Academic Resilience as Predictor of Secondary School Students' Academic Achievement in Biology in Ogidi Education Zone

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Abstract
The study investigated academic resilience as a predictor of secondary school students' academic achievement in Biology in Ogidi Education Zone, Anambra State. A correlational survey research design was adopted for the study. The population comprised all Senior Secondary Two (SS2) students offering Biology in government-owned schools in the zone. A sample of 348 students (165 males and 183 females) was drawn using a multistage sampling technique. The instruments used for data collection were the modified Simon Cassidy Academic Resilience Scale (ARS-30) and the students' cumulative annual Biology results for the 2024/2025 academic year. The Academic Resilience Scale was validated by three experts from the Faculty of Education, Nnamdi Azikiwe University, Awka. The reliability of the instrument was established using the Cronbach's Alpha method, which yielded a coefficient of 0.82. Data collected was analyzed using regression analysis at the 0.05 level of significance. The findings of the study revealed that academic resilience significantly and positively predicted students' academic achievement in Biology. The study also revealed that gender did not significantly moderate this relationship. It was recommended among others that schools should integrate resilience-building into teaching, counseling, and school programs to enhance students' academic achievement in Biology.

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1. Introduction

Biology is a vital and popular subject among secondary school students. This is understandably so, given that biology is the backbone of many inventions in science, such as biotechnology, genetic engineering, DNA technology, pharmaceuticals, health education, and environmental education, which have led to improved living conditions of man in his environment. Biology is the branch of science that deals with the study of plants and animals in their natural environment. It is also a branch of science that deals with the study of living things, which includes human beings. Biology is a natural science that studies how life first came to be, how the living world works, its functions, and how these living things interact with one another in their environment (Ekwesianya, 2025). Biology is also a natural science that studies the living world. It is a prerequisite subject for many fields of learning that contributes immensely to the technological growth of the nation. According to Mbaegbu, Ikeanumba, & Anazodo (2023), Biology is the backbone of many inventions in science, such as biotechnology, genetic engineering, DNA technology, pharmaceuticals, and health education. Despite the importance of Biology, the analysis of students' achievement in the Senior School Certificate Examination (SSCE) in Biology by researchers and examination bodies such as the West African Examination Council (WAEC) shows that students' performance in Biology fluctuates. This is evident in the WAEC Chief Examiner's report of 2018-2023, with raw mean scores indicating unsatisfying achievement in Biology over the years. This shows that more work needs to be done to ensure consistent improvement and sustenance of students' achievement in Biology.

Academic achievement is the extent to which students acquire knowledge, skills, and attitudes from educational activities. According to Enoch and Asogwa (2021), academic achievements refer to the overall accomplishment of students, which is evident in their scores in standardized examinations. It can also be seen as the extent to which a student, teacher, or institution has attained their short or long-term educational goals. Academic achievement is referred to as the observed and measured aspects of students' mastery of skill and subject content as measured with valid and reliable tests (Nnoli, 2025). The academic achievement of any educational institution or system is a direct indication or measure of how well the institution has achieved the set goals and objectives for which it was established. Academic achievement is often measured through examinations, continuous assessments, observations, etc. The outcome of these examinations or assessments serves as a pointer to the direction of the students' achievement, whether positive or negative. In recent times,

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the outcry over the poor academic achievement of students in Nigeria is on the increase. The trends in the academic achievement of secondary school students in Nigeria in the last two decades have become a major source of concern to all stakeholders in the education sector. Onu, Anyaegbunam, and Uzoigwe (2020) stated that the academic achievement of students in Biology has been low and dwindling over the years in Nigeria, especially in the Senior Secondary Certificate Examination (SSCE).

