SOCIAL LEARNING ENVIRONMENT AND PROBLEM - SOLVING SKILLS AS CORRELATES OF STUDENTS' PERFORMANCE COMPETENCE IN CHEMISTRY

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Abstract: *The study investigated on social learning environment and problem-solving skills as correlates of students' performance competence in chemistry in Ogidi education zone of Anambra state. The study used correlation research design. The population of the study comprised of all the 2,840 senior secondary school two (SS2) Chemistry students in the zone. The sample size of the study was made up of 1420 students (530 males, 890 females). The sample was drawn using multistage sampling procedure. Five purpose of study, five research questions and five hypotheses guided the study. Three instruments were used for the study namely Social Learning Environment Questionnaire (SLEQ), Problem Solving Skill Inventory (PSSI) and Students Academic Performance Test (SAPT). The data collected were analysed using Pearson's Product Moment Correlation for both research questions and hypotheses which were tested at .05 level of significance. The results revealed a low negatively relationship between students' perception of social learning and academic performance competence in Chemistry. Hence a no significant in relationship between students' perception of social learning and academic performance competence in Chemistry. Secondly, the result also revealed a low negatively relationship between male and female students' perception of social learning and academic*

performance competence in Chemistry. Hence, no significant difference in relationship between male and female students' perception of social learning and academic performance competence in Chemistry. Thirdly, the study revealed low positive relationship between students' problem- solving skill and performance scores in Chemistry. Hence, there was no significant difference in relationship between students' problem- solving skill and performance scores in Chemistry. Fourthly, the study revealed a low positive relationship between male and female students' problem- solving skill and performance scores in Chemistry. Hence, there was no significant difference in relationship between male and female students' problem- solving skill and performance scores in Chemistry. Finally, a low positive relationship between secondary school students' perception on social learning environment scores, problem solving skills scores and performance competence scores in Chemistry scores. Hence, there was no significant difference in relationship between secondary school students' perception on social learning environment scores, problem solving skills scores and performance competence scores in Chemistry scores. From the findings recommendations and conclusions were made.

Key words: *Science; Chemistry; Social Learning Environment and Problem- Solving Skills.*

Introduction

Science is the concerted human effort to better understand the history of the natural world and how the natural world works with observable physical evidence, as the basis of the understanding. It is a knowledge acquired through observation of natural phenomena, and experimentation that tries to simulate natural processes under controlled conditions (Driel & Jone, 2021). Science has many branches and can be seen in various areas of life. The branches of science, according to Okoye and Igboabuchi (2017) include earth and space, social sciences, life science and physical science. This study is interested in a branch of physical science known as Chemistry.

Chemistry is a branch of science that deals with the study of nature, composition and properties of matter, as well as the changes matters undergone under different conditions. Chemistry deals with the study of our environment and things that are happening around it. According to Chukwu (2015), Chemistry does not only explain the environment but also offers a lot of useful and important knowledge to humanity. Examples are in the area of industrial production of fertilizer, insecticides, food and drinks, clothing and textile materials and many

other useful ideas and application. Chemistry also contributes to the theoretical base for the production of ammunitions for defence, security, building, medicine and many more (Obikezie et. al., 2023).

In as much as Chemistry is important to man and his environs, students' performance in Chemistry in secondary schools is still a thing to worry about. Over the years, research studies (Alabi, 2014; Copriady, 2015) have indicated that academic performance of students who enroll in Chemistry has not been encouraging. The poor performance of students in science subjects, particularly in Chemistry, has assumed a serious dimension as reported by the West African Examinations Council (WAEC) Chief Examiner's report on Chemistry 2015 to 2019. From the reports, candidates have the following weaknesses: inability to understand the demands of the questions, exhibited poor communication skill, wrote trivial names instead of formulae, application of theoretical approach to practical questions among other weaknesses. All these point to the fact that secondary school students offering Chemistry lack problem-solving skills. This lack of problem-solving skills could be attributed to the school social learning environment Chemistry learners found themselves (Obeka, 2016).

