

CHEMISTRY EDUCATION UNDERGRADUATE STUDENTS' MENTAL HEALTH ISSUES AS CORRELATE TO THEIR INTEREST IN CHEMISTRY COURSES IN SOUTHEAST UNIVERSITIES

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Abstract

This study examined the relationship between mental health issues and interest in chemistry courses among Chemistry Education undergraduate students in federal universities in Southeast Nigeria (n = 2500). The research was motivated by increasing academic stress, perceived course difficulty, limited coping resources, and the influence of mental health on motivation, arousal, and self-efficacy. Two research questions and two hypotheses guided the study. A correlational research design was employed. The sample of 2500 students was selected using proportionate stratified random sampling from the five federal universities in the region. Data were collected using two instruments: the Chemistry Mental Health Inventory (CMHI) and the Chemistry Interest Inventory (CII). Both instruments were validated by three experts—two from Educational Foundations (specialists in Measurement and Evaluation and Educational Psychology) and one from Science Education specializing in Chemistry Education. A trial test was conducted with 50 students in Delta State, yielding reliability coefficients of 0.87 and 0.77 using Cronbach's alpha. Research questions were analyzed using R and R², while hypotheses were tested using linear regression; Hayes' Process was applied to examine gender moderation. Findings indicated a low positive relationship between mental health issues and interest in chemistry, with no significant moderating effect of gender. Implications, recommendations, and conclusions were drawn accordingly.

Introduction

Chemistry education at the undergraduate level forms the backbone of scientific literacy, technological development, and innovation (Mafarja et al., 2025). It equips students with the conceptual understanding and analytical reasoning required to interpret natural phenomena and solve real-world problems. Foundational coursework—such as general chemistry, organic chemistry, and inorganic chemistry—plays a pivotal role in shaping students' cognitive abilities, particularly in abstract reasoning, quantitative thinking, and experimental inquiry (Anim-Eduful & Forson, 2025; Pazicni & Popova, 2025). Laboratory-based learning further supports theoretical instruction by enabling students to observe chemical principles in action, thus deepening comprehension and enhancing problem-solving skills (Bahyoune et al., 2023). As a scientific discipline, chemistry encompasses the study of matter, its properties, composition, and transformations, and constitutes an essential pillar in advancing industry, health care, environmental sustainability, and the economy (Obikezie et al., 2023). Consequently, strong chemistry education is fundamental for national development, particularly in countries striving to strengthen their scientific and technological capacity.

Despite this fundamental role, higher-education institutions continue to report irregular and inconsistent student performance in core chemistry courses. In Nigeria, CHM 111—an introductory inorganic chemistry course taken by first-year students across science, engineering, and medical faculties—has repeatedly shown unstable pass and fail rates over the years. Data from 2021 to 2023 reveal fluctuating performance patterns, suggesting deeper challenges beyond instructional delivery or course difficulty (Nnoli & Nwuba, 2025; Ojochegebe & Okafor, 2024). The inconsistency in these outcomes raises critical questions regarding the factors influencing students' academic trajectory. Performance disparity in high-demand science courses often stems from cognitive, affective, and psychosocial factors, including student attitudes, interest, motivation, and mental health.

Mental health has emerged as a crucial determinant of academic success among university students. According to the World Health Organization (2023), mental health comprises emotional, psychological, and social well-being. It influences how individuals think, feel, learn, handle stress, and engage with academic tasks. Mental health issues—such as anxiety disorders, mood disorders (including depression), and general psychological distress—have become increasingly prevalent among young adults, particularly those enrolled in demanding academic programs. WHO (2018) estimates that approximately 15% of young adults aged 18–25 experience mental health difficulties, with higher prevalence in low- and middle-income countries. These conditions impair concentration, reduce motivation, diminish cognitive functioning, and weaken students' capacity to cope with academic pressure.

Within the context of chemistry education, several studies have established a connