

Predicting students' academic achievement in biology: The contributions of social intelligence and its dimensions

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ABSTRACT

The drive to identify psychological conditions that influence students learning outcomes, and thus proffer solutions, prompted the study on the predictive role of social intelligence (SI) on secondary school students' academic achievement in biology, applying a predictive correlational research design. 1,198 high school students, obtained using multistage sampling procedure, were the respondents. Social intelligence scale (SIS) and students academic records were employed for data collection. Adapted SIS yielded a reliability coefficient value of 0.79 with Cronbach's alpha estimation. Regression analyses were utilized to analyze data. The results revealed that SI accounted for 36.2% of the variance in students' achievement in biology, indicating that SI as well as its dimensions (social awareness, social skills, and social information processing skills) positively and significantly contributed to students' achievement in biology. Considering the findings, it was recommended that education stakeholders should organize periodic trainings and orientation programs to educate teachers on strategies that can be adopted to promote acquisition of SI skills among students.

Keywords: academic achievement, biology, secondary school students, social intelligence

INTRODUCTION

Academic achievement (AA) often interchangeably used as academic success, in education today, has continued to assume more importance owing to the fact that it assists investors in education, at all educational tiers, determine how well learning targets are attained, informing them on what knowledge the benefactors have acquired, how well they understand the knowledge they have acquired, and what they still need to acquire. Iviemu (2021) posited that AA is a measure of the quality of education, the efficacy of schools, and the degree of academic success of students and the country, as a whole. Ikwuka and Samuel (2017), in their study, opined that AA is a learning product that shows the degree at which a learner, instructor or an organization has attained her instructional targets, usually ascertained through examinations or tests. It is a result from output demonstrating how far a learner has come towards attaining the targets of a task, in any kind of learning environment (Suleiman, 2023). From the forgone, it is safe to say that the term "AA" is the end product of one's exposure to a planned academic experience.

As a learning outcome that drives assessment and evaluation, Susheela (2017) expressed that academic success is

crucial since it is closely associated with favorable results and principles, as students who succeed academically have greater opportunities for the future. That is, higher self-esteem and healthy family, greater chances of employment, good mental balance and social relationship, and most importantly, are less inclined to participate in deviant behavior. Chapagai (2024) reported that high AA directs individuals to refine their personality skills, serves as a source of encouragement, stimulates further activity, gives meaning to one's life and also leads to improve one's self-respect while a low achievement may serve as a source of discouragement and at times, even leads to nervous breakdowns as it inculcates inferiority complex in students. Similar to this, Tshewang (2015) reaffirmed that AA defines employment opportunities because learners with excellent grades or good academic standings, on graduation, are often provided with greater chances to select their prospective careers and earn more lucrative salaries, hinting that while greater AA has many positive effects, low AA may have detrimental effects on learners, instructors, and the country, as a whole. Considering this great emphasis placed on AA, researchers, in efforts to maximize academic output, are in constant struggle to identify variables, both environmental and personal, that could be influenced by academic gains. In the course of literature review, we identified social intelligence (SI) as a student-related (non-

cognitive) variable that play a significant role in students sustaining social relationships in efforts to meet academic demands and thus, was motivated to determine its predictive role on AA of students.

SI, synonymously termed “social intelligence quotient” or “social radar”, is simply the ability to interact well with others, and get them to cooperate with you. Raj and Komalavalli (2022) defined it as the awareness of social dynamics, collaboration techniques and approaches that can assist someone in achieving their goals when interacting with others. Academically, Nwuba and Okoli (2025) describes SI as a learner’s capability to perceive and leverage obscure aspects of an interpersonal setting, with the aim to persuade or entice a communicative partner, to indirectly accomplish academic goals while avoiding conflict with the partner. As a concept rooted in cognition and human behavior, Kanimozhi and Vasimalairaja (2018), in their study, recognized the skills of communication, social roles and rules, understanding the motivation of others and impression management as the key components that drive SI. In the same vein, Silvera et al. (2001) cited in Odofin (2022) posited that SI is a complex concept with close relation to cognitive and emotional intelligence, merging the skills of SI into three core dimensions of; self-awareness skills/ interpersonal sensitivity (the capacity to identify one’s emotions, comprehend one’s emotional responses, and how they affect behavior and performance), social skills (SS)/facilitation (capacity to perceive another person’s emotions or understand their thoughts and intentions, fostering efficient interpersonal interaction) and social information processing skills (SIPS) (the ability to modify both individual and collective behavior to fit into a dominant social class).