Social learning environment is a 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. 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 and global contexts through use of problem solving skills (Nabunga 2020).

Problem solving skills (PSS) refers to the ability to identify a problem, determine its cause and figure out all possible solutions to solve the problem. According to Kim et. al., (2018), PSS is the ability to use appropriate methods to tackle unexpected challenges in an organized manner. Kim et. al further asserted that PSS have been proven to be one of the key factors for success in organization and personal career that are related to science activities in a related manner. Copriady (2015), opined that PSS exist in a volatile manner which requires a systematic approach. According to Dubicks and Sarkene (2017), problem-solving skills are defined in a number of studies which exist in technology based industry of teaching and learning. For Akujieze and Ifeakor (2017), PSS consist of using generic or adhoc method in an orderly manner to find solution to difficulties which when learned will affect the attitude of the learner positively towards materials that were learned to show a high level in performance competence in science subjects like Chemistry.

Academic performance competence is the extent to which a student, teacher or institution has attained their short or long-term educational goals (Kapor,2018). Performance competence depicts how much students own their learning. A lot of factors affect students' academic performance competence in Chemistry and they include; truancy by the students, poor social learning environment, incompetent teachers, poor teaching method and others. These factors bear so much influence on the academic performance competence of Chemistry students that over the years, Chemistry and science students do not show much interest in Chemistry subject, they see the subject and other related science subjects as unattainable task, with that most of them have obnoxious notion about Chemistry and other science subjects due to their social learning environment (Kapor,2018).

Some authors have also attempted to resolve the issue of casual relationship between social learning environment, problem solving skills and academic performance competence in students. Indeed, Iweka (2017) revealed a low mean perception and low negative perception between students' performance competence and classroom environment with no significant difference in integrated science. More so, Wordu (2014) observed that a well-equipped and conducive learning environment with qualified teachers influence mechanical student's academic performance competence especially male and female students at high extent with no significant difference in gender group's opinion do to equal perception on problem solving skills the students.

Mandina and Ochinogor (2018) observed statistically significant difference in correlation between students' performance competence and problem-solving skills in Mathematics. More so, Ariniezca and Ikhsan (2020) who reported that students had a moderate positive relationship between attitude, performance and problem process skills in Chemistry while Kanmani and Nagarathinam (2017) reported that problem-solving skill of the higher secondary student was found to be on average and there was a high positive correlation and inter relationship between problem-solving skill, social learning and performance competence in Mathematics.

Some authors have also attempted to resolve the issue of significant difference in correlation among students' perception of social learning environment, problem-solving skills and academic performance competence. Kanmani and Nagarathinam (2017) observed a low positive relationship between students' academic performance competence and their social learning environment using socio-cultural theory (SCT) by Vygostsky. The authors further asserted that there is no significant in relationship between students' academic performance competence and social learning environment in some secondary school science subject. While Ariniezca and Ikhsan (2020) reported that a

moderate positive relationship exists between students' academic performance competence and their perception in problem solving skills in Chemistry. The authors further asserted that there is no significant difference in relationship between students' academic performance competence and their perception in problem solving skill in Chemistry using problem-solving skill theory (PSST).

It appears the question of whether relationship exists or does not exist between social learning environment, problem-solving skills and students' performance competence in Chemistry has not been concisely answered because both the theoretical and empirical studies reviewed in this study have produced diverse and contradictory results either it talks about the relationship between social learning environment and students' performance competence or relationship between perception of problem solving skill and students' performance competence. Non seems to address the issues of the three variables. Similarly, the issue of gender difference in social learning environment, problem-solving skills and performance competence in secondary school Chemistry has not been resolved and therefore subject to further investigation. Thus, this study was focused on social learning environment and problem-solving skills as correlates of male and female students' performance competence in Chemistry.

