



ACADEMIC STRESS AS A PREDICTOR OF SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN CHEMISTRY IN ENUGU STATE, NIGERIA

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ABSTRACT

The study investigated academic stress as a predictor of secondary school students' Chemistry achievement in Enugu State, Nigeria. Two research questions guided the study and two null hypotheses were tested at 0.05 level of significance. The predictive correlational research design was adopted for the study. A total of 5,333 Senior Secondary Two (SS2) students offering Chemistry in public secondary schools in Enugu State constituted the population, out of which 600 students were sampled using multistage sampling procedures. The instrument for data collection was the Perception of Academic Stress Scale (PASS), validated by three experts from Nnamdi Azikiwe University, Awka. The reliability of the instrument was established using Cronbach's Alpha which yielded a reliability coefficient of 0.82. Students' Chemistry achievement scores were obtained from school records. The data obtained were analyzed using simple and multiple linear regression. The findings revealed that 1.1 percent of the variance in Chemistry achievement scores was predicted by students' academic stress. Furthermore, all dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, and stress related to academic self-perception) were significant joint predictors of Chemistry achievement, with expectation-related stress positively predicting achievement while workload and self-perception stress negatively predicted it. The conclusion drawn from the findings was that external academic expectations can motivate Chemistry learning, but workload pressure and self-doubt impair it. It was recommended among others that Chemistry teachers should balance academic expectations with manageable workloads to reduce student stress.

Keywords: Academic Stress, Predictors, Chemistry Achievement, Secondary School Students

Introduction

Chemistry is the scientific discipline concerned with the study of matter, its properties, composition, structure, and the changes it undergoes during chemical reactions (Burdge & Overby, 2024). According to Ebbing and Gammon (2021), Chemistry is often referred to as the "central science" because it bridges other natural sciences like physics and biology. Furthermore, Atkins and de Paula (2022) describe Chemistry as the foundation for many industries, including pharmaceuticals, agriculture, and environmental management, highlighting its crucial role in technological and scientific progress. Despite the importance of Chemistry, students' academic achievement in the subject in Enugu State in particular and Nigeria in general has not improved satisfactorily.

Historically, WAEC and NECO results according to Utibe and Agwagah (2015) and Amoke (2020), have shown varied performance levels. Literature from recent years often indicated improvements in pass rates, but challenges persist, particularly in rural schools. In



Nigeria generally, approximately 55% of students who sat for the WAEC Chemistry examination according to the Chief Examiners' Reports achieved a credit (C6) or higher. The pass rate saw a slight decline in 2020, with 53% of students achieving a credit or higher, reflecting increased challenges, possibly worsening by disruptions from the COVID-19 pandemic. In 2021, the pass rate improved to 56% as schools adapted to new learning methods and resumed normal operations. Despite the notable general improvement in percentage pass rate of students in Chemistry, the students' academic achievement remains unsatisfactory when compared to the achievement of other students in advanced nations. The variations in achievement among students in Enugu state and Nigeria in general may be attributed to educational resources and teaching methods, curriculum quality, socio-economic and institutional factors.

Studies highlight that Nigerian schools often face challenges related to inadequate laboratory facilities, outdated textbooks, and insufficient access to modern technology (Ogunyemi & Akinola, 2022). These limitations impact students' practical experience and understanding of Chemistry. The Chemistry curriculum in Nigeria is often criticized for being overly theoretical and lacking practical components. The emphasis is sometimes more on rote memorization rather than on developing critical thinking and problem-solving skills (Adeyemo & Oladipo, 2022). The challenges peculiar to students in Enugu state thus generate and induce in them some level of academic stress that may affect students' academic achievement in Chemistry.

Academic stress is defined as the feeling of pressure and anxiety that students experience due to academic demands, such as examinations, assignments, and overall academic performance (Smith & Brown, 2023). This stress is subjective, meaning it varies from student to student based on their personal perceptions and coping abilities. Studies (Gobena, 2024; Mohammed, Mansur & Diffang, 2024) have shown that academic stress can significantly impact students' academic outcomes. Stress levels often correlate negatively with academic achievement, as excessive stress impairs cognitive functioning, focus, and overall mental well-being (Arsenio & Loria, 2020). In Nigerian educational settings, where students often face high expectations and competitive academic environments, the adverse effects of stress are especially pronounced (Apeh, Gidado & Diffange, 2023). Academic stress according to Bedewy and Gabriel (2015) can be related to such dimensions as: stress related to academic expectation, stress related to school work and examination, and stress related to academic self-perception.

Academic stress related to academic expectations stems from pressure to meet standards set by parents, teachers, or oneself, creating a fear of underperformance (Bedewy & Gabriel, 2015). Bedewy and Gabriel (2015) further noted that stress from school work and examinations arises from high volumes of assignments, tight deadlines, and the intense outcome focus of tests. Stress tied to academic self-perception involves negative self-evaluation, where students doubt their abilities and fear not being "good enough," regardless of actual achievement. In the context of Chemistry, a subject that requires critical thinking, problem-solving, and a deep understanding of complex concepts, academic stress can be a substantial barrier to success.

Statement of the Problem

Academic achievement in Chemistry, a critical subject for scientific and technological advancement, has been a concern in Nigeria, particularly in Enugu State, where students



continue to struggle with attaining satisfactory results in national examinations. Among the various factors influencing academic performance, academic stress has emerged as a significant predictor of students' outcomes. Despite the known associations between stress and students' achievement, limited empirical evidence exists on how academic stress specifically predicts Chemistry achievement among secondary school students in Enugu State. This study seeks to address this gap by investigating academic stress as a predictor of Chemistry achievement, examining both the overall predictive value and the relative contributions of its dimensions.

Purpose of the Study

The purpose of the study was to determine academic stress as a predictor of secondary school students' academic achievement in Chemistry in Enugu State. The study specifically determined:

1. Predictive value of academic stress on students' academic achievement scores in Chemistry.
2. Relative contribution of the individual dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, stress related to academic self-perception) to students' academic achievement scores in Chemistry.

Research Questions

The following research questions guided the study:

1. What is the predictive value of academic stress on students' academic achievement scores in Chemistry?
2. What is the relative contribution of the individual dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, stress related to academic self-perception) to students' academic achievement scores in Chemistry?

Hypotheses

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

1. The prediction of academic stress on students' academic achievement scores in Chemistry is not significant.
2. The relative contribution of the individual dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, stress related to academic self-perception) to students' academic achievement scores in Chemistry is not significant.

Method

The study adopted the predictive correlational research design. The study was conducted in Enugu State, Nigeria. The population of the study comprised 5,333 Senior Secondary Two (SS2) students offering Chemistry in the 2025/2026 academic session in public secondary schools in Enugu State. The sample for the study was 600 SS2 students offering Chemistry in Enugu State who were obtained using a multi-stage sampling procedure involving random and purposive sampling techniques.

The instrument for data collection was the Perception of Academic Stress Scale (PASS). The Perception of Academic Stress Scale, adapted from Bedewy and Gabriel (2015), is a psychometric self-report instrument used to measure academic stress among students.



The scale consists of 18 items designed to evaluate different dimensions of academic stress, including stress from academic expectations, workload, and academic self-perception. Responses on PASS are rated on a Likert-type scale ranging from: 1 = Strongly Disagree to 5 = Strongly Agree. The students' scores in Chemistry were gathered using a proforma; their results in Chemistry for one academic year were obtained, averaged, and used as students' academic achievement.

Two experts from the Department of Science Education and one from the Department of Educational Foundations (Measurement and Evaluation Unit) all from Nnamdi Azikiwe University, Awka validated the instrument. The reliability of PASS was established using Cronbach's Alpha which yielded a coefficient of internal consistency of 0.82. The instruments were administered with the help of six research assistants. The study's data were analyzed using simple linear regression. All null hypotheses were tested at a 0.05 significance level and were rejected whenever the P-value was less than or equal to 0.05.

Results

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

Table 1: Prediction of Students' Achievement score in Chemistry by Academic stress

Model	R	R ²	Adjusted R ²	Unstandardized coefficients (B)	Std. Error
Constant				77.615	
AS	.103 ^a	.011	.009	-.143	13.790

a. Predictors: (Constant), Academic stress

Table 1 shows that the R-Square value of .011 indicates that 1.2percent of the variance in students' achievement score in Chemistry is predicted by academic stress. The unstandardized coefficient *B* of -.143 shows that a unit rise in academic stress decreases achievement score in Chemistry by -.143.

Research Question 2: What is the relative contribution of the individual dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, stress related to academic self-perception) to students' academic achievement scores in Chemistry?

Table 2: Contributions of the Dimensions of Academic stress in the Prediction of Achievement scores in Chemistry

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	71.672	3.899		18.383	.000
1 SRAE	.523	.187	.114	2.801	.005
SRSWE	-.165	.082	-.082	-2.027	.043
SRSAS	-.214	.102	-.085	-2.089	.037

Table 2 shows the standardized beta coefficient which indicates predictive correlation between individual dimensions of academic stress and achievement score in Chemistry. The unstandardized B coefficient shows the predictive value of each dimension of academic stress which indicates their relative contribution to achievement score in Chemistry. Table 4.2



shows that achievement in Chemistry increases by .523 whenever there is a unit increase in stress related to academic expectation (SRAE), but decreases by .165 and .214 whenever there is a unit increase in stress related to school work (SRSWE) and stress related to students' academic self-perception (SRSAS) respectively. The order of relative contribution to achievement score in Chemistry from the highest to lowest by each dimension of academic stress therefore is; stress related to academic expectation, stress related to students' academic self-perception and stress related to school work and examination.

Hypothesis 1: The prediction of academic stress on students' academic achievement scores in Chemistry is not significant.

Table 3: Significance of Prediction of Achievement score in Chemistry by Students' Academic stress

Model	Sum of Squares	df	Mean Square	F	P-value
1 Regression	1221.752	1	1221.752	6.425	.012 ^b
Residual	113714.873	598	190.159		
Total	114936.625	599			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Academic stress

Table 3 shows that academic stress is a significant predictor of achievement scores in Chemistry, $F(1, 598) = 6.425$, $p < .05$. The null hypothesis was therefore rejected meaning that the prediction of academic stress on students' academic achievement scores in Chemistry is significant. Since academic stress is a significant predictor of achievement scores in Chemistry, the regression model ($Y = a + bX$) for the prediction of achievement score in Chemistry as derived from Table 2, where constant = 77.615 and b value = -.143 is:

Achievement = 77.615 - .143 (AS)

Where, Achievement = Achievement score in Chemistry and AS = Academic stress.

Hypothesis 2: The relative contribution of the individual dimensions of academic stress (stress related to academic expectation, stress related to school work and examination, stress related to academic self-perception) to students' academic achievement scores in Chemistry is not significant

Table 4: Significance of Prediction of Achievement score in Chemistry by the Individual Dimensions of Students' Academic stress

Model	Sum of Squares	Df	Mean Square	F	P-value
1 Regression	2965.631	3	988.544	5.262	.001 ^b
Residual	111970.994	596	187.871		
Total	114936.625	599			

a. Dependent Variable: Achievement

b. Predictors: (Constant), Stress related to students' academic self-perception, Stress related to school work and examination, Stress related to academic expectation

Table 4 shows that all the individual dimension of academic stress jointly predicted the students' achievement scores in Chemistry significantly, $F(3, 596) = 5.262$, $p < .05$. 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 4 shows that all the dimensions of academic stress are a significant predictor of achievement scores in Chemistry, stress related to academic expectation $t(3, 596) = 2.801$, $p < 0.05$, stress related to



school work and examination $t(3, 596) = -2.027, p < 0.05$, stress related to students' academic self-perception $t(3, 596) = -2.089, p < 0.05$. Thus, all the dimensions of academic stress are significant contributors to the achievement score of students in Chemistry in the following order of significance: stress related to academic expectation, stress related to students' academic self-perception and stress related to work and examination. However, since the joint prediction of all the dimensions of academic stress in the prediction of achievement score in Chemistry is significant, the regression model ($Y = a + bX_1 + cX_2 + cX_3 \dots$) for the prediction of achievement score in Chemistry as derived from Table 2 is as follows:

$$\text{Achievement} = 71.672 + .523(\text{SRAE}) - 165(\text{SRSWE}) - .214(\text{SRSAS})$$

Where, Achievement = Achievement score in Chemistry and SRAE = Stress related to academic expectation, SRSWE = Stress related to school work and examination, SRSAS = Stress related to students' academic self-perception

Discussion

The finding that academic stress significantly predicts Chemistry achievement, albeit with a modest effect size, can be understood through the unique cognitive demands of the subject itself. Chemistry requires students to master abstract concepts such as mole ratios, chemical bonding, and stoichiometry, all of which demand substantial working memory capacity and logical reasoning skills. When students experience academic stress, their cognitive resources become divided between managing anxiety and processing complex chemical information, leading to reduced efficiency in problem-solving tasks. The negative direction of this relationship suggests that for secondary school students in Enugu State, academic stress has already surpassed the optimal threshold described in the Yerkes-Dodson law, where moderate arousal enhances performance. Chemistry, being a subject that builds cumulatively, means that stress-induced lapses in understanding one topic directly impair comprehension of subsequent topics, creating a cascading effect on overall achievement.

Furthermore, the high-stakes nature of Chemistry examinations in Nigerian secondary schools likely amplifies stress responses beyond manageable levels for many students. The pressure to perform well in sciences for future career prospects in medicine, pharmacy, or engineering may intensify the perceived threat of poor performance. Additionally, students who lack effective coping mechanisms may enter a cycle where initial stress leads to poor performance, which further increases stress in subsequent assessments. The physical symptoms of stress, including increased heart rate and muscle tension, may directly interfere with the fine motor skills required for laboratory practicals and written calculations in Chemistry.

This finding aligns with Liu, Liu, and Wu (2020), who reported a significant negative correlation between academic stress and academic performance among Chinese undergraduate students, indicating that higher stress levels consistently predict lower achievement across different educational contexts. Similarly, Baker, Arish, and Khadijah (2022) found that academic stress significantly predicted academic achievement among high school students, with those experiencing high stress scoring lower on performance metrics. Ghanbari and Yavari (2021) also documented a significant negative correlation between academic stress and medical students' academic performance in Iran, supporting the cross-cultural consistency of this relationship. However, the magnitude of the predictive effect in the present study differs from some international findings, which may reflect contextual



differences in how Nigerian secondary school students experience and report academic stress compared to university students in developed countries. The present study's location in Enugu State, where educational resources vary considerably, may mean that stress interacts with other environmental factors in ways not captured in more homogeneous educational systems.

The finding that stress related to academic expectation positively predicted Chemistry achievement while stress related to school work and examination and stress related to academic self-perception negatively predicted achievement reveals a nuanced pattern that can be explained by examining the nature of Chemistry learning in Nigerian secondary schools. Stress arising from expectations of parents and teachers may serve as a motivating force because these external pressures communicate clear performance standards and social consequences, prompting students to increase study effort and seek additional help. Such externally-directed stress may be perceived as legitimate concern from authority figures rather than a personal failing, allowing students to channel it productively.

In contrast, stress related to school work and examination directly concerns the volume of assignments, difficulty of test questions, and time pressures, which likely exceed students' actual capacity to manage the Chemistry curriculum. When students feel overwhelmed by the sheer quantity of work, they may resort to surface learning strategies such as memorization rather than deep understanding, which is particularly detrimental for Chemistry where conceptual integration is essential. Stress related to academic self-perception involves internal doubts about one's ability to succeed, which may trigger avoidance behaviours and learned helplessness, reducing the effort students invest in practicing chemical problem-solving. Students who doubt their capacity to understand Chemistry may prematurely give up on difficult topics such as organic reaction mechanisms or equilibrium calculations, creating knowledge gaps that compound over time. The positive contribution of expectation-related stress suggests that some level of external pressure, when communicated supportively rather than punitively, may actually benefit Chemistry students in the Enugu State context.

The positive predictive role of expectation-related stress contrasts with Oladipo, Adesola, and Olatunde (2021), who found that external pressure from parents and teachers contributed negatively to academic stress overall, though they did not separate this dimension from other stress sources in their analysis of Nigerian secondary school students. Akinola, Fadare, and Adeyemo (2022) found that all dimensions of academic stress, including workload pressure and fear of failure, negatively impacted undergraduate performance at the University of Ibadan, which differs from the present finding that expectation-related stress had a positive coefficient. Sahu and Tiwari (2023) reported that among Indian engineering students, workload stress was the strongest negative predictor of performance, while family expectation stress showed a weaker but still negative relationship, partially contradicting the direction observed in Enugu State. This divergence may be explained by cultural differences in how Nigerian secondary school students perceive academic expectations from parents and teachers; in Enugu State, such expectations may be communicated within supportive community structures that frame pressure as collective aspiration rather than individual threat.

Conclusion

The study concludes that academic stress has a significant but modest negative impact on students' achievement in Chemistry, with higher stress levels associated with lower



achievement. Among the dimensions of stress, academic expectation exerts a positive influence while stress from schoolwork and examinations and self-perception negatively impact achievement. These findings suggest that external academic expectations can be motivating, but workload pressure and self-doubt impair learning outcomes in Chemistry.

Recommendations

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

1. Chemistry teachers should regularly monitor students' stress levels and provide timely academic support to prevent stress from impairing learning outcomes.
2. Schools should maintain reasonable academic expectations that motivate students without creating excessive workload or self-doubt that hinders Chemistry performance.
3. Curriculum developers should design a more balanced Chemistry curriculum that reduces pressure from academic expectations and allows students adequate time for comprehension and application.

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