A solid grasp of SI dimensions intimates one that, when fostered, the attribute aids mental activities, decision making and communication, making it an invaluable adaptability trait for fostering AA, balancing one’s affairs, strengthening social ties, and succeeding across all domains. Supporting the premise, Sini and Amalraj (2019) reported that SI is a crucial component of schooling since it helps students develop positive interpersonal relationships, behave tactfully, prosper in life, resolve societal issues and take on a variety of civic responsibilities. Similarly, Purwanti and Norviana (2019) noted that individuals possessing a significant degree of SI have the ability to solve problems, establish relationship (interactions), show genuineness and empathy, communicate, and synchronize, which are indicators of autonomy, self-awareness and personal development. In a similar spirit, Lyngdoh (2019) observed that socially gifted people not only possess the ability to persuade others, communicate effectively, and successfully bargain, but they also have the ability to manage interpersonal connections, which can influence others to do things their way. Al-Kfaween (2019) explained that learners with a high degree of SI are bound to possess a good attitude toward both themselves and other people since they will never want to denigrate anyone and will instead assist them in leading an optimistic and productive life. Summarizing, Nawaz (2021) posited that socially savvy people have little trouble making others feel at ease and included to share ideas, harnessing their talents to achieve economic growth and technical development.

Recognizing the contributions of SI to learning outcomes, numerous empirical investigations have been conducted to determine the impact and connection between students’ learning outcomes and SI. For instance, Sreeja and Nalinilatha (2017) examined the association between SI and AA among secondary school students in Palakkad District Kerala, India, adopting a survey research method. The study concluded that no significant association exists between SI and AA of high school students, revealing that schools do not offer a suitable setting for pupils to develop their SI. In another study, Obilor and Ikpa (2019) ascertained the correlation between AA of school students and their SI in River State, Nigeria. Employing a correlational research design and using 240 respondents, the outcomes revealed that SI dimensions and students’ AA are significantly related. Yan-Carlo (2022) investigated SS and their influence on academic performance of students of high Andean educational institutions in Puno Region, Peru. The study, which used a cross-sectional correlational approach recorded a substantial positive association between school students’ SS and their academic output. In the same year, Odofin (2022) examined the relationship between SI competencies and AA of secondary school students in Rivers State, Nigeria, adopting a correlational survey research design. The study revealed that there was no linear relationship between SI competencies and AA, concluding that SI competencies do not support students’ AA.

In their study, Okoli and Usang (2025) examined the predictive influence of SI on chemistry students’ academic success in Cross River State, Nigeria, adopting a co-predictive research design. The study concluded that although SI, favorably and significantly, added to chemistry students’ academic success, its dimension of social information processing and social awareness (SA) are not significant predictors, only SS is. Similarly, Okoli et al. (2025) sought to ascertain if SI and its dimensions predict AA of students taking English language in Anambra State, Nigeria adopting a co-predictive research design. The findings revealed that English language students’ AA was substantially predicted by SI, however only the dimension of social information processing significantly predicted achievement and not SS or SA. A glance through the reviewed empirical studies informs the researcher that despite the assumption that SI contributes positively to learning outcomes, empirical findings on the attribute have remained inconsistent. Taking cognizance of these inconsistent results, coupled with the fact that, also based on empirical reviews, no comparable investigation on SI has been carried out in biology, specifically, to ascertain its contributory role to biology students’ AA in the subject in Anambra State, Nigeria, the investigation’s notion was conceived.

Biology, one of the STEM subjects taught in schools, has been acknowledged as key for sustainable development owing to the fact that its application to all facets of life, spanning from health, agroforestry, tourism, and conservation to biotechnology, has necessitated development and advancements in the world, on the global scale. Strengthening the above claims, Okoye and Onwuachu (2018) posited that notable research in biology has led to the creation of medications and vaccines to prevent and treat numerous major illnesses, transplantation of organs, artificial fertilization and production of hybrid species with desirable qualities. Biology

forms the core for scientific and technological boom as its application to medicine, natural resource growth and management, nursing, agriculture, biotechnology, engineering and geography has made it an invaluable asset for understanding the living world, contributing significantly to national development (Nwuba et al., 2024). Summarizing, Anyigor et al. (2025) affirmed that insights gained from biology is pivotal to healthy living as it helps individuals understand and deal with all the physiochemical aspects of life, such as body and blood diseases, water and salt balance, food digestion, temperature regulation, and hormonal balance. A deep comprehension of these benefits intimates one on the invaluable relevance of biology to national development, maintenance of life, and wellbeing of individuals, and thus the need to ensure that students, taught the subject at its introductory stage, are willing to learn, understand and excel in the subject.

Despite this great emphasis placed on learning biology, current studies (Anyigor et al., 2025; Nwuba & Okoli, 2026) indicate that learners sometimes are not keen to take up the subject due to its curriculum cumbersome nature and contents vagueness, and some that even enroll, sadly perform below stakeholders' expectations, as shown in the West African Examination Council (2019-2023) statistical data report on biology from 2019-2023. Specifically, for A1-C6 aggregate, 55.63% pass was achieved in 2019, 63.23% in 2020, 58.09% in 2021, 64.16% in 2022 and 54.69% in 2023. Considering the forgone, researchers (Okoli & Okoye, 2025; Omaka, 2025) in recent times have maintained that, to boost academic success, emphasize and efforts should be placed more on students' personal (non-cognitive) variables, since students in secondary schools constantly experience a variety of triggers and challenges pertaining to educational requirements that may influence motivation, interest, wellbeing, and over time, academic success. In the course of literature review, in efforts to identify these personal variables that may be modified for academic success, we identified SI as a potential student attribute that has become well-embraced in STEM education, in the 21st century, as a tool for effective communication and collaboration, owing to the fact that it enables students to read others and understand their intentions and motivations, to effectively work with them, and thus were motivated to explore their predictive role on AA of biology students', the rationale behind the investigation.