Consequently, to guild the study there emerge five purpose of study: One, "relationship between secondary school students' perception of social learning environment and academic performance competence in Chemistry". Second, "relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender". Third, "relationship between secondary school students' problem solving skills and performance competence in Chemistry". Fourth, "relationship between secondary school students' problem solving skills and performance competence in Chemistry when moderated with gender". Fifth, "correlation among secondary school students' perception of social learning environment, problem solving skills and performance competence in Chemistry". The purpose of the study is to be achieved. Therefore, the purpose of the study which forms the research questions are unknown. Perhaps the outcome of this study would provide concise answers to the under listed research questions.

1. What is the relationship between secondary school students' perception of social learning environment and academic performance competence in Chemistry?
2. What is the relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender?

3. What is the relationship between secondary school students' problem solving skills and performance competence in Chemistry?
4. What is the relationship between secondary school students' problem solving skills and performance competence in Chemistry when moderated with gender?
5. What is the correlation among secondary school students' perception of social learning environment, problem solving skills and performance competence in Chemistry?

Hypotheses

The study tested the following null hypotheses at 0.05 level of significance:
1. There is no significant relationship between secondary school students' perception of social learning environment and academic performance competence in Chemistry.
2. There is no significant relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender.
3. There is no significant relationship between secondary school students' problem solving skills and performance competence in Chemistry.
4. There is no significant relationship between secondary school students' problem solving skills and performance competence in Chemistry when moderated with gender.
5. There is no significant correlation among secondary school students' perception of social learning environment, problem solving skills and performance competence in Chemistry.

Method

The design of the study was correlation survey. Correlation design is used to investigate relationship between two or more variable without the researcher controlling or manipulating any of them. The area of the study was Ogidi education zone of Anambra state Nigeria. The population of the study comprised of all the 2,840 senior secondary school two (SS2) Chemistry students in the zone. The sample size of the study was made up of 1420 students (530 males, 890 females). The sample was drawn using multistage sampling procedure involving different techniques was used to draw the sample size. First, purposive sampling technique was used to select 26 coeducational schools from 40 schools in Ogidi Education Zone. Coeducational schools were purposely selected in that they have greater number of schools in the study area and the researcher also wants to observe males and females in the same

learning environment, having comparable learning environment and large population size. Finally, stratified random sampling techniques were used to select five schools from each of the local government areas that make up the zone. In all, fifteen coeducation schools were used for the study with a sample size of 1,420.

Instrument
Three instruments were used for the study namely Social Learning Environment Questionnaire (SLEQ), Problem Solving Skill Inventory (PSSI) and Students Academic Performance Test (SAPT). SLEQ was adapted by the researchers from "What is happening in the classroom questionnaire" (WIHICQ), by Myint SweKhine (2001). It consists seven (7) clusters namely; students' cohesiveness, teachers' support, students' involvement, investigation, task orientation, cooperation and equity. Five-point scale response format was used which ranging from almost never (1 point), seldom (2 points), sometimes (3points), often (4 points) and always (5 Points).

The second instrument was The PSSI was adapted by the researcher from social learning inventory-revised (SPSI-R:D' Zurilla et al., 2002 *www.sax.sagepub.com*). The following adaptations were made in the problem-solving skill inventory: Section A containing items eliciting information on biodata of the respondents and Section B which contains items eliciting information on problem-solving skills was modified and scale introduced ranging from Strongly Disagree (SD), Disagree (D), Agree (A), Strongly Disagree (SD) with weight of 1,2,3,4 and 4,3,2,1 for negative and positive responses respectively. Items on the instrument were reduced from 52 to 32 based on the validator's recommendations.

For the third instrument which is students' academic competence, Student's termly results were obtained from the promotion result for 2021/22 academic session, which comprises first, second and third term respectively. And the results recorded in a preformat was validated by the experts from the zone and the Head of Department of Chemistry in the selected schools. Since is a standard instrument, the reliability was not tested.

Similarly, SLEQ and PSSI where validated by three experts. Two from Department of Science Education and one from Education Foundation (Measurement and Evaluation) all from Nnamdi Azikiwe University Awka. To test the consistency and reliability of the two instruments adapted, SLEQ and PSSI where administered to 60 students at Nawfia which is in Awka education outside the area of study and reliability of .71 and .73 where yielded using Cronbach alpha. Pearson product moment correlation was used to answer both research questions and to test the hypotheses at .05 level of significant.

