

# Social Learning Environment and Problem-Solving Technique on Science Education University Students' Attitudes: Does Gender Moderate the Relationship?

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**Abstract:** This investigation evaluated the social learning environment and problem solving technique on Science Education university students' (n=909) attitudes: do gender moderate the relationship? The study area is federal universities in Enugu and Ebonyi state, Nigeria. The methodology used in the study was correlation design. The Yamane sample size technique was used to draw the sample. The study was guided by four research questions and four hypotheses. The Social Learning Environment Questionnaire (SLEQ), the Problem Solving Techniques Inventory (PSTI), and the Student's Attitude Scale (SAS) were the three instruments used in data collection. The results indicated that attitudes about Science Education option courses and perceptions of the social learning environment among university students were moderate positively related ( $R=0.330$ ), the relationship is significant ( $P < .05$ ). More so, the result indicated that attitudes about Science Education option courses and perceptions of the social learning environment among university male students were low positively related ( $R = 0.039$ ). However, there is a significant difference in relationship ( $P < .05$ ). The result also revealed that attitudes about Science Education option courses and perceptions of the social learning environment among university female students were moderate positively related ( $R = 0.459$ ), however, a significant difference exists in the relationship ( $P > .05$ ). It is also revealed that there is a low positive relationship between university students' problem- solving techniques and attitude towards Science Education option subjects scores. ( $R= 0.171$ ), thus there is a significant difference in relationship ( $P < .05$ ). Finally, attitudes about Science Education option courses and problem-solving techniques among university male and female students were low positively. ( $R= 0.132$  male;  $R = 0.258$  female). As a result, the relationship is significant ( $P < .05$ ).

**Key words:** Science Education, Social Learning Environment, Problem- Solving Technique and Attitude

## **1. Introduction**

Through the dissemination of scientific ideas and practices to those who are not generally considered to be part of the scientific community, science education seeks to establish a society that is scientifically literate. Scientific Education, according to Abumchukwu et al. (2024) is the process of instructing and educating individuals in a place, especially in schools, to improve the individual environmental awareness and ability for methodical inquiry. Recalling that Scientific Education and its technological applications are among the best means of equipping every member of society to confront the dynamic nature of science in modern society is imperative. In Nigeria, there are numerous fields of science education that correspond to the curricula of secondary schools and universities. They are Integrated Science (Basic Science and Technology), Computer Studies, Data Processing, Chemistry, Biology, Physics and Mathematics. These are for both junior and senior secondary school curriculum in Nigeria. Physics, Chemistry, Biology, Mathematics, Integrated Science, Computer Science, Measurement and Evaluation are the courses taught in Nigerian universities. All of these courses are available as electives inside the Science Education Department, Faculty of Education, at most Nigerian Universities (Obikezie et al., 2023; Ochsen et al., 2023).

With this, it can be asserted that Science Education is centered on environmental research and environmental occurrences. It can also be said that it provides a natural link between the home, classrooms and gives individuals an opportunity to learn about the outside world. No wonder some studies opined that Science Education ought to emphasize the value of science to society and aid students in understanding their surroundings (Obikezie et al., 2023). The majority of these values are achieved by utilizing social learning environments. This is to say that Cultural, material, and human activities are all part of the social learning environment (Obikezie et al., 2023; Ochsen et al., 2023).

Social learning environment according to Assem et al. (2023) takes into account people's cultural and behavioral traits as well as the significance of emotion in learning. Human activities and material systems unite to generate the social learning environment, just as the physical environment and living things combine to form ecology (Ochsen et al., 2023). Because of this, learning in a physical setting fosters the development of students' problem-solving techniques by helping them to make ideas and information more tangible (Ngu et al., 2024).

Problem-Solving Techniques often known as PST. PST involves prioritizing, determining the underlying source of the problem, and selecting a treatment from a range of possibilities that may be unstable and require a deliberate approach (Adula et al., 2023). Also, Problem-solving techniques are characterized by several investigations conducted within the domain of technology-based education (Ngu et al., 2024). More so, Abumchukwu and Okigbo (2023) stated that PST comprises using generic or ad hoc approaches in an orderly manner to solve problems that, if learned, would positively affect the learner's attitude toward the learned material.