Theoretical Framework

The study adopted the social intelligence theory (SIT) proposed by Edward Thorndike, an English psychologist, in 1920. The theory states that an individual's ability to understand and manage others is an evolutionary adaptation for dealing with highly complex social situations, as well as for gaining and maintaining power in social groups. Edward Thorndike, whose work later inspired developments in understanding emotional intelligence and relational competence, explained that SI is distinct from abstract intelligence (dealing with ideas) and mechanical intelligence (dealing with objects), as it focuses on the ability to comprehend and navigate social relationships, interpret the emotions and behaviors of others, and respond appropriately in social contexts. Edward Thorndike believed that SI was

critical for success in the environment, as it requires interpersonal cooperation and communication, making it a vital aspect of human interaction.

SIT emphasizes that the ability to understand and manage interpersonal relationships is a critical skill in collaborative and interactive environments, such as the classroom. SIT underscores practical, everyday intelligence in human relations rather than academic or theoretical problem-solving abilities, emphasizing that success in life often depends not just on intellectual capacity but also on the ability to effectively interact with and influence others. Applying this theory, in the context of biology education, suggests that students with higher SI are better equipped to engage with peers, teachers, and group learning processes, which are crucial for mastering complex biological concepts. In biology, where learning often involves laboratory experiments, teamwork, and discussions, SI can facilitate better communication, cooperation, and problem-solving among students, as students with heightened SA and the ability to interpret social cues are more likely to seek and provide help during group tasks, fostering an enriched learning environment. In conclusion, the theory explains the relevance of social interaction and collaboration in the learning process, suggesting that individuals construct knowledge together through shared experiences, discussions, and problem-solving activities and thus encourages teachers to provide collaborative learning scenarios in the classroom that will encourage students to work together, exchange ideas, and collectively build understanding, promoting sustained interest, higher retention rates and deeper learning that enhances AA.

Dimensions of Social Intelligence

Silvera et al. (2001) cited in Odofin (2022), identified SI as a multidimensional construct divided into three core skills/dimensions as follows.

Self-awareness (interpersonal sensitivity)

This refers to ability to recognize one's feelings, understand one's emotional reactions, and how they influence one's behavior and performance. SA cluster includes primal empathy (the ability to detect or sense the emotions of another person) and attunement (attention that goes beyond empathy which enhances quality rapport) (Odofin, 2022). SA, according to Obilor and Ikpa (2019) helps people get an idea of the perception they create in other people's minds, as a self-aware person is both confident of his own abilities and mindful of his limitations. Ebrahimpoor et al. (2013) asserted that an individual through becoming aware of others feelings, tastes and needs, identifies the paradoxical situations, and makes use of this source of information to establish a good relationship with them. Ebrahimpoor et al. (2013) believed that understanding others feelings while making decision and ethical judgments is of high value, and lack of sympathy is a fundamental shortcoming in SI.

Social skills (facilitation/desirability)

SS or facilitation, which builds on SA, refers to one's ability to sense how others feel or know what they think or intend, that facilitates successful, smooth and effective

communication. Odofin (2022) posited that SS include synchrony (which means interacting effectively at the non-verbal level), self-presentation (way of presenting oneself in ways that make a desired impression), self-control (the ability to “control and mask” the expression of emotions), influence (shaping the outcome of social interactions using self-control) and concern (caring about others needs and acting accordingly). Ebrahimpoor et al. (2013) argued that individuals who intend to build relationships with others effectively need to have the ability to distinguish, separate, and control their feelings, as it is only through having superior SS, will the individual know where and when to show emotional state.

Social information processing skills (social adaptation)

SIPS or social adaptation refers to the ability to adjust individual and group behavior to conform to the prevailing system of norms and values in a given society, class, or social group. It reflects a person's ability in regulating distressing emotions like anxiety or nervousness and managing such situations (Ebrahimpoor et al., 2013). Obilor and Ikpa (2019) noted that SIPS includes the skill of self-motivation (ability to encourage oneself in the face of adversity to put a positive spin on their negative emotions and end up successful). Odofin (2022) argued that social adaptation is significant when social changes affect important aspects of life and the individual finds it difficult to cope with life or achieve his objectives within prescribed norms. Odofin (2022) stressed that the failure of students to adapt to social norms in an academic environment, combined with specific unfavorable situations, may adversely affect his/her personality, growth and learning outcomes (interest and AA).