     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   .

In interpreting the null hypotheses, the decision rule is that when P-value is less than or equal to 0.05 ($P \leq 0.05$) the null hypotheses was rejected. On the other hand, when P-value is greater than the alpha level 0.05 ($P \geq 0.05$), the null hypotheses was not rejected (accepted).

Result

The result of this study was presented in line with the research questions and the hypotheses as follows.

Research Question 1

What is the relationship between secondary school students' perception of social learning environment and academic performance competence in Chemistry?

Table 2: Pearson Correlation Coefficient for the Relationship between Social Learning Environment and Academic Performance Compentence in Chemistry

Variables Decision	N	r	R^2	Magnitude & Direction	Sig
Not 0.876[b] Significant SPSLE Performance in Chemistry	1420	-0.03	0.00	Low negative relationship	

Key: R^2 = coefficient of determination

Table 1 reveals correlation coefficients of the relationship between students' perception of social learning environment and academic performance competence in Chemistry as -0.03. This means there was a low negatively relationship between students' perception of social learning and academic performance competence in Chemistry. The coefficient of determination (0.00) also known as the relationship value means that 0% or non of students' perception in social learning

accounted for the variation in students' academic performance competence in Chemistry.

Research Question 2

What is the relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender?

Table 2: Pearson Correlation Coefficient for the Relationship between Social Learning Environment and Performance Competence in Chemistry when Moderated by Gender

Variables	N	r	R^2	Magnitude & Direction	Sig	Decision
SPSLE Performance in Chemistry	1420	-0.02	0.00	Low negative relationship	0.653^c	Not Significant

Key: R^2 = coefficient of determination

Table 2 reveals correlation coefficients of the relationship between secondary school students' perception of social learning environment and academic performance competence towards Chemistry when moderated by gender as -0.02. This means there was a low negatively relationship between male and female students' perception of social learning and academic performance competence in Chemistry. The coefficient of determination (0.00) also known as the relationship value means that 0% of male students' perception in social learning accounted for the variation in their academic performance competence in Chemistry.

Research Question 3

What is the relationship between secondary school students' problem solving skills and performance competence in Chemistry?

Table 3: Pearson Correlation Coefficient for the Relationship between Social Learning Environment and Performance Competence Score in Chemistry

Variables	N	r	R^2	Magnitude & Direction	Sig	Decision
SPSS APC	1420	0.03	0.001	Low positive relationship	0.653	Not Significant

Key: R^2 = coefficient of determination

Table 3 shown that correlation coefficients of the relationship between students' problems solving skill and academic performance competence scores in Chemistry as 0.03. This means there was a low positive relationship between students' problem- solving skill and performance scores in Chemistry. The coefficient of determination (0.001) also known as the relationship value means that 0.1% of students' problem-solving skill accounted for the variation in performance competence of students in Chemistry.

Research Question 4

What is the relationship between secondary school students' problem solving skills and performance competence in Chemistry when moderated with gender?

Table 4: Pearson Correlation Coefficient for the Relationship between Problem-Solving Skill and Performance scores in Chemistry when Moderated by Gender

Variables	N	r	R^2	Magnitude & Direction	Sig	Decision
SPSLE Performance in Chemistry	1420	0.08	0.003	Low positive relationship	0.655[c]	Not Significant

Key: R^2 = coefficient of determination

Table 4 shows correlation coefficients of the relationship between secondary school students' problem-solving skills scores and performance competence scores in Chemistry when moderated by gender as 0.08. This means there was a low positive relationship between male and female students' problem- solving skill and performance scores in Chemistry. The coefficient of determination (0.003) also known as the relationship value means that 0.3% of male and female students' problem- solving skill accounted for the variation in performance competence of students in Chemistry.

Research Question 5

What is the correlation among secondary school students' perception of social learning environment, problem solving skills and performance competence in Chemistry?