Attitude is an individual's actions, emotions, and mental processes. It is also a psychological construct, or mental and emotional experience that characterizes an individual, their viewpoint, or their method of problem-solving. More so, attitude is composed of ideas, viewpoints, and feelings. Students' viewpoints and feelings are reflected in their attitude toward learning. When a student is able to apply and understand what they have learnt in a social or outside of the classroom context, it can be advantageous to the student attitude (İlhan et al., 2024). This could be the reason why Hamer et al. (2024) averred that a learning mindset involves the evolution of curiosity as well as moral personality. These moral personalities could be used by university students in their social learning environments to learn specific science education topics or courses.

## **2. Literature Review**

### **2.1 Studies on Social Learning Environment and Problem-Solving Techniques**

Studies found a strong relationship between the attitudes of Asian university students pursuing Science Education and their perceptions of the social learning environment with no significant difference in relationship (Samuel & Mangoting, 2021). Khan et al. (2023) found a favorable connection between social environments of university students' motivation and engagement in Pakistan University toward Science Education. Abumchukwu and Okigbo (2023) claimed a favorable moderate positive relationship between social learning environment and secondary school students' attitudes in Chemistry. The authors further asserted a significant relationship between students' perception of social learning environment scores and attitudes towards Chemistry even when moderated with gender. Likewise, Oluwatosin and Ogbeba (2017) found a marginally positive relationship between male university students' attitudes and social learning in stoichiometry. Getie and Popescu (2020) discovered that male target language learners have positive attitudes towards the other educational context factor that is in the English textbook of grade 10 towards students' social setting for learning in Ethiopia. Sundawa et al. (2020) observed a strong relationship between students' attitudes toward and behaviors associated with entrepreneurship and how they perceive the social learning environment. This connection in relationship, is explained by how entrepreneurial sustainability 4.0 modes affect each female student's unique capacity for problem-solving technique.

Kurniawati et al. (2021) discovered a strong positive relationship (high positive relationship coefficient value) between the problem-solving skills of college students and their attitudes toward learning. After conducting more study, the researchers revealed a favorable association between students' learning outcomes and their capacity for problem-solving as well as a good relationship between students' learning outcomes and their attitudes toward science. Meanwhile, Inyang (2021) discovered, among other things, that applying problem-solving techniques significantly enhanced students' academic attitudes in secondary school science classrooms. While Anasufi et al. (2024) discovered a strong positive correlation ( $r = 0.69$ ) between problem-solving ability and student learning outcomes and/or achievement in the Asian continent irrespective of gender. Faradilla et al. (2020) found that an examination of observational and questionnaire data revealed that the learning environment and problem-solving techniques had a stronger positive relationship on the attitudes of female students than those of their male counterparts. However, attitudes, the social learning environment, and the problem-solving technique of female secondary science students were not found to differ by Gunawan et al. (2020). Thus, the degree of an individual's problem-solving technique and social learning environment may be determined by their attitude toward a particular issue, irrespective of gender. Additionally, Julius (2020) reported that there was not any discernible distinctions between male and female students' attitudes, problem-solving techniques, and social learning environments when it came to secondary school algebraic issues using the social learning theory (SLT). Because integrating SLT enhances understanding of the learning environment's impact on students, revealing gender-based differences in attitudes. This approach fosters targeted interventions, promoting inclusive educational strategies that align with students' experiential learning and social contexts, ultimately improving engagement and outcomes in Science Education (Julius, 2020). In contrast, Usman and Mandulili (2019) found a direct correlation between male and female students' attitudes, problem-solving techniques, and views of the social learning environment in junior secondary school science through the use of the Thorndike Problem-Solving Technique Theory (PSTT). This is because Problem-Solving Technique Theory (PSTT) can enhance comprehension of how problem-solving approaches influence students' attitudes towards Science Education. This connection allows for the identification of effective techniques that foster positive attitudes and engagement. Additionally, analyzing gender moderation can uncover tailored strategies that support diverse learning needs, ultimately leading to improved educational outcomes in science-related fields otherwise known as Science Education (Usman & Mandulili, 2019).

The problem statement highlights inconsistent findings in existing research regarding the relationships between problem-solving techniques, social learning environments, and university students'

attitudes towards Science Education. It emphasizes the need for further investigation, particularly considering gender differences. The study aims to address four key objectives: the relationship between attitudes and perceptions of the social learning environment, the impact of gender on these relationships, and the connection between problem-solving techniques and attitudes toward Science Education. Ultimately, the study seeks to clarify these relationships and provide answers to the research questions posed.