Research Questions

The study was directed by the following research questions:

1. Is AA of biology students' predicted by SI?
2. Is school students' AA in biology predicted by individual dimensions of SI (SA, SS, and SIPS)?

Hypotheses

The significance threshold of 0.05 was used to test the null hypotheses

1. School students' AA in biology is not significantly predicted by their SI.
2. AA of biology students' is not significantly predicted by individual dimensions of SI (SA, SS and SIPS).

MATERIALS AND METHODS

Research Design

A predictive correlational research design was applied. Predictive research, according to Creswell (2012), is a kind of correlation design that aims to determine the input construct(s) (variables) that predict the output construct(s) (variables), in addition to determining the relationship that exists between the variables.

Research Respondents

1,198 respondents were drawn from the 24,102 SS2 biology students, in the 265 public schools in Anambra state, in the 2024/2025 academic session, using the multiple-level sampling procedure, applied thus; At first, since the population was already divided into sectors according to the state's six education zones (Aguata, Awka, Nnewi, Ogidi, Onitsha, and Otuocha), the researchers used a straightforward random sample procedure to pick out three zones (Awka, Nnewi, and Onitsha). Three zones, out of the six, were picked for the investigation in order to have a large sample size, that will allow the researcher to generalize the study's findings. Following the zone sampling, the researchers estimated the number of SS2 students anticipated from each of the selected zones (Awka = 458; Nnewi = 301; Onitsha = 446) using the proportionate stratified random sampling approach mathematical formula. This was used to make sure that the sample's representation of each zone (stratum) matched the population's proportion. Next, five schools were chosen from each of the three sampled zones using the purposive sampling technique. Purposive sampling was chosen for two reasons: first, to guarantee that at least one school was chosen from each local government area in the zone, and second, to make sure that each chosen school had enough biology students to meet the sample size allotted to each zone when added together. Lastly, SS2 students, from the chosen schools, were picked at random using a basic random sampling procedure to create the study's sample size of 1,198.

Data Collection Tools

To collect data, social intelligence scale (SIS) adapted from Silvera et al.'s (2001) Tromsø SIS and biology score proforma (BSP), were employed. The original version of the SIS, as designed by Silvera et al. (2001), is a 21-item structured questionnaire with seven response options ranging from 1 (describes me extremely poorly) to 7 (describes me extremely well), arranged under the three SI core dimensions (social information processing, SS, and SA). In adjusting the SIS, to suit the level of the respondents, the 21-items in the original scale were retained but however adjusted to Likert 5-points rating options of strongly agree (SA), agree (A), undecided (UN), disagree (D) and strongly disagreed (SD). This modification was done, as recommended by the validators', for easy analysis and most importantly to remove ambiguity and make the response options distinct, so that the respondents can express their opinions effortlessly. Owing to modifications in its response options, SIS was revalidated by experts and then, subjected to pilot testing, for internal consistency, to yield a reliability coefficient of 0.79, by Cronbach's alpha estimation.

In contrast, the BSP is a record worksheet that includes the respondents' average biology academic scores from their 1st, 2nd, and 3rd terms of the 2024-2025 academic year. The biology academic scores are a collation of termly scores from standardized teacher-made test and examinations, developed from well drafted test blueprint, administered to the students. The research assistants, used in the study, met the classroom biology teachers in the sampled schools, and they provided the results of the biology exams for each of the three terms, from their academic record booklet.

Table 1. SI as a predictor of biology students' AA

Model	R	r ²	Adjusted r ²	Unstandardized coefficients (B)	Standard error
Constant (SI)	0.602 ^a	0.362	0.362	50.730 (0.499)	6.499

^aPredictors: (Constant), SI^bDependent: Biology students AA**Table 2.** Significance of contribution of SI to biology students' AA

Model	Sum of squares	df	Mean square	F	p-value	Decision
Regression	28,702.602	1	28,702.602	679.567	.000 ^b	Significant
1 Residual	50,515.009	1,196	42.237			
Total	79,217.610	1,197				

^aDependent variable: AA in biology^bPredictors: (Constant), SI**Table 3.** Contributions of SI dimensions to biology students' AA

Model	Unstandardized coefficients		Standardized coefficients		T	Significance	Remark
	B	Standard error	Beta				
(Constant)	49.172	1.286			38.231	.000	
1 SIP	.707	.060	.302		11.742	.000	Significant
SS	.480	.050	.253		9.570	.000	Significant
SA	.372	.044	.216		8.421	.000	Significant

