



**SOCIAL INTELLIGENCE AS A PREDICTOR OF SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN CHEMISTRY IN CROSS RIVER STATE, NIGERIA**

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### Abstract

The study investigated social intelligence as a predictor of secondary school students' academic achievement in Chemistry in Cross River state, Nigeria. The study was guided by two research questions and two null hypotheses. The study adopted the predictive correlation research design. The population of the study was 6, 376 senior secondary two (SS2) students of Chemistry in the public secondary schools in Cross River State, from which 800 students were sampled for the study. The instrument for data collection was the Tromsø Social Intelligence Scale (TSIS), validated by three experts. The reliability the instrument was established using Cronbach Alpha with coefficient of internal consistency of 0.79. The instrument was administered to the students with the help of six research assistants. The data obtained was analyzed using simple and multiple linear regressions. The findings of the study revealed among others that 0.6percent of the variance in students' Chemistry scores is predicted by social intelligence. Furthermore, achievement in chemistry were significantly predicted by social intelligence  $F(1, 2799) = 4.487, p < .05$ . It was recommended among others that, teachers should incorporate more collaborative and interactive activities in Chemistry classrooms to enhance students' social skills.

**Keyword:** Achievement, Chemistry, Social Intelligence, Social Skills

### Introduction

Chemistry as a subject pose unique challenges due to its abstract concepts, mathematical requirements, and practical applications. Despite the vital role Chemistry plays in preparing students for careers in science, engineering, and health-related fields, many students struggle to achieve proficiency, as evidenced by their academic achievement which have not satisfactorily met expectations notwithstanding some improvements over the years. This issue raises concerns about the factors contributing to such outcomes. Existing interventions have predominantly focused on improving teaching methodologies, with little attention given to students' personal and social competencies that contribute to chemistry learning.

Chemistry is the scientific study of the composition, structure, properties, and changes of matter (Brown, LeMay, Bursten, Murphy and Woodward, 2018). It explores interactions at the atomic and molecular levels, forming the basis for various scientific and industrial



applications (Chang and Goldsby, 2020). Chemistry is integral to the advancement of society due to its applications in medicine, agriculture, energy, and environmental conservation. Its principles and practices are foundational for solving complex global challenges, including drug synthesis, food preservation, and developing sustainable technologies. Despite its importance, students often indicate poor interest in the subject and show low proficiency in critical areas of the subject, attributed to a lack of foundational understanding and poor instructional methodologies (Osuafor and Okonkwo, 2019). The problem raises concerns, as chemistry's role is critical in fostering scientific literacy and technological progress. Several factors contribute to the challenges students face in achieving high academic achievement score in chemistry with the instructional methods adopted by teachers standing out as most prominent. Thus, most educational studies on how to improve students' understanding of the concepts in chemistry with a view to improve their academic achievement is often geared towards innovative instructional methods. However, the academic achievement of students in chemistry often demands sustained effort, adaptability, and effective interpersonal collaboration often related to psychological variables such as social intelligence.

Social intelligence according to Sanwal and Sareen (2022) refers to the ability to effectively navigate and negotiate complex social environments and relationships. It encompasses understanding and managing one's own and others' emotions, behaviours, and interpersonal dynamics to facilitate effective communication and interaction. Socially intelligent students are better equipped to collaborate in group projects, seek help from peers and teachers, and navigate the social dynamics of the classroom (Akanni and Oduaran, 2018). In a collaborative subject like chemistry, where teamwork and communication are often necessary during laboratory exercises, social intelligence can significantly influence outcomes. This is because students with high social intelligence can overcome the abstract nature of chemistry concept through social interactions. The Tromso Social Intelligence Scale (TSIS) identifies three core dimensions of social intelligence: social information processing, social skills and social awareness.

Social information processing measures the capacity to understand and interpret social cues, both verbal and non-verbal, such as empathy, emotional tone, and underlying intentions in communication. It emphasizes accurately reading and decoding messages within interpersonal interactions (Chater, Zohbi, Alobaidi & Abdennadher, 2023). Social skills involves the ability to initiate, maintain, and manage social relationships effectively. It includes active listening, assertiveness, conflict resolution, and adaptability in diverse social settings,



enabling individuals to build and sustain meaningful interactions (Lathesh & Avadhani, 2018). Social awareness dimension focuses on sensitivity to social contexts, norms, and dynamics. It measures the ability to act appropriately in varying situations by understanding the expectations and emotional climate of the academic environment (Chater *et al.*, 2023; Sanwal & Sareen, 2022), which can be peculiar from one Nigeria state to the other.