### **3. Research Questions**

1. What is the relationship between university students' perception of the social learning environment and attitude towards Science Education option subjects?
2. What is the relationship between university students' perception of the social learning environment and attitude towards science education option subjects when moderated with gender?
3. What is the relationship between university students' problem-solving technique and attitude towards Science Education option subjects?
4. What is the relationship between university students' problem-solving technique and attitude towards Science Education option subjects when moderated with gender?

The study tested the following null hypotheses at 0.05 level of significance:

1. There is no significant relationship between university students' perception of the social learning environment and attitude towards Science Education option subjects.
2. There is no significant relationship between university students' perception of the social learning environment and attitude towards Science Education option subjects when moderated with gender.
3. There is no significant relationship between university students' problem-solving technique and attitude towards Science Education option subjects.
4. There is no significant relationship between university students' problem-solving technique and attitude towards Science Education option subjects when moderated with gender.

### **4. Methodology**

The study used a correlation survey as its design. When examining the relationship between two or more factors without the investigator changing or modifying any one of them, correlation design is employed.

#### **4.1 Participants**

The study's focus was in federal universities in Enugu and Ebonyi state. All undergraduate students in the Science Education Department at these federal institutions were used, which amounted to 5691. This forms the study's population. The sample of the study consisted of 909 undergraduate students (303 males and 606 females). The sample was selected using Yamane 1967 standard formula, which stipulated that a population of 5000 to 5999 should have a sample size of 909 at  $\pm 3\%$ . See below figure in column size of population 5000.

**Figure 1**

*Precision Levels in Sampling (Yamane, 1967)*

**Table 1.** Sample size for  $\pm 3\%$ ,  $\pm 5\%$ ,  $\pm 7\%$  and  $\pm 10\%$  Precision Levels Where Confidence Level is 95% and  $P=.5$ .

Size of Population	Sample Size (n) for Precision (e) of:			
	$\pm 3\%$	$\pm 5\%$	$\pm 7\%$	$\pm 10\%$
500	a	222	145	83
600	a	240	152	86
700	a	255	158	88
800	a	267	163	89
900	a	277	166	90
1,000	a	286	169	91
2,000	714	333	185	95
3,000	811	353	191	97
4,000	870	364	194	98
5,000	909	370	196	98
6,000	938	375	197	98
7,000	959	378	198	99
8,000	976	381	199	99
9,000	989	383	200	99
10,000	1,000	385	200	99
15,000	1,034	390	201	99
20,000	1,053	392	204	100
25,000	1,064	394	204	100
50,000	1,087	397	204	100
100,000	1,099	398	204	100
>100,000	1,111	400	204	100

a = Assumption of normal population is poor (Yamane, 1967). The entire population should be sampled.

#### 4.2 Instrument for Data Collection

The Questionnaire on the Social Learning Environment Questionnaire (SLEQ), the Problem Solving Technique Inventory (PSTI), and the Students' Attitude Survey (SAS) were the three instruments employed in the study. The researchers adapted the SLEQ based on Myint SweKhine's "What is happening in the classroom questionnaire 2001. There are seven (7) groups that make up this model: cohesion among students, support from instructors, student participation, inquiry, task orientation, collaboration, and equity. Five-point rating system for responses was used which ranged from nearly never (1 point), infrequently (2 points), occasionally (3 points), frequently (4 points), to always (5 points).

Second instrument was PSTI which was adapted by the researchers from social learning inventory-revised (Abumchukwu & Okigbo, 2023). The following adaptations were made in the problem-solving skill inventory: Part A containing items eliciting information on bio data between the responders and Part B contained items eliciting information on problem-solving skills was modified and scale introduced ranging from Strongly Disagree (SD), Disagree (D), Agree (A), and 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.

The third instrument which is SAS was adapted from Salta and Tzougraki's Attitude Measurement Instrument (2004). The answer structure is a four-point scale with four possible outcomes: strongly agree (4 points), agree (3 points), disagree (2 points), and severely disagree (1 point). The total number of items is thirty (30). The three instruments were validated by three specialists. Two from the Department of Science Education and one from the Education Foundation (Evaluation and Measurement) from Nnamdi Azikiwe University in Awka. To test the consistency and the dependability of the three instruments adapted, SLEQ, PSTI and SAS were administered to 60 undergraduate students at a federal university in Anambra state Nigeria which is outside the area of study and reliability of 0.71, 0.86 and 0.73 where yielded using Cronbach alpha.