^aDependent variable: AA in biology

Data Collection

The direct administration of the instrument SIS was assisted by research assistants. Before the instrument was administered, the principals and students at the sampled schools were presented with an ethical approval letter, requesting for their consent, to carry out the investigation in their schools. Upon presentation of the ethical approval letter, the research assistants briefly explained the research investigation goals, what the instrument entails, how to fill it out and then the need to collect students' academic records from the biology classroom teachers. For each of the retrieved questionnaire, responses of each of the student was collated, summed and recorded while for their achievement scores in biology, students' termly results were collected from the form (class) teachers, and recorded on the score proforma, after the students have responded to the instrument. During responses sorting, compilation and totaling, the researchers noticed that seven of the retrieved questionnaires were incompletely filled. As a result, they were removed, lowering the sample size from the original estimated size of 1,205 to 1,198. In scoring the retrieved questionnaire, each student's response to an item in the SIS was weighed, the weighed responses, from the 21 items, summed and then, recorded for each student against his/her average academic score. The highest possible score for the SIS, is 105 and the lowest possible is 21.

Data Analyses

Analyses of collected data were done using regression analyses (simple and multiple). From the analyzed tables, R-value (R) shows the nature, magnitude and direction of the association that exists between the constructs of concern in the study, r-squared (r²)/coefficient of determination indicates the difference in respondents' AA that is caused by the SI while the obtained unstandardized beta-coefficients reveals the contributions of SI and its three dimensions on the biology students' AA. In order to explain association values of coefficients when connecting a significant number of paired scores, the resultant R-values (R) were interpreted using a

three-way range provided by Nworgu (2015). The ranges are as follows: ± 0.30 - ± 0.01 (low association), ± 0.31 - ± 0.79 (moderate association), and ± 0.80 -1.00 (high association). To affirm the significance of contribution, each null hypothesis was tested at 0.05 significant levels using the following decision rule: If the probability value was below or equivalent to the 0.05 significant level ($p \leq 0.05$), the null hypothesis was dismissed; however, if the probability value was greater than 0.05 ($p > 0.05$), it was not dismissed.

RESULTS

Research question one: Is biology students' AA predicted by SI?

Data analysis, as seen in **Table 1**, shows r² (coefficient of determination) estimate of 0.362 and R-value of 0.602, suggesting a somewhat moderate association between SI and AA. According to the coefficient of determination (r²) value, SI predicts 36.2% of the variation in students' biology success scores. Additionally, the unstandardized beta coefficient estimate of 0.499 shows that students' biology achievement rises by 49.9% for every unit increase in SI.

Hypothesis one: School students' AA in biology is not significantly predicted by their SI.

Analyzed data in **Table 2** indicates a probability value of 0.000, at F-value (1 and 1196) of 679.567. Considering that the probability value is below the 0.05 significant level, we rejected the null hypothesis. The result affirms that students' AA in biology is significantly predicted by SI. Since SI contributed to biology students' achievement, significantly, the equation model ($Y = a + bx$) for the contribution as seen in **Table 1**, where constant is 50.730 and b value is 0.499 is: **AA = 50.730 + 0.499 (SI)**, where AA is AA in biology and SI is SIS.

Research question two: Is school students' AA in biology predicted by individual dimensions of SI (SA, SS, and SIPs)?

Table 4. Significance of contributions of SI dimensions to biology students' AA

Model	Sum of squares	df	Mean square	F	Significance	Decision
Regression	26,216.632	3	8,738.877	196.868	.000 ^b	Significant
1 Residual	53,000.978	1,194	44.389			
Total	79,217.610	1,197				

Note. ^aDependent variable: AA in biology & ^bPredictors: (Constant), SA, SIP, SS

Table 3, obtained unstandardized beta coefficients values, reveals that when SIP goes up by a unit, biology students' achievement score increases by 70.7%, a single increment in SS increases biology students' achievement score by 48.0% and finally, a 37.2% increment is observed in biology students' achievement score when SA rises by a unit. Result in **Table 3** reveals that the order of contributions of SI dimensions to biology students' achievement score in descending order is; Social information processing (70.7%), followed by SS (48.0%) and lastly, by SA (37.2%)

Hypothesis two: School students' AA in biology is not significantly predicted by individual dimensions of SI (SA, SS and SIPS).

Data in **Table 4** reveals that SI dimensions, jointly, predicted biology students' AA significantly, as obtained probability estimate (0.000) is lower, when compared against the threshold level of 0.05, at an F-value (3 and 1194) of 196.868. Additional analysis of the data in **Table 3** demonstrates that SA, SIP, and SS, separately, are all significant predictors of students' academic success in biology. This is because their obtained p-values at t-values (3,1194) of 8.421 for SA (0.000), 9.570 for SS (0.000), and 11.742 for SIPS (0.000) are below the 0.05 threshold level. Affirming from the obtained results that all the three SI dimensions, both separately and collectively, are significant predictors of biology students' achievement scores, the equation model ($Y = a + bx_1 + cx_2 + dx_3$) can be derived from **Table 3** and illustrated as: $AA = 49.172 + 0.707 (SIP) + 0.480 (SS) + 0.372 (SA)$.

