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Relationship between students' problem-solving skills and interest in biology in public secondary schools in Anambra State Nigeria

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ABSTRAK

Penelitian ini menganalisis hubungan keterampilan pemecahan masalah dengan minat terhadap Biologi pada siswa sekolah menengah negeri di Negara Bagian Anambra, Nigeria. Penelitian menggunakan desain korelasional. Populasi terdiri atas 14.767 siswa Senior Secondary II yang mempelajari Biologi di 268 sekolah menengah negeri. Sampel berjumlah 637 siswa dari 18 sekolah di enam wilayah pemerintah daerah dalam Zona Pendidikan Awka dan Otuocha, yang dipilih melalui pengambilan sampel bertahap. Data dikumpulkan menggunakan angket yang dikembangkan peneliti. Instrumen menjalani validasi muka dan konstruk, dengan koefisien alfa Cronbach sebesar 0,80 untuk SSRSS dan 0,79 untuk SBIS. Analisis menggunakan korelasi Pearson dan regresi linear sederhana pada taraf signifikansi 0,05. Keterampilan pemecahan masalah menunjukkan hubungan positif yang sangat lemah dengan minat Biologi ($r = 0{,}051$; $R^2 = 0{,}003$). Hubungan tersebut tidak signifikan secara statistik, $F(1, 635) = 1{,}685$, $p = 0{,}195$, sehingga hipotesis nol tidak ditolak. Model menjelaskan sekitar 0,3% variasi minat Biologi. Temuan menunjukkan bahwa keterampilan pemecahan masalah tidak menjadi prediktor linear yang signifikan bagi minat Biologi pada siswa yang diteliti.

Kata Kunci: pemecahan masalah; minat siswa; Biologi; penelitian korelasional; sekolah menengah

ABSTRACT

This study examined the relationship between problem-solving skills and interest in Biology among public secondary school students in Anambra State, Nigeria. A correlational research design was adopted. The population comprised 14,767 Senior Secondary II Biology students in 268 public secondary schools. Multistage sampling yielded 637 students from 18 schools in six local government areas within Awka and Otuocha Education Zones. Data were collected using researcher-developed questionnaires. The instruments underwent face and construct validation, with Cronbach's alpha coefficients of 0.80 for the SSRSS and 0.79 for the SBIS. Pearson correlation and simple linear regression were used at the 0.05 significance level. Problem-solving skills showed a very weak positive relationship with Biology interest ($r = 0.051$, $R^2 = 0.003$). The relationship was not statistically significant, $F(1, 635) = 1.685$, $p = 0.195$; consequently, the null hypothesis was not rejected. The model explained approximately 0.3% of the variance in Biology interest. Problem-solving skills were therefore not a statistically significant linear predictor of Biology interest among the sampled students.

Keywords: problem-solving skills; student interest; Biology; correlational study; secondary education

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1. INTRODUCTION

Problem-solving skills and interest represent cognitive and affective dimensions of learning Biology. Problem-solving involves interpreting biological situations, examining evidence, identifying relationships, and developing reasoned solutions. Interest concerns students' curiosity, attention, and willingness to engage with

biological concepts. Examining the relationship between these dimensions provides evidence about whether students who report stronger problem-solving skills also express greater interest in the subject.

Biology requires students to connect concepts and apply knowledge to living systems. Instruction that engages students in problems and investigations provides opportunities to develop these capacities. N. Febrianti et al. (2026) examined project-based learning integrated with science, technology, engineering, and mathematics (STEM) and reported improvements in metacognitive awareness, conceptual understanding, and Biology problem-solving ability. K. Febrianti et al. (2025) reported higher Biology learning outcomes among students taught through problem-based learning. Anggrella et al. (2026) also documented improvements in problem-solving skills and creativity following scaffolding inquiry-based STEM instruction among prospective Biology teachers.

Problem-solving has also been examined in relation to students' beliefs about their capabilities. Maulina et al. (2026) reported a significant relationship between self-efficacy and problem-solving ability in senior high school Biology. Rofi and Abidin (2026) reviewed research on these two constructs in Biology education. Self-efficacy concerns perceived capability to perform a task, whereas subject interest concerns students' attraction to and engagement with the subject. These constructs provide related but distinct perspectives on students' learning experiences.

In Anambra State, research has examined psychological characteristics in relation to Biology learning. Nnorom et al. (2025) investigated self-regulatory skills in relation to academic achievement, while Ezeanyagu et al. (2023) examined motivation and self-esteem as predictors of Biology achievement. Nnalue et al. (2026) examined self-efficacy and interest among public secondary school Biology students and reported a negligible, statistically non-significant relationship. These studies locate students' cognitive and affective characteristics within Biology education while distinguishing interest from examination performance.

Instructional approaches offer another perspective on student engagement. Nnalue et al. (2024) investigated computer animation in relation to secondary school students' Biology achievement. Enem et al. (2025) examined technological gamification in Computer Studies and reported a significant difference in interest between instructional groups. Muogbo et al. (2025) investigated experiential learning and students' interest in Computer Studies. The attention to interest in these studies supports its examination as an educational outcome in its own right.

Other science education studies have addressed the cognitive and instructional demands of learning. Obikezie et al. (2023) examined generative learning and Chemistry achievement, and Obikezie et al. (2025) examined school location, gender, science process skills, and achievement. Okafor (2015) investigated difficulties encountered by secondary school Physics students when answering mathematically related questions. These studies consider how students engage with scientific tasks across subject areas. Within technology-supported instruction, Nneka and Okafor (2013) examined science teachers' computer literacy and usage, providing an instructional context for the use of digital resources.

The present study focuses on the direct relationship between problem-solving skills and interest in Biology among public secondary school students in Anambra State. This focus connects students' reported analytical skills with their affective orientation towards the same subject. The research question was: What is the relationship between students' problem-solving skills and their interest in Biology in public secondary schools in Anambra State? The null hypothesis stated that there is no statistically significant relationship between the two variables. The hypothesis was tested at the 0.05 significance level.

2. RESEARCH METHOD

A. Research Design and Participants

The study adopted a correlational research design to examine problem-solving skills and interest in Biology without manipulating either variable. It was conducted in public secondary schools in Awka and Otuocha Education Zones, Anambra State, Nigeria. Problem-solving skill scores constituted the predictor, and Biology interest scores constituted the outcome in the simple linear regression analysis.

The population comprised 14,767 Senior Secondary II (SS2) Biology students in 268 public secondary schools in Anambra State. Population information was obtained from the Post Primary Schools Service Commission records in July 2024. The sample comprised 637 SS2 Biology students from 18 public secondary schools.

A multistage sampling procedure was used. Awka and Otuocha Education Zones were randomly selected. Three local government areas were then selected from each zone, yielding Njikoka, Awka South, Anaocha, Anambra East, Anambra West, and Ayamelum. Three public secondary schools were randomly selected from each local government area, giving 18 schools. All SS2 Biology students present in the selected schools participated in the study.

B. Instruments and Validation

Data were collected using researcher-developed structured questionnaires identified as SSRSS and SBIS. Questionnaire responses provided the problem-solving skill and Biology interest scores used in the analysis. Three experts in Science Education, Biology Education, and Measurement and Evaluation from Nnamdi Azikiwe University and Chukwuemeka Odumegwu Ojukwu University reviewed the instruments for face and construct validity. Their feedback informed revisions before administration.

Construct validity was examined using principal component analysis, with the Kaiser–Meyer–Olkin measure used to assess sampling adequacy. The instruments were trial-tested with 20 SS2 Biology students in neighbouring Enugu State. Internal consistency was assessed using Cronbach's alpha, yielding coefficients of 0.80 for the SSRSS and 0.79 for the SBIS.

C. Data Collection and Analysis

Permission was obtained from the principals of the selected schools before questionnaire administration. The researcher and five trained research assistants administered the questionnaires and collected completed copies on site. Data were analysed using SPSS.

Pearson's product–moment correlation coefficient summarised the direction and strength of the linear relationship between problem-solving skills and Biology interest. Simple linear regression estimated the proportion of interest variance explained by problem-solving skills. The overall regression model was evaluated using analysis of variance. Statistical significance was assessed at $\alpha = 0.05$, with the null hypothesis rejected when $p < 0.05$.

3. RESULTS AND DISCUSSION

A. Relationship between Problem-Solving Skills and Biology Interest

Table 1 presents the correlation and regression model summary for the relationship between students' problem-solving skills and interest in Biology.

Table 1. Correlation and regression model summary

Variables	N	r	R^2	Adjusted R^2	Std. error of estimate
Problem-solving skills and Biology interest	637	0.051	0.003	0.001	10.1099

The correlation coefficient was positive and very weak ($r = 0.051$). The coefficient of determination was $R^2 = 0.003$, indicating that the simple linear regression model explained approximately 0.3% of the variance in Biology interest. The adjusted R^2 was 0.001, and the standard error of the estimate was 10.1099.

B. Test of the Null Hypothesis

The null hypothesis stated that students' problem-solving skills were not significantly related to their interest in Biology. Table 2 presents the analysis of variance for the simple linear regression model.

Table 2. Analysis of variance for the regression of Biology interest on problem-solving skills

Source	Sum of squares	df	Mean square	F	p
Regression	172.192	1	172.192	1.685	0.195
Residual	64,903.400	635	102.210	—	—
Total	65,075.592	636	—	—	—

Note. Outcome: Biology interest. Predictor: problem-solving skills. N = 637.

The regression model was not statistically significant, $F(1, 635) = 1.685$, $p = 0.195$. Since p exceeded 0.05, the null hypothesis was not rejected. Problem-solving skills were not a statistically significant linear predictor of Biology interest among the sampled students.

C. Discussion

The observed relationship between problem-solving skills and interest in Biology was positive but very weak. The low coefficient of determination and the non-significant regression test indicate that the measured problem-solving scores explained little variation in students' interest. The positive direction therefore describes the sample association, while the inferential result does not support a statistically significant linear relationship between the two variables.

The result is consistent with the distinction between cognitive skills and subject interest. Problem-solving concerns the processes involved in analysing and resolving tasks, while interest concerns students' willingness and desire to engage with Biology. In this sample, these dimensions showed little linear covariation. Their educational relevance can therefore be considered separately when describing students' Biology learning experiences.

Nnalue et al. (2026) similarly reported a negligible, non-significant relationship between self-efficacy and Biology interest. Although self-efficacy and problem-solving are different constructs, both studies address the relationship between a learner characteristic and interest in Biology. The present finding specifically concerns problem-solving skill scores. Maulina et al. (2026), by comparison, examined problem-solving in relation to self-efficacy, and Rofi and Abidin (2026) reviewed the same pair of constructs. Evidence concerning

self-efficacy and problem-solving describes a different relationship from the association with subject interest examined here.

The findings of instructional studies also address distinct questions. K. Febrianti et al. (2025) examined Biology learning outcomes following problem-based instruction, while N. Febrianti et al. (2026) examined metacognitive awareness, conceptual understanding, and problem-solving through project-based STEM learning. Anggrella et al. (2026) studied changes in problem-solving and creativity following scaffolding inquiry-based STEM instruction. These studies concern outcomes associated with instructional approaches; the present study estimates the relationship between two measured student characteristics.

Research on achievement likewise provides a separate perspective on Biology learning. Nnorom et al. (2025) examined self-regulatory skills and achievement, whereas Ezeanyagu et al. (2023) examined motivation and self-esteem in relation to achievement. Interest and achievement represent different outcomes, so associations with examination performance do not establish an equivalent relationship with interest. The present analysis contributes evidence specifically about the affective outcome of Biology interest.

The findings support giving explicit attention to both analytical skills and students' interest when planning Biology learning activities. Teachers can provide opportunities to interpret evidence and solve biological problems while also attending to students' responses to the subject. Interactive, experiential, and technology-supported activities remain relevant instructional options discussed in the literature on interest (Enem et al., 2025; Muogbo et al., 2025). Their use should be accompanied by attention to interest as a distinct learning outcome, alongside the development of problem-solving skills.

4. CONCLUSION

Students' problem-solving skills showed a very weak positive relationship with interest in Biology among the sampled public secondary school students in Anambra State ($r = 0.051$, $R^2 = 0.003$). The relationship was not statistically significant, $F(1, 635) = 1.685$, $p = 0.195$, and the null hypothesis was not rejected. Problem-solving skills were therefore not a statistically significant linear predictor of Biology interest in this sample. Biology instruction should give explicit attention to students' analytical skills and their interest in the subject as distinct educational outcomes.

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