Data generated from the study was analyzed using simple linear regression. The R-value or correlation coefficient was used to determine the magnitude and direction of the relationship. The

interpretation of the correlation coefficient was according to Nworgu in Abumchukwu et al. (2024) provided a three-way guide for interpreting correlation coefficient values when a large number of pairs of scores have been correlated. They are as follows:  $r = \pm 0.80 - \pm 1.00$ , high positive or negative relationships;  $r = \pm 0.31 - \pm 0.79$ , moderate positive or negative relationship;  $r = \pm 0.00 - \pm 0.30$ , low positive or negative relationship. The R-squared value, known as the coefficient of determination was used to show the percentage variance in students' attitude that was explained by the relationship variables. The unstandardized beta coefficients were used to determine the relationship value of the variables which show the increase or decrease in attitude, for every unit rise in the relationship variable. The significance of the individual dimensions were tested using their F-values and P-values. The decision rule for accepting or rejecting the null hypotheses was to reject the null hypotheses whenever P value was less than or equal to 0.05 ( $P \leq 0.05$ ) and not to reject the null hypotheses whenever P value was greater than 0.05 ( $P > 0.05$ ).

## 5. Data Analysis

The result of this research was provided in accordance with the research questions and the hypotheses as follows.

### Research Question 1

What is the relationship between university students' perception of the social learning environment and attitude towards Science Education option subjects?

**Table 1**

*Pearson Correlation Coefficient for the Relationship between University Students' Perception of the Social Learning Environment and Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
SLEQ	909	0.330 <sup>a</sup>	0.109	.108	moderate relationship	9.09172
Attitude						

a. Predictors: (Constant), SLEQ

b. Dependent Variable: SAS

Table 1 reveals coefficients of the relationship between university students' perception of social learning environment and attitude towards Science Education option subjects as 0.330. This indicates that attitudes about Science Education optional courses and perceptions of the social learning environment among university students were moderate positively related. The coefficient of 0.330 is 0.109. This coefficient of determination indicates that 10.9% of university students accounted for the variation in their perception of the social learning environment in the Science Education option subject. This implies that 89.1% of variation in their social learning environment is attributed to other factors.

### Research Question 2

What is the relationship between university students' perception of social learning and attitude towards Science Education option subjects when moderated with gender?

**Table 2a**

*Pearson Correlation Coefficient of the Relationship between University Male Students' Perceptions of the Social Learning Environment and Their Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
SLEQ	303	0.039 <sup>a</sup>	0.002	-0.002	low relationship	10.01727
Attitude						

a. Predictors: (Constant), SLEQ

b. Unless noted otherwise, statistics are based only on cases for which GENDER = MALE.

c. Dependent Variable: SAS

Table 2a reveals coefficients of the relationship between university male students' perception of social learning environment and attitude towards Science Education option subjects as 0.039. This indicates that attitudes about Science Education optional courses and perceptions of the social learning environment among university male students were low positively related. The coefficient of 0.039 is 0.002. This coefficient of determination indicates that 0.2% of male university students accounted for the variation in their perception of the social learning environment in the Science Education option subject. This implies that 99.8% of variation in university male students' social learning environment is attributed to other factors

**Table 2b**

*Pearson Correlation Coefficient of the Relationship between University Female Students' Perceptions of the Social Learning Environment and Their Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
SLEQ	606	0.459 <sup>a</sup>	0.211	0.209	moderate relationship	8.21970
Attitude						

a. Predictors: (Constant), SLEQ

b. Unless noted otherwise, statistics are based only on cases for which GENDER = FEMALE.

c. Dependent Variable: SAS

Table 2b reveals coefficients of the relationship between university female students' perception of social learning environment and attitude towards Science Education option subjects as 0.459. This indicates that attitudes about Science Education optional courses and perceptions of the social learning environment among university female students were moderate positively related. The coefficient of 0.459 is 0.211. This coefficient of determination indicates that, 21.1% of female university students accounted for the variation in their perception of the social learning environment in Science Education option subjects. This implies that 78.9% of variation in university female students' social learning environment is attributed to other factors.

### Research Question 3

What is the relationship between university students' problem-solving techniques and attitude towards Science Education option subjects?

**Table 3**

*Pearson Correlation Coefficient for the Relationship between University Students Problem-Solving Techniques and Their Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
PSTI	909	0.171 <sup>a</sup>	0.029	.028	low relationship	9.48695
Attitude						

a. Predictors: (Constant), PSTI

b. Dependent Variable: SAS

Table 3 reveals coefficients of the relationship between university students' problem-solving techniques and their attitude towards Science Education option subjects as 0.171. This means there was a low positive relationship between university students' problem-solving techniques and attitude towards Science Education option subjects scores. This indicates that attitudes about Science Education option courses and perceptions of the problem-solving technique among university students were low positively related. The coefficient of 0.171 is 0.029. This coefficient of determination indicates that 2.9% of university students accounted for the variation in their perception of the problem-solving techniques in the Science Education option subject. This implies that 97.1% of variation in their problem-solving techniques is attributed to other factors.

### Research Question 4

What is the relationship between university students' problem-solving techniques and attitude towards Science Education option subjects when moderated with gender?

**Table 4a**

*Pearson Correlation Coefficient of the Relationship between University Male Students' Problem-solving Techniques and Their Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
PSTI	303	0.132 <sup>a</sup>	0.017	0.014	Low relationship	9.93790
Attitude						

a. Predictors: (Constant), PSTI

b. Unless noted otherwise, statistics are based only on cases for which GENDER = MALE.

c. Dependent Variable: SAS



Table 4a reveals coefficients of the relationship between university male students' problem-solving techniques and their attitude towards Science Education option subjects as 0.132. This indicates that attitudes about Science Education optional courses and problem-solving techniques among university male students were low positively related. The coefficient of 0.137 is 0.017. This coefficient of determination indicates that 1.7% of male university students accounted for the variation in their problem-solving techniques in the Science Education option subject. This implies that 98.3% of variation in university male students' problem-solving techniques is attributed to other factors than their attitude.

**Table 4b**

*Pearson Correlation Coefficient of the Relationship between University Female Students' Problem-solving Techniques and Their Attitude in Science Education Option Subjects*

Variables	N	R	R <sup>2</sup>	Adjusted R Square	Magnitude & Direction	Std. Error of the Estimate
PSTI	606	0.258 <sup>a</sup>	0.067	0.065	low relationship	8.93719
Attitude						

a. Predictors: (Constant), PSTI

b. Unless noted otherwise, statistics are based only on cases for which GENDER = FEMALE.

c. Dependent Variable: SAS

Table 4b reveals coefficients of the relationship between university female students' problem-solving techniques and their attitude towards Science Education option subjects as 0.258. This indicates that attitudes about Science Education option courses and problem-solving techniques among university female students were low positively related. The coefficient of 0.258 is 0.067. This coefficient of determination indicates that 6.7% of female university students accounted for the variation in their problem-solving techniques in the Science Education option subject. This implies that 93.3% of variation in university female students' problem-solving techniques is attributed to other factors than their attitude.

### Hypotheses

**Ho<sub>1</sub>:** There is no significant relationship between university students' perception of the social learning environment and attitude towards Science Education option subjects.

**Table 5**

*Regression ANOVA on Significance of Relationship of Perception of Social Learning Environment in Science Education Subjects by University Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	9131.590	1	9131.590	110.473	.000 <sup>b</sup>
Residual	74972.054	907	82.659		
Total	84103.644	908			

a. Dependent Variable: SAS

b. Predictors: (Constant), SLEQ

Table 5 shows that there is a significant relationship between university students' perception of social learning environment and attitude towards Science Education option subjects,  $F(1,907) = 110.473$ ,  $P < .05$ . The null hypothesis was therefore rejected implying that relationship exist between university students' perception of social learning environment and attitude towards Science Education option subjects.

**H<sub>02</sub>:** There is no significant relationship between university students' perception of social learning and attitude towards Science Education option subjects when moderated with gender.

**Table 6a**

*Regression ANOVA on Significance of Relationship of Perception of Social Learning Environment in Science Education Subjects by University Male Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	47.028	1	47.028	.469	.494 <sup>c</sup>
Residual	30204.048	301	100.346		
Total	30251.076	302			

a. Dependent Variable: SAS

b. Selecting only cases for which GENDER = MALE

c. Predictors: (Constant), SLEQ

Table 6a shows that there is no significant difference in relationship between university male students' perception of social learning environment and attitude scores in Science Education subjects,  $F(1,301) = .469$ ,  $P > .05$ . The null hypothesis was therefore upheld implying that relationship do not exist between university male students' perception of social learning environment and attitude towards Science Education option subjects.

**Table 6b**

*Regression ANOVA on Significance of Relationship of Perception of Social Learning Environment in Science Education Subjects by University Female Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	P value
Regression	10881.263	1	10881.263	161.052	.000 <sup>c</sup>
Residual	40808.330	604	67.563		
Total	51689.592	605			

- a. Dependent Variable: SAS  
b. Selecting only cases for which GENDER = FEMALE  
c. Predictors: (Constant), SLEQ

Table 6b shows that there is a significant difference in relationship between university female students' perception of social learning environment and attitude scores in Science Education subjects,  $F(1,604) = 161.052, P < .05$ . The null hypothesis was therefore rejected implying that relationship do exist between university female students' perception of social learning environment and attitude towards Science Education option subjects.

**Ho<sub>3</sub>:** There is no significant relationship between university students' problem-solving technique and attitude towards Science Education option subjects.

**Table 7**

*Regression ANOVA on Significance of Relationship of Problem-Solving Technique in Science Education Subjects by University Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	P value
Regression	2471.649	1	2471.649	27.462	.000 <sup>b</sup>
Residual	81631.995	907	90.002		
Total	84103.644	908			

- a. Dependent Variable: SAS  
b. Predictors: (Constant) PSTI

Table 7 shows that there is a significant difference in the relationship between university students' problem-solving techniques and attitude scores in Science Education subjects,  $F(1,907) = 27.462, P < .05$ . The null hypothesis was therefore rejected implying that relationship exist between university students' problem-solving techniques and attitude towards Science Education option subjects.

**Ho<sub>4</sub>:** There is no significant relationship between university students' problem-solving techniques and attitude towards Science Education option subjects when moderated with gender.

**Table 8a**

*Regression ANOVA on Significance of Relationship of Problem-Solving Techniques in Science Education Subjects by University Male Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	523.750	1	523.750	5.303	.022 <sup>c</sup>
Residual	29727.326	301	98.762		
Total	30251.076	302			

- a. Dependent Variable: SAS
- b. Selecting only cases for which GENDER = MALE
- c. Predictors: (Constant), PSTI

Table 8a shows that there is a significant relationship between university male students' problem-solving techniques and their attitude scores in Science Education subjects,  $F(1,301) 5.303, P < .05$ . The null hypothesis was therefore rejected.

**Table 8b**

*Regression ANOVA on Significance of Relationship of Problem-Solving Techniques in Science Education Subjects by University Female Students' Attitude*

Model	Sum of Squares	df	Mean Square	F	P value
Regression	3446.063	1	3446.063	43.144	.000 <sup>c</sup>
Residual	48243.529	604	79.873		
Total	51689.592	605			

- a. Dependent Variable: SAS
- b. Selecting only cases for which GENDER = FEMALE
- c. Predictors: (Constant), PSTI

Table 8b shows that there is a significant relationship between university female students' problem-solving techniques and their attitude scores in Science Education subjects,  $F(1,604) 43.144, P < .05$  the null hypothesis was therefore rejected.

## **6. Discussion of Findings**

The results indicated that attitudes about Science Education option subjects and perceptions of the social learning environment among university students were moderately positively related, which when tested proved statistically significant. This research shows that undergraduate students' perceptions of the social learning environment have a significant impact on how they perceive Science Education option courses, and that perceptions of social learning can explain why undergraduate students' attitudes vary across Science Education courses. The findings of this study support those of previous research by Khan et al. (2023) who found a favorable connection between social environments of university students' motivation and engagement in Pakistan University toward Science Education. The finding is also in line with Abumchukwu and Okigbo (2023) who claimed a favorable moderate positive relationship between social learning environment and secondary school students' attitudes in Chemistry. But the finding is not in consonance with Samuel and Mangoting (2021) who found a strong relationship between the attitudes of Asian university students pursuing Science Education and their perceptions of the social learning environment. But in line with the authors' observation in terms of relationship is significant (Samuel & Mangoting, 2021). By the virtue of this study, which has added to the body of knowledge, the researchers' affirmed that the relationship between attitudes of university students towards Science Education option subjects and their social learning environment is moderately positive and when tested, proved significant.

The result revealed that attitudes about Science Education option courses and perceptions of the social learning environment among university male students were low positively related. However, there is no significant relationship. The result also showed that attitudes about Science Education option courses and perceptions of the social learning environment among university female students were moderately positively related. However, significant relationships exist. The findings are not in line with Sundawa et al. (2020) who observed a strong relationship between students' attitudes toward and behaviors associated with entrepreneurship and how they perceive the social learning environment. But one of the findings is in line with Oluwatosin and Ogbaba (2017) who found a marginally positive relationship between male university students' attitudes and social learning in stoichiometry. The findings are in line with Getie and Popescu (2020) discovered that male target language learners have positive attitudes towards the other educational context factor that is in English textbook of grade 10 towards students' social setting for learning in Ethiopia. This conclusion of the findings are further supported by Abumchukwu and Okigbo (2023) who asserted a significant relationship between students' perception of social learning environment scores and attitudes towards Chemistry even when moderated with gender (female) but not in line in male students' findings. By the virtues of these observations, this study has joined the body of knowledge that revealed that attitudes about Science Education option courses and perceptions of the social learning environment among university male students were low positively related. However, not significant in relationship and that attitudes about Science Education option courses and perceptions of the social learning environment among university female students were moderate positively related. However, there is a significant relationship.

The data from the result also shows a low positive relationship between university students' problem-solving techniques and attitude towards Science Education option subjects scores. Thus, a significant relationship exists. This finding is not in conformity with Kurniawati et al. (2021) who discovered a strong positive relationship (high positive relationship coefficient value) between the problem-solving skills of college students and their attitudes toward learning. But the finding is in conformity with Inyang (2021) who discovered that problem-solving techniques significantly enhanced students' academic attitudes in secondary school science classrooms. By the rise of this finding, this study has joined the group of knowledge that discovered a low positive relationship between university students' problem-solving techniques and attitude towards Science Education option subjects' scores with a significant difference in the relationship.

Finally, the study revealed that attitudes about Science Education option courses and problem-solving techniques among university male and female students were low positively related. However, there is a significant difference in relationships. The finding of the study is not in line with Anasufi et al. (2024)

who discovered a strong positive correlation ( $r=0.69$ ) between problem-solving ability and student learning outcomes and/or achievement in the Asian continent irrespective of gender. The finding of the study is also not in conformity with Faradilla et al. (2020) who revealed that the learning environment and problem-solving techniques had a stronger positive relationship on the attitudes of female students than those of their male counterparts. But the finding is in line with Usman and Mandulili (2019) who found a direct correlation between male and female students' attitudes, problem-solving techniques, and views of the social learning environment in junior secondary school science through the use of the Thorndike Problem-Solving Technique Theory (PSTT).

The findings of this study could be as result that SLT enhances understanding of the learning environment's impact on students, revealing gender-based differences in attitudes or due to the fact that Problem-Solving Technique Theory (PSTT) can enhance comprehension of how problem-solving approaches influence students' attitudes towards Science Education, which the connection allows the identification of effective techniques that foster positive attitudes and engagement in learning (Gunawan et al.,2020; Julius, 2020; Usman & Mandulili, 2019).

## 6. Conclusion

Among other things, it can be affirmed that attitudes toward Science Education choice courses and how university students perceive social learning are slightly positively related. As a result, the relationship is significant. Second, a weak positive relationship was discovered between the perception of social learning and university students' attitudes toward Science Education option subjects, even though the relationship was not statistically significant. Furthermore, although there was a slight positive relationship, there was no significant relationship between university students' attitudes and their problem solving technique in the Science Education option subject scores.

## 7. Co-Author Contribution

There is no conflict of interest in this article, according to the authors. Obikezie, M.C, Ekoyo, D.O, Onyeka, E.C, Abumchukwu, A.A and Awosika, O. F thought through, organized, penned, and contributed to the data's statistical analysis while Okafor-Agbala,U.C, Egolum, E. O, Enebechi, R.I, Chikendu, R. E, and Eke, J .A devoted time to the literature review. Each contributor offered suggestions and helped to shape the research, analysis, and writing.

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