relationship with their attitude in Chemistry.

Table 3 reveals correlation coefficients of the relationship between female students' perception of social learning and attitude towards Chemistry as 0.46. This means there was a moderate positive relationship between female students' perception of social learning and attitude in Chemistry. Hence, there is a significant relationship between female secondary school students' perception of social learning environment scores and attitude towards scores in Chemistry as shown in table 6. The results is in line with the findings of Karpudewan and Chong Keat (2017) who noticed a positive relationship between female students' perception of social learning scores and attitude in Biology and a significant difference in relationship between female secondary school students' perception of social learning environment scores and attitude towards science subjects' scores. The result is consonance with Sundawa et al (2020) who opined a positive relationship between female students' perception of social learning scores and attitude in practical work. By virtue of this finding, this research has joined the school of thought that relates female students' perception of social learning significantly to students' attitude.

Conclusion

Based on the investigation into analysis on the gender difference between secondary school Chemistry students' attitude and social learning environment in Ogidi education zone, it can be concluded among others that social learning environment has a moderate positive relation with students attitudes in Chemistry and there was a significant relationship between

students' perception of social learning environment scores and attitudes towards Chemistry. Also, male students' social learning environment has a low positive relationship with their attitudes in Chemistry and female students' social learning environment has a moderate positive relationship with their attitudes in Chemistry.

Recommendations

Based on the findings of the study, and the conclusion drawn, the following recommendations are made:

1. Teachers and other stake holders should endeavour to provide adequate and equal opportunities to students in terms of social learning environment. This will help the students to develop positive attitudes towards Chemistry.
2. Teachers should endeavour to create conducive social learning environment and stimulating atmosphere for all the classes, irrespective of gender.
3. Teachers and other stake holders should endeavour to provide adequate and equal opportunities to both sexes in terms of social learning environment and inculcation of positive problem solving skills. This will help the students to develop positive attitudes towards chemistry to enhance their academic performance in the subject.

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