More so, while each social intelligence may predict academic outcomes, its predictive effect on students' achievement in Chemistry in Cross River state has yet to be widely established. The contribution of the individual dimensions of the social intelligence to academic achievement in chemistry is not also widely understood. This gap in understanding hinders the development of an improved and holistic targeted intervention to boost students' achievement to reach the comparable standards seen in developed countries. Therefore, there is need to explore the role of social intelligence in predicting the academic achievement of students in Chemistry among secondary school students in the Cross River State. This study sought therefore, to address this problem and gap in knowledge by examining the predictive effect of social intelligence in determining secondary school students' academic achievement in Chemistry to inform educators, policymakers, and stakeholders about the importance of fostering these non-cognitive skills to enhance learning outcomes.

### **Purpose of the Study**

The purpose of the study is to investigate social intelligence as a predictor of secondary school students' academic achievement in Chemistry in Cross River state, Nigeria. The study specifically investigated the;

- 1 Predictive value of social intelligence on students' academic achievement scores in Chemistry;
- 2 Relative contribution of the dimensions of social intelligence (social information processing, social skill, and social awareness) to prediction of students' academic achievement in Chemistry.

### **Research Questions**

The following research questions guided the study:

1. What is the predictive value of social intelligence on students' academic achievement scores in Chemistry?
2. What are the relative contributions of the dimensions of social intelligence (social information processing, social skill, and social awareness) to prediction of students' achievement in Chemistry?



## Hypotheses

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

1. Social intelligence is not a significant predictor of students' academic achievement scores in Chemistry.
2. The relative contributions of the dimensions of social intelligence (social information processing, social skill, and social awareness) to prediction of academic achievement scores in Chemistry is not significant.

## Method

This study used the predictive correlational research design. A correlational study entails the collection of data to examine the existence and strength of relationships between two or more measurable variables. Nworgu (2015) conceptualized correlational research as the process of identifying relationships among variables. The study was conducted in Cross River State. The state serves as the geographical context for this study. Cross River State, situated in the South-South geopolitical zone of Nigeria and is home to numerous secondary schools, both public and private, with approximately 303 schools registered under the Ministry of Education in Cross River State. The population of the study consisted of 6, 376 (3, 203 Males, 3, 189 Females) senior secondary year two (SS2) students offering Chemistry in the year 2024/2025 academic session in the public secondary schools in Cross River State. The sample for this study comprised 800 Senior Secondary Two (SS2) students offering Chemistry in selected secondary schools obtained using a multi-stage sampling procedure involving stratified, simple random, proportionate and systematic random sampling. The schools within the Cross River State was stratified based on their location (urban and rural) to ensure that both urban and rural schools are proportionally represented in the study. Within each stratum, a random selection of secondary schools was conducted to ensure unbiased representation of schools. From each selected school, a proportionate number of SS2 students offering Chemistry was randomly chosen to ensure that the sample reflects the overall distribution of students in each school. In cases where the number of Chemistry students in a selected school exceeds the required proportion, systematic random sampling was applied to pick students from the class list at regular intervals.

The instrument for data collection was the Tromsø Social Intelligence Scale (TSIS) is a self-report questionnaire adapted from Silvera, Martinussen, and Dahl (2001) to assess social intelligence. The TSIS is designed to measure an individual's general social intelligence, encompassing multiple components of social functioning and social understanding. It provides



an overall score as well as scores for specific aspects of social intelligence, making it a comprehensive tool for understanding how individuals engage socially.

The TSIS consists of 21-items and includes the following three key dimensions of social intelligence:

1. **Social Information Processing (SIP):** This dimension (items 1, 2, 6, 9, 14, 17, and 19) assesses how well an individual processes social information, including their ability to understand social cues and accurately interpret others' emotions and intentions. It measures the cognitive aspect of social intelligence.
2. **Social Skills (SS):** This dimension (items: 4, 7, 10, 12, 15, 18, and 20) focuses on the individual's capacity to effectively interact with others in a social context. It evaluates one's ability to use social knowledge and understanding to navigate social situations successfully, emphasizing verbal and non-verbal communication, persuasion, and social engagement.
3. **Social Awareness (SA):** Social awareness refers to the ability to understand and be sensitive to the emotions, motives, and intentions of others. This dimension (items: 2, 5, 8, 11, 13, 16, and 21) assesses empathy, emotional sensitivity, and the capacity to adjust one's behavior to fit social norms or the needs of others.

These three dimensions combine to provide a comprehensive assessment of social intelligence, reflecting both cognitive and behavioral aspects of social functioning. The TSIS consists of 21 items, which are rated on a 7-point scale ranging from 1 (describes me extremely poorly) to 7 (describes me extremely well). The total score is the sum of the responses across all 21 items, yielding a possible total score range from 21 to 147, where higher scores indicate higher levels of social intelligence interpreted as follows:

- i. **Low social intelligence:** Scores closer to 21, indicating lower proficiency in understanding and engaging in social situations.
- ii. **Average social intelligence:** Scores around the mid-range (approximately 53-75), suggesting moderate social understanding and ability to interact.
- iii. **High social intelligence:** Scores closer to 105 and above, indicating strong social understanding, empathy, and effective interpersonal skills.