Table 5: A Model Summary of Students' Perception on Social Learning Environment, Problem Solving Skills Scores and Performance Competence Scores in Chemistry

Model Decision & Direction	N	r	R^2	Magnitude	Sig
Significant	1420	0.03^a	0.001	Low positive relationship	Not 0.58^b

Key: R^2 = coefficient of determination

Table 5 reveals how much of the overall variance of students' performance competence in Chemistry is explained by the variables (students' perception on social learning environment scores and problem solving skills). Results showed that the relationship of the independent variables and the criterion variable was 0.03 and the coefficient of determination (R^2) was 0.001. This means there was a low positive relationship between secondary school students' perception on social learning environment scores, problem solving skills scores and performance competence scores in Chemistry scores. The table that explained 1% of the total variance of students' performance in

Chemistry. This also means that 1% of students' performance competence in Chemistry is accounted for by the variables (social learning environment scores and problem solving skills scores).

Hypotheses

Ho1: There is no significant relationship between secondary school students' perception of social learning environment and academic performance competence in Chemistry.

Table 2 revealed the Pearson correlation coefficient for the relationship between secondary school students' perception of social learning environment and performance score in Chemistry. A low negative correlation was found r (1420) =-0.03, p=0.00>0.05) indicating a no significant relationship between the two variables. The null hypothesis which stated that there is no significant relationship between secondary school students' perception of social learning environment scores and performance scores in Chemistry was therefore not rejected. The inference drawn was that there is no significant relationship between secondary school students' perception of social learning environment scores and performance scores in Chemistry.

Ho2: There is no significant relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender.

Table 2 revealed the Pearson correlation coefficient for the relationship between secondary school students' perception of social learning environment and performance in Chemistry when moderated with gender. A low negative correlation was found r (1420) =-0.02, p=0.00<0.05) indicating no significant relationship between the two variables. The null hypothesis which stated that there is no significant relationship between secondary school students' perception of social learning environment and performance in Chemistry when moderated with gender was therefore not rejected.

Ho3: There is no significant relationship between secondary school students' problem solving skills and performance competence in Chemistry.

Table 3 revealed the Pearson correlation coefficient for the relationship between secondary school students' problem solving skills and performance score in Chemistry. A low positive correlation was found r (1420) = 0.03 p=0.00>0.05) indicating a no significant relationship between the two variables. The null hypothesis which stated that there is no significant relationship between secondary school students' problem solving skills and performance in Chemistry was therefore not rejected. The inference drawn was that there is no significant relationship between secondary school students' problem-solving skills and performance in Chemistry.

Ho4: There is no significant relationship between secondary school students' problem solving skills and performance competence in Chemistry when moderated with gender.

Table 4 revealed the Pearson correlation coefficient for the relationship between secondary school students' problem-solving skills and performance in Chemistry when moderated with gender. A low positive correlation was found r (1420) = 0.08 p=0.00>0.05) indicating a no significant relationship between the two variables in chemistry when moderated with gender. The null hypothesis which stated that there is no significant relationship between secondary school students' problem-solving skills and performance in Chemistry when moderated with gender was therefore not rejected. The inference drawn was that there is no significant relationship between secondary school students' problem-solving skills and performance in Chemistry when moderated with gender.

Ho5: There is no significant correlation among secondary school students' perception of social learning environment, problem solving skills and performance competence in Chemistry.

Table 5 revealed the Pearson correlation coefficient among secondary school students' perception of social learning environment, problem solving skill and performance in Chemistry. A low positive correlation was found r (1420) = 0.03 p=0.00>0.05) indicating a no significant relationship between the three variables. The null hypothesis which stated that there is no significant correlation among secondary school students' perception of social learning environment, problem solving skill and performance in Chemistry was therefore not rejected. The inference drawn was that there was no significant correlation among secondary school students' perception of social learning environment, problem solving skill and performance in Chemistry.