Researchers have identified several factors that contribute to the poor academic achievement of Biology students. These factors include poor teaching methods, lack of modern laboratory facilities, large class sizes, family background, and learners' background knowledge. However, most studies aimed at proffering solutions to this problem have continued to overlook the role of students' psychological attributes, such as their ability to adapt and thrive in challenging situations and manage stress. Ononye, Ndudi, Bereprebofa, and Maduemezia (2022) pointed out that students encounter a myriad of stressors impacting their cognitive and emotional function, such as an unconducive learning environment, failure, overwhelming school work, limited support resources, poor teacher support, poor parental support, examinations, etc. The constant encounter of these stressors can cause students to experience apathy or disengagement from their studies, making them perform poorly. In response to these challenges, academic resilience has been evidenced as a critical personal resource that can stimulate students' related outcomes, like academic achievement (Romano, Angelini, Consiglio, & Fiorilli, 2021).

Academic resilience is widely conceptualized as the individual characteristic, capability, or process to positively adapt to challenges and overcome threatening events. It is a cognitive capacity to successfully anticipate and adapt to challenging circumstances in an academic context (Romano et al., 2021). Academic resilience refers to students' ability to effectively deal with academic challenges, setbacks, and pressures. It involves perseverance, a positive mindset, and the capacity to bounce back from failure. To buttress this, students who will perform well in their academics will be intentional in overcoming academic challenges and stress without giving up. Many research findings have shown that there is a significant relationship between academic resilience and academic achievement. Ejelue and Osuafor (2021) state that about 18% of the variance in academic achievement can be explained by academic resilience. Chikendu, Ejesi, and Agu (2021) concluded that students with high academic resilience perform better in both continuous assessments and final professional examinations compared to those with low academic resilience.

Bittmann (2021) in his study revealed that students with higher resilience consistently achieved better grades, expressed greater satisfaction, and reported lower dropout intentions, with all results statistically significant. From the above studies conducted by various researchers, it is evident that academic resilience is closely related to academic achievement.

The difference in academic resilience between males and females has been found to be inconsistent across various parts of the world. Gender refers to the range of physical, biological, mental, and behavioral characteristics differentiating feminine (female) and masculine (male) populations. It is a socio-culturally constructed concept that ascribes certain characteristics and roles to sex, such as male and female within society (Nnoli 2025). Females exhibit higher resilience than males, while others reported that males demonstrate greater resilience (Anagha & Navyashree, 2020). However, studies such as Aigboidion, Onyishi, and Ngwoke (2020) suggest that gender plays a minimal role in shaping academic resilience among adolescents.

1.1. Statement of the Problem

The unsatisfactory academic performance of secondary school students in Biology has continued to raise concerns despite numerous efforts and interventions. Over the years, studies have explored various factors responsible for the poor academic achievement of students in Biology, among these factors include; poor teaching method, non-availability of modern laboratory, large class size, family background and learner's background knowledge. The focus of most studies directed towards proffering solutions to the problem of poor academic achievement among secondary school students, have continued however to neglect the role of students' psychological attributes in their academic achievement. Researchers pay little or no attention to the place of such attributes as students' ability to cope with academic stress and handle pressure. These stressors include overwhelming school work, exam pressure, failure, family crisis which affect their ability to focus, understand concepts, and stay motivated in their studies.

Although several studies have examined the relationship between academic resilience and students' academic achievement, there is limited evidence on how academic resilience predicts achievement specifically among secondary school Biology students in the Ogidi Education Zone of Anambra State. Are there differences in resilience between male and female students? Are students with limited resilience more likely to experience stress and academic challenges during their studies and consequently perform poorly? Does academic resilience predict students' academic achievement in Biology? These questions give credence to the need to investigate the extent to which academic resilience influences the academic performance of secondary school Biology students in the Ogidi Education Zone, Anambra State.

1.2. Research Questions

a. To what extent does academic resilience predict secondary school students' academic achievement in Biology?

b. What is the predictive value of academic resilience on male and female secondary school students' academic achievement in Biology?