DISCUSSION

Social Intelligence and Biology Students' Academic Achievement

The outcomes of the data analyzed proved that SI significantly and favorably influenced biology students' academic success. This favorably and significant contributory role can be hinged on attributes of empathy, interpersonal sensitivity, practical communication skills, and flexibility, associated with SI that promotes self-efficacy, confidence, persistence, a sense of purpose, connection and commitment to school among students. Students, who are socially intelligent, are typically stronger competitors because their level of cognition, the quantity of knowledge they acquire, the way they handle it, their connectivity, and their interpersonal abilities all have an unintentional impact on their academic performance. These assertions lend credence to the insinuations of Won et al (2018), Latip (2021) and Ahmad (2023), in their respective studies, that a higher level of social cognitive ability can boost not only educational outcomes but also the likelihood of high school graduation, job fulfillment, healthy personal and professional relationships, improved psychological well-being, decreased illicit conducts, and civic

engagement as the trait instills in students the skills of perseverance, collaborative thinking, compassion, independence, self-assurance, courteousness, interpersonal thinking, mindfulness, engagement, sincerity, adaptability, appearance (clarity), coherence, and impression management that foster one's own development and growth

By implication, the current research confirms that SI is essential for developing students' passion for biology, encouraging their curiosity, and eventually, elevating their level of academic success. Given the premise, the research suggests that instructors of biology should embrace strategies in the classroom that encourage students to develop SI skills, as by designing such scenarios students are encouraged to engage more in open dialogues that enable them to interact effectively with their peers, exchanging information on biology concepts that they find challenging and abstract, thereby cultivating their interest in biology. The present findings validate the reports of Obilor and Ikpa (2019), Yan-Carlo (2022), Okoli et al. (2025), and Okoli and Usang (2025) who revealed in their individual investigations that SI, favorably and substantially, correlated with students' achievement. The finding however disagrees with that of Sreeja and Nalinilatha (2017) and Odofin (2022) who reported in their study that AA and SI do not share substantial relationship.

Social Intelligence Dimensions and Biology Students' Academic Achievement

On SI dimensions contributions to biology students' AA, the investigation highlighted that SIP, SS and SA, positively and jointly, predicted students' AA in biology significantly, with SIP being the supreme predictor, then SS and finally, SA. The highest prediction by SIP can be attributed to the skill of self-motivation (the capacity to support oneself throughout times of hardship in order to turn challenging feelings into positive ones to accomplish success) associated with SIPS dimension of SI. Embracing the premise, Odofin (2022), argued that the ability of SIP is crucial when social trends impact significant facets of life and the student struggles to deal with life or accomplish his goals in the classroom. This is because a student's inability to adjust to cultural expectations in an academic setting, when coupled with certain unfavorable circumstances, may negatively impact his or her character, development and instructional outcomes (AA). Although SIP proved to be the highest contributor to students' achievement in biology, testing of the null hypothesis further revealed that individually, all the three SI dimensions (SS, SIP, and SA), on their own, substantially contributed to biology students' achievement.

The findings underpin the nuanced roles the dimensions of SI play in enhancing interaction and cooperation among students, that promotes achievement. As students acquire SI from interpersonal relationships and interactions, Mehta

(2021) and Safara et al. (2023) affirmed that it helps them adapt to the environment that they live in, instilling in them the skills of patience, cooperation, empathy, self-control, confidence, tactfulness, social cognition, communication, authenticity, flexibility, self-presentation (clarity), synchrony and impression management, that drive personal growth and development. The findings somewhat to an extent agree and disagree with the findings of Okoli and Usang (2025) and Okoli et al. (2025). In agreement, the current study accedes to the findings of Okoli and Usang (2025) and Okoli et al. (2025) who noted, in their individual studies, that when analyzed jointly SI dimensions significantly predicted AA of students. However, while the current study recorded that SIP, SS and SA, individually, are significant contributors to students' AA in biology, Okoli and Usang (2025) reported that, in chemistry, only SS, individually, is a significant determinant of students' AA while Okoli et al. (2025) reported that, among the three dimensions, only SIP significantly contributed to English language students' achievement.

CONCLUSION AND RECOMMENDATIONS

The current study examined the predictive influence of SI on AA of biology students in secondary schools, adopting a predictive correlational research design. Considering the findings, the investigation concluded that SI and its dimensions are positive and significant contributors to biology students' academic success, in secondary schools. The study acknowledging that biology is a difficult subject due to the bulky nature of its curriculum and the complexity of its concepts, highlights the need to cultivate a positive, friendly and inclusive classroom atmosphere that encourages open dialogues, allowing students interact more, voice their concerns and seek help when necessary. By alleviating stigma and fostering a supportive environment, students are more inclined to collaborate more and feel secure in discussing their challenges in academics, fostering their SI which in return contributes to their AA in biology. Hence, the research establishes that fostering classroom interactions and methodological interventions can substantially boost students' SI, which may in the long run contribute to their academic success in biology.

Given the study's outcomes, the following suggestions were proposed to enhance students' SI in the classroom:

1. Biology classroom instructions should be designed by teachers to create atmospheres that are collaborative, interactive and friendly enough for students to express their affective learning through healthy emotional expressions, which will in the long run contribute to their AA.
2. Education stakeholders should organize periodic trainings, sensitization and orientation programs to educate teachers on strategies that can be adopted to promote acquisition of SI skills among students.
3. Considering the broad nature of the biology curriculum, designers and developers of biology curriculum should restructure the curricula to involve activities, in-between lessons, that give students opportunities to collaborate with members of their

peers to foster their collaborative and SS, that promote their interest in the subject, reinforcing their resilience in the process and contributing to their AA.

4. In collaboration with professional associations and non-governmental organizations, the government, at all educational levels, should host summits, forums, and training sessions to enlighten teachers on the contributions of SI to students' educational goals and overall development, as well as on ways in which the attribute can be fostered, among learners, in the classroom.

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Ethical statement: The authors declare that the guidelines stated in the ethical approval letter obtained from the Ethics Unit at Nnamdi Azikiwe University, Awka, Nigeria were strictly adhered to in this study and that the authors abstained from any activities that is in contrast to the educational research and publication ethics. Also, all the responsibilities, if any arises, due to breach of ethics will be borne by the authors. An ethical approval letter presented to the administrators of the sampled schools and the respondents (students), requesting approval to conduct the research. The letter was acknowledged by the administrators and respondents, before the commencement of the research fieldwork.

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Data sharing statement: All data generated or analyzed during this study are available for sharing upon request. Interested parties are encouraged to direct their inquiries to the corresponding author, who will facilitate the provision of the data in a timely and appropriate manner.

REFERENCES

- Ahmad, U. (2023). Social intelligence and the academic achievement: A comparative study between children of working and non-working mothers of Madiya Pradesh, India. *INSIGHT Journal of Applied Research in Education*, 28(1), 116-124.
- Al-Kfaween, E. M. (2019). Social intelligence and its relation with the pattern of social relationships (cooperation, competitive) of the average diploma students in Jordan. *Journal of Studies in Education*, 9(3), 50-63. <https://doi.org/10.5296/jse.v9i3.15094>

- Anyigor, C. P., Nwuba, I. S., & Osuji, C. C. (2025). Self-regulation ability as a correlate of secondary school students' academic achievement in biology in Anambra State. *UNIZIK Journal of STM Education*, 8(1), 86-96.
- Chapagai, S. D. (2024). Factors affecting the academic achievement of the students in community campuses. *KMC Journal*, 6(1), 241-259. <https://doi.org/10.3126/kmcj.v6i1.62344>
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating qualitative and quantitative research* (4th ed.). Pearson.
- Ebrahimpoor, H., Zahed, A., & Elyasi A. (2013). The study of relationship between social intelligence and organizational performance case study: Ardabil regional water company's managers. *International Journal of Organization Leadership*, 2(1), 1-10. <https://doi.org/10.33844/ijol.2013.60352>
- Ikwuka, O. I., & Samuel, N. N. C. (2017). Effect of computer animation on chemistry academic achievement of secondary school students in Anambra State, Nigeria. *Journal of Emerging Trends in Educational Research and Policy Studies*, 8(2), 98-102.
- Iviemu, T. S. (2021). Academic resilience, social intelligence, examination anxiety and academic performance among students in tertiary institutions in Delta South Senatorial District. *International Journal of Research and Innovation in Social Science*, 5(8), 57-92. <https://doi.org/10.47772/IJRIS.2021.5805>
- Kanimozhi, T., & Vasimalairaja, M. (2018). Role of social intelligence in student's educational development. *International Journal of Creative Research Thoughts*, 6(1), 137-140.
- Latip, A. E. (2021). Social-emotional learning program for build responsible character of students in elementary school. *Journal of Madrasah Ibtidaiyah Education*, 5(1), 67-77. <https://doi.org/10.32934/jmie.v5i1.228>
- Lyngdoh, A. (2019). Need of social intelligence for teachers. *Journal of Emerging Technologies and Innovative Research*, 6(3), 630-634.
- Mehta, S. (2021). A social intelligence study in connection with respondents' academic successes. *Journal of Emerging Technologies and Innovative Research*, 8(6), 167-174.
- Nawaz, M. N. (2021). Social intelligence and academic achievement of college students-a study of District Kulgam. *Turkish Online Journal of Qualitative Inquiry*, 12(2), 622-626.
- Nworgu, B. G. (2015). *Education research: Basic issues and methodology* (3rd ed.). University Trust Publishers.
- Nwuba, I. S., & Okoli, J. N. (2025). Social intelligence dimensions and secondary school students' interest in learning biology. *UEJTL: Universal Education Journal of Teaching and Learning*, 2(4), 185-190. <https://doi.org/10.63081/uejtl.v2i4.106>
- Nwuba, I. S., & Okoli, J. N. (2026). Predicting students' academic achievement in biology by their academic resilience and its dimensions. *Multidisciplinary Approaches in Education and Rehabilitation*, 8(11), 3-13. <https://doi.org/10.59519/mper8101>
- Nwuba, I. S., Opara, J. U., Okani, I. I., Egwu, S. O., Awosika, F. O., & Christian-Ike, N. O. (2024). Restructuring teaching and learning of biology for academic excellence in a conventional classroom using integrated innovative formative assessment techniques. *Science and Education*, 5(4), 313-326.
- Obilor, E. I., & Ikpa, A. I. (2019). Social intelligence and academic achievement of students in selected senior secondary schools in Rivers State. *International journal of social sciences and Humanities*, 7(2), 93-100.
- Odofin, T. (2022). Social intelligence competencies and academic achievement of secondary school students in Rivers State of Nigeria. *Prestige Journal of Counselling Psychology*, 5(1), 118-124.
- Okoli, J. N., & Okoye, P. O. (2025). Cognitive distortions as a predictor of students' achievement in biology in colleges of education in Anambra State. *UNIZIK Journal of STM Education*, 8(1), 1-16.
- Okoli, J. N., & Usang, P. F. (2025). Social intelligence as a predictor of secondary school students' academic achievement in chemistry in Cross River State, Nigeria. *UNIZIK Journal of STM Education*, 8(2), 12-22.
- Okoli, R. I., Ikwuka, O. I., & Anierobi, E. I. (2025). Social intelligence as a predictor of senior secondary school students' academic achievement in English language in Anambra State. *UNIZIK Journal of Educational Research and Policy Studies*, 20(1), 395-402.
- Okoye, P. C., & Onwuachu, W. C. (2018). Influence of cognitive styles and school location on academic achievement of students' interest in biology. *IAA Journal of Scientific Research* 4(1), 1-8.
- Omaka, N. T. (2025). *Emotional regulation, academic coping strategy and cognitive flexibility as predictors of secondary school students' achievement in biology in awka education zone* [Unpublished PhD thesis]. Nnamdi Azikiwe University.
- Purwanti, E., & Noviana, P. D. (2019). Social intelligence contribution in perspective learning outcomes of elementary school social science subject. *Advances in Social Science, Education and Humanities Research*, 38, 337-340. <https://doi.org/10.2991/icet-19.2019.84>
- Raj, J. A. M., & Komalavalli, S. (2022). Influence of social intelligence on academic achievement of high school students. *International Journal of Early Childhood Special Education*, 14(6), 2926-2931.
- Safara, M., Koohestani, H. R., & Salmabadi, M. (2023). The role of social intelligence and resilience in explaining students' distress tolerance: A study during COVID-19 pandemic. *Journal of Educational, Cultural and Psychological Studies*, 28, 61-80. <https://doi.org/10.7358/ecps-2023-028-safa>

- Silvera, D., Martinussen, M., & Dahal, T. (2001). The Tromsø social intelligence scale, a self-report measure of social intelligence. *Scandinavian Journal of Psychology*, 42, 313-319. <https://doi.org/10.1111/1467-9450.00242>
- Sini, K. S., & Amalraj, A. (2019). Relationship between social intelligence and academic achievement among secondary school students. *International Journal of Advanced Academic Research Arts, Humanities and Education*, 5(7), 23-30.
- Sreeja, P., & Nalinilatha, M. (2017). A study on relationship between social intelligence and academic achievement of higher secondary students. *International Journal of Research – Granthaalayah*, 5(6), 476-488. <https://doi.org/10.29121/granthaalayah.v5.i6.2017.2059>
- Suleiman, A. (2023). Factors that affect students' academic achievement in the faculty of social science at the university of Bosaso, Garowe, Somalia. *Open Journal of Social Sciences*, 11, 446-461. <https://doi.org/10.4236/jss.2023.112029>
- Susheela. (2017). *Academic achievement and psychological well-being of secondary school students in relation to their emotional intelligence and self-efficacy* [PhD thesis, Kurukshetra University].
- Tshewang, R. (2015). A study of factors influencing students' academic performance in a higher secondary. *The CERD Educational Journal School in Bhutan*, 16(2), 74-97.
- West African Examination Council. (2019-2023). WAEC results (2019-2023). *West African Examination Council*. www.waec.org.ng
- Won, S. J., Heo, C. U., & Choi, Y. S. (2018). The effects of school life, emotional intelligence, and social intelligence on resilience of nursing university students. *Biomedical Research*, 29(21), 3829-3834. <https://doi.org/10.4066/biomedicalresearch.29-18-1049>
- Yan-Carlo, Q. (2022). Social skills and academic performance in educational institutions of High Andean Puno-Peru in 2020. *Journal of Positive School Psychology*, 6(8), 1574-1583.