Discussion of Findings

The finding revealed a low negatively relationship between students' perception of social learning and academic performance competence in Chemistry. Hence there was no significant relationship between students' secondary school students' perception of social learning environment scores and academic performance competence scores in Chemistry. The result is in line with Iweka (2017) who revealed a low mean perception and low negative perception between students' performance competence and classroom environment with no significant difference in integrated science but not in line with Kanmani and Nagarathinam (2017) who observed a low positive relationship between students' academic performance competence and their social learning environment using socio-cultural theory (SCT) by Vygostsky with no significant difference. The no significant relationship between

secondary school students' perception of social learning environment scores and performance scores in chemistry could be as a result that students most times they are some non stable situations in learning environment example playing around and been more interested in extracurricular activities than Chemistry learning.

The result revealed a low negative relationship between male and female students' perception of social learning and academic performance competence in Chemistry. Hence, there is no significant relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender. The result is support of Wordu (2014) findings who observed that a well-equipped and conducive learning environment with qualified teachers influence mechanical student's academic performance competence especially male and female students at high extent with no significant difference in gender group's opinion. By virtue of this finding, this research has joined the school of thought that relates a low negative relationship between male and female students' perception of social learning and academic performance competence in Chemistry and no significant relationship between secondary school students' perception of social learning environment and performance competence in Chemistry when moderated with gender.

The finding also shows a low positive relationship between students' problem- solving skill and performance competence scores in Chemistry. Hence, there was no significant relationship between secondary school students' problem-solving skill scores and performance competence scores in Chemistry. The finding was not in consonance with Ariniezca and Ikhsan (2020) who reported that students had a moderate positive relationship between attitude, performance and problem process skills in Chemistry. The results also not in line with Kanmani and Nagarathinam (2017) who observed that problem-solving skill of the higher secondary student was found to be on average and there was a high positive correlation and inter relationship between problem-solving skill, social learning and performance competence in Mathematics and in collaboration with Ariniezca and Ikhsan (2020) who reported that a moderate positive relationship exists between students' academic performance competence and their perception in problem solving skills in Chemistry.

The finding is also not in line with Mandina and Ochinogor (2018) who observed a statistical significant difference in correlation between students' performance competence and problem-solving skills in Mathematics. The low positive relationship between students' problem-solving skill and performance competence scores in Chemistry and no significant relationship between problem solving skill and academic performance competence in Chemistry secondary school students, could

be as a results of problem solving skills being impetus to success.

The result shows a low positive relationship between secondary school students' problem-solving skills scores and performance scores in Chemistry when moderated by gender. Hence, there is no significant relationship between secondary school students' problem-solving skills and performance in Chemistry when moderated with gender. The finding is in consonance with Ariniezca and Ikhsan (2020) who observed a no significant difference in relationship between students' academic performance competence and their perception in problem solving skill in Chemistry using problem-solving skill theory (PSST) and that of Wordu (2014) who observed no significant difference in gender group's opinion do to equal perception on problem solving skills the students.

The data from the study shows low positive relationship between secondary school students' perception on social learning environment scores, problem solving skills scores and performance competence scores in Chemistry scores. The inference drawn there is no significant relationship between secondary school students' perception of social learning environment, problem solving skill scores and performance competence scores in Chemistry. The findings of this result is not in line with the report of Kanmani and Nagarathinam (2017) who reported that problem-solving skill of the higher secondary student was found to be on average and there was a high positive correlation and inter relationship between problem-solving skill, social learning and performance in mathematics. By virtue of the finding, this study has joined the school of thought that postulated a no significant difference in relationship between secondary school students' perception of social learning environment, problem solving skill scores and performance competence scores in Chemistry.

Recommendations

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

1. Students should constantly make use of the available social learning environment, apply the problem-solving skills in their everyday problems to enable them have more insight to skills.
2. Chemistry teachers should endeavour to create and inculcate right problem solving skills to students to enable them have right attitude towards good academic performance competence.
3. Governments should provide adequate counseling services in schools to monitor students' academic performances competence towards their subjects.

Conclusion

It can be concluded among others that low negative relationship exists

between students' perception of social learning and academic performance competence in Chemistry but the relationship was not significant. Secondly, a low negative relationship between male and female students' perception of social learning and academic performance in Chemistry was concluded but no significant in relationship.

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