The students' scores in Chemistry was gathered using a proforma which is a record sheet with columns and rows for recording the students' results. Their results in Chemistry for one academic year was obtained and the mean was computed and used as students' academic achievement. The instrument was validated by two lecturers from Nnamdi Azikiwe University's Department of Science Education and one from the Department of Education



Foundations (Measurement and Evaluation Unit). The reliability of the TSIS which is a polytomous scales, was re-evaluated through Cronbach's Alpha technique which yielded a coefficient of internal consistency of 0.79.

Six research assistants, who are colleagues of the researcher, administered the instruments in collaboration with Chemistry teachers from the selected schools. After receiving a detailed briefing from the researcher on the study's objectives and data collection procedures, the research assistants accompanied the researcher to each school. Upon arrival, they sought permission from the appropriate Head of Department before retrieving students' Chemistry scores from the most recent academic year. These scores were systematically organized, with serial numbers assigned to each instrument to ensure that students' responses are matched with their corresponding Chemistry scores. To maximize the response rate, the instruments was administered directly to the students by the researcher, the research assistants, with the assistance of the Chemistry teachers in the schools involved. The instruments were collected immediately after completion to ensure prompt and accurate data collection. Once the data collection was completed, the researcher reviewed the instruments, consolidated the students' responses with their Chemistry scores, and prepared the data for analysis. The data from the study was analyzed using simple linear and multiple regression techniques. All null hypotheses was tested at a 0.05 significance level; a P-value of 0.05 or less ( $P \leq 0.05$ ) led to the rejection of the null hypothesis, whereas a P-value greater than 0.05 ( $P > 0.05$ ) resulted in its retention.

## Results

**Research Question 1:** What is the predictive value of social intelligence on students' academic achievement scores in Chemistry?

**Table 1:** Prediction of Students' Achievement score in Chemistry by Social Intelligence

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	Unstandardized coefficients (B)	Std. Error
Constant				78.864	11.419
Social Int.	.075 <sup>a</sup>	.006	.004	.085	

a. Predictors: (Constant), Social Intelligence

Table 1 shows that the R-Square value of 0.06 indicates that 0.6percent of the variance in Chemistry scores is predicted by social intelligence. The unstandardized coefficient of 0.085 shows that a unit rise in social intelligence increases academic achievement score in Chemistry by 8.5%.



**Research Question 2:** What are the relative contributions of the dimensions of social intelligence (social information processing, social skill, and social awareness) to prediction of students' achievement in Chemistry?

**Table 2:** Contributions of the Dimensions of Social Intelligence in the Prediction of Achievement scores in Chemistry

Model	Unstandardized Coefficients	Std. Error	Standardized Coefficients	t	Pvalue
(Constant)	75.458	4.493		16.793	.000
Social Information Processing	.158	.098	.057	1.610	.108
<sup>1</sup> Social Skills	.198	.092	.076	2.141	.033
Social Awareness	.143	.074	.068	1.934	.053

a. Dependent Variable: Chemistry Achievement score

Table 2 shows that, a unit rise in social information processing increase academic achievement score in Chemistry by 15.8% and a unit rise in social skills increase academic achievement score in Chemistry by 19.8% whereas a unit rise in social awareness increases academic achievement in Chemistry by 14.3%. The order of relative contribution to achievement score in Chemistry from the highest to lowest by each dimension of social intelligence therefore is; social skills (19.8%), social information processing (15.8%) and then social awareness (14.3%).

**Hypothesis 1:** Social intelligence is not a significant predictor of students' academic achievement scores in Chemistry.

**Table 3:** Significance of Prediction of Achievement score in Chemistry by Social Intelligence

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	585.000	1	585.000	4.487	.034 <sup>b</sup>
<sup>1</sup> Residual	104047.789	798	130.386		
Total	104632.789	799			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Social Intelligence

Table 3 shows that social intelligence significantly predicts achievement scores in Chemistry,  $F(1, 2799) = 4.487, p < .05$ . The null hypothesis was therefore rejected meaning that the social intelligence significantly predicts of students' academic achievement in Chemistry. Since social intelligence significantly predicts of achievement scores in Chemistry, the regression model ( $Y = a + bX$ ) for the prediction of achievement score in Chemistry as



derived from Table 1, where constant = 78.864, a value = .085 is  $ASC = 78.864 + 0.085 (SI)$   
 Where, ASC = Achievement score in Chemistry and SI = Social Intelligence

**Hypothesis 2:** The relative contributions of the dimensions of social intelligence (social information processing, social skill, and social awareness) to prediction of academic achievement scores in Chemistry is not significant.

**Table 4:** Significance of Prediction of Achievement score in Chemistry by Dimensions of Social Intelligence

Model	Sum of Squares	df	Mean Square	F	Pvalue
Regression	1435.764	3	478.588	3.692	.012 <sup>b</sup>
1 Residual	103197.025	796	129.645		
Total	104632.789	799			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Social Awareness, Social Information processing, Social skill

Table 4 shows that the dimensions of social intelligence significantly predict achievement scores in Chemistry,  $F(3, 799) = 3.692, p < .05$ . The null hypothesis was therefore rejected meaning that the dimensions of social intelligence significantly predicts of students' academic achievement in Chemistry.

However, data contained in Table 4 shows the significance of the contributions of the individual dimensions to the prediction of achievement scores in Chemistry. Table 6 shows that social information processing is not a significant predictor of achievement scores in Chemistry,  $t(3, 799) = 1.610, p > 0.05$ , social skills is a significant predictor of achievement scores in Chemistry,  $(3, 799) = 2.141, p < 0.05$  and social awareness is not a significant predictor of achievement scores in Chemistry,  $(3, 799) = 1.934, p > 0.05$ . Since the all the dimensions of social intelligence jointly predicted achievement scores in Chemistry, the regression model ( $Y = a + bX_1 + cX_2 + dX_3$ ) for the prediction of achievement score in Chemistry as derived from Table 2, where constant = 75.458, a value = .158, b value = .198 and c value = .143 is:

$$ASB = 75.458 + 0.158 (SIP) + 0.198 (SS) + 0.143 (SA)$$

Where, ASB = Achievement score in Chemistry and SI = Social information processing, SS = Social skills and SA = Social Awareness

### Discussion

The result of the study shows that social intelligence significantly predicts students' achievement in Chemistry, indicating that students who demonstrate higher levels of social intelligence tend to perform better academically in the subject. Chemistry, while cognitively



demanding, often requires collaboration, discussion, and group-based problem-solving in laboratory and classroom settings. Students with strong social intelligence may be better positioned to engage meaningfully with peers and teachers, seek clarification when needed, and participate actively in cooperative learning environments, all of which can enhance their understanding and academic performance.

This finding aligns with the work of Adebayo and Alabi (2016), who emphasized the role of social-emotional skills in promoting academic success through improved classroom engagement and peer collaboration. It also supports the view of Odu and Williams (2017) that social intelligence fosters learning by strengthening communication and reducing classroom anxiety. Within the context of science education in Nigeria, where group-based activities and teacher-student interaction are key components of instruction, the role of social intelligence becomes even more pronounced in shaping academic outcomes.

The finding that social skill is the only dimension of social intelligence that significantly contributes to students' achievement in Chemistry suggests that the ability to effectively interact, communicate, and collaborate with others plays a crucial role in academic success in Chemistry. Social intelligence while it encompasses various dimensions, such as social awareness and empathy, the study highlights that it is the practical ability to engage in meaningful social interactions that most strongly influences Chemistry achievement. Chemistry, being a subject that often involves group work, laboratory experiments, and collaborative problem-solving, may help students to develop the ability to express ideas clearly, ask questions, and work cooperatively with peers and instructors. Students with strong social skills are more likely to engage in discussions, seek help when needed, and contribute to group activities, all of which can enhance their understanding of complex concepts and improve their performance.

This finding is consistent with research by Ojo and Adegboye (2020) who emphasized that emotional regulation which is a key component of social skill are essential for academic success, particularly in science education, where teamwork and problem-solving are often integral to the learning process. Additionally, the result aligns with Johnson and White's (2019), who found that students with higher social skills tend to experience more positive academic outcomes, particularly in environments that require active participation and group work. In the secondary schools, where group-based learning activities are common in the teaching of Chemistry, the ability to navigate social dynamics effectively may be particularly beneficial. This suggests that fostering social skills in students could be an important strategy



for enhancing achievement in Chemistry, especially in classrooms where collaboration is key to understanding and applying scientific concepts.

### Conclusion

The conclusion drawn from the findings is that social skill within the broader concept of social intelligence is the most significant contributor to students' achievement in Chemistry. This underscores the importance of students' ability to effectively communicate, collaborate, and engage with peers and instructors, which plays a crucial role in enhancing their academic performance in Chemistry.

### Recommendations

Based on the findings, it was recommended that:

1. Teachers should incorporate more collaborative and interactive activities in Chemistry classrooms to enhance students' social skills.
2. School programs should include training that supports the development of effective communication and interpersonal skills among students.
3. Educational stakeholders should recognize the role of social skill development as part of academic support strategies, especially in science subjects like Chemistry

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