1.3. Hypotheses

The following hypotheses were tested at the 0.05 level of significance.

a. Academic resilience does not significantly predict secondary school students' academic achievement in Biology.

b. Academic resilience does not significantly predict male and female secondary school students' academic achievement in Biology.

2. Method

The study adopted a correlational survey research design. The area of this study was Ogidi Education Zone in Anambra State. The population of the study consists of all Senior Secondary Two (SS2) students offering Biology in government-owned schools in the zone. A sample of 348 students (165 males and 183 females) was drawn using a multistage sampling technique. The instruments used for data collection were the modified Academic Resilience Scale (ARS-30) by Cassidy (2016) and the students' cumulative annual Biology results for the 2024/2025 academic year. The Academic Resilience Scale was validated by three experts from the Faculty of Education, Nnamdi Azikiwe University, Awka. The reliability of the instrument was established using the Cronbach's Alpha method, which yielded a coefficient of 0.86. A direct delivery method was used to collect data. Data collected was analyzed using regression analysis at the 0.05 level of significance.

3. Results and Discussion

3.1. Results

3.1.1. Research Question 1: To What Extent Does Academic Resilience Predict Secondary School Students' Academic Achievement in Biology?

Table 1. Simple Linear Regression Analysis: Academic Resilience Predicting Biology Achievement

Variable	*B*	*SE B*	*β*	*t*	*p*	*95% CI*
Academic Resilience	.251	.015	.668	16.687	.000	[0.221, 0.281]*

Note. R^2 = .446, $F(1, 346) = 278.442$, $p < .001$; *CI calculated manually using t-critical = 1.97

The results indicate that academic resilience significantly predicts Biology academic achievement, $F(1, 346) = 278.442$, $p < .001$. Academic resilience accounted for 44.6% of the variance in Biology achievement ($R^2 = .446$), representing a large effect size. The regression equation is: Biology Achievement = 49.631 + 0.251(Academic Resilience). For every one-unit increase in academic resilience, Biology achievement increases by 0.251 points. The strong positive beta coefficient (β = .668) indicates a strong positive relationship between academic resilience and Biology achievement.

3.1.2. Hypothesis 1: Academic Resilience Will Not Significantly Predict Secondary School Students' Academic Achievement in Biology.

Based on the regression analysis results ($t = 16.687$, $p < .001$), the null hypothesis is rejected at α = .05. The findings demonstrate that academic resilience significantly predicts secondary school students' academic achievement in Biology. The effect size is large (β = .668), indicating that academic resilience is a strong and meaningful predictor of Biology performance.

3.1.3. Research Question 2: What is the Predictive Value of Academic Resilience on Male and Female Secondary School Students' Academic Achievement in Biology?

Table 2. Hierarchical Multiple Regression Analysis: Academic Resilience by Gender Predicting Biology Achievement

Model	Variables	R^2	R^2 Change	F Change	p
1	Academic Resilience	.446	.446	278.442	.000
2	Academic Resilience + Gender	.462	.016	10.141	.002
3	Academic Resilience + Gender + AR * Gender	.465	.003	2.098	.148

Table 3. Coefficients for Final Model (Model 3)

Variable	B	SE B	β	t	p	95% CI
Academic Resilience	.228	.021	.607	10.906	.000	[0.187, 0.269]*
Gender	-.559	2.374	-.026	-.235	.814	[-5.22, 4.10]*
AR * Gender	.043	.030	.174	1.448	.148	[-0.016, 0.102]*

Note. Gender coded as 1 = Male, 2 = Female; *CI calculated manually
Dependent Variable: Achievement Scores

The hierarchical regression analysis revealed that adding gender significantly improved the prediction model in Step 2, $\Delta R^2 = .016$, $F(1, 345) = 10.141$, $p = .002$. However, the interaction between academic resilience and gender did not significantly improve the prediction beyond the main effects, $\Delta R^2 = .003$, $F(1, 344) = 2.098$, $p = .148$. The final model accounted for 46.5% of the variance in Biology achievement.

The non-significant interaction term ($t = 1.448$, $p = .148$) indicates that the relationship between academic resilience and Biology achievement does not differ significantly between male and female students. Both genders benefit similarly from academic resilience in their Biology performance.

3.1.4. Hypothesis 2: Academic Resilience Will Not Significantly Predict Male and Female Secondary School Students' Academic Achievement In Biology

The null hypothesis is partially rejected. While academic resilience significantly predicts Biology achievement in the main effects model ($p < .001$), the interaction with gender was not significant ($p = .148$). This indicates that academic resilience significantly predicts Biology achievement for both male and female students equally, with no significant difference in the strength of the relationship across genders.

3.2. Discussion

The findings of this study revealed that academic resilience significantly predicts secondary school students' academic achievement in Biology, explaining a substantial proportion of variance in student performance. This suggests that academic resilience is a critical psychological resource that enables students to thrive despite academic challenges and setbacks. This aligns with several empirical studies in the literature. Ejelue and Osuafor (2021) found similar results in their investigation of Biology achievement among students in the Onitsha Education Zone, where academic resilience significantly predicted student performance. Similarly, Duru, Obasi, and Oguoma (2024) demonstrated that academic resilience significantly predicted Mathematics achievement among senior secondary school students, explaining a considerable portion of variance in student performance. The consistency of these findings across different subject areas and geographical locations suggests that academic resilience operates as a universal predictor of academic success. The analysis demonstrated that academic resilience is not merely a desirable trait but a crucial predictor of academic success in Biology. This suggests that educational interventions focused on building students' resilience may yield substantial improvements in Biology achievement. Romano et al.(2021) opined that academic resilience is a critical personal resource that can stimulate students' related outcomes, such as academic achievement. This implies that students who develop higher levels of academic resilience are likely to experience markedly better academic outcomes, regardless of other factors that might influence their performance.

The findings of the study showed that while academic resilience significantly predicts Biology achievement, gender does not significantly moderate this relationship. This indicates that the positive effects of academic resilience on Biology achievement operate consistently across both male and female students. This finding contrasts with studies such as Ajao, Animasahun, and Afolabi (2024), who reported that gender moderated the relationship between academic resilience and academic performance, with male students showing higher resilience levels. However, the current study's findings are more consistent with Amoadu,

Agormedah, Obeng, Srem-Sai, Hagan, and Schack (2024), who found no significant gender differences in academic resilience levels among senior high school students. The absence of gender moderation implies that both male and female students achieve equally in Biology under equal opportunities and learning environment. This suggests that resilience-building interventions in Biology education should not be gender-specific but should be designed to benefit all students equally. Aigboidion, Onyishi, and Ngwoke (2020) suggested that gender plays a minimal role in shaping academic resilience among adolescents.

3.3. Recommendations

The following recommendations are made based on the findings of the study:

a. Biology teachers should incorporate resilience-building activities into their lesson plans by designing learning experiences that encourage students to persist through challenging concepts and view setbacks as learning opportunities.

b. School counselors should develop and implement structured emotional intelligence training programs by conducting weekly group sessions that teach students emotion recognition, regulation, and social skills relevant to academic contexts.

4. Conclusion

The results of the study show that academic resilience is a strong and significant predictor of the academic achievement of high school students in the subject of Biology in the Ogidi Education Zone. Academic resilience explains the large proportion of variance in learning achievement, making it an important psychological factor that allows students to survive and succeed despite various academic challenges. Additionally, gender does not moderate the relationship, meaning both male and female students benefit equally from high levels of academic resilience. Thus, strengthening academic resilience needs to be a strategic focus in learning interventions, guidance, and school programs to improve students' overall academic achievement.

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Declaration on AI Use

The authors declare that no artificial intelligence (AI) or AI-assisted tools were used in the preparation of this manuscript. AI were used only to improve readability and language under strict human oversight; no content, ideas, analyses, or conclusions were generated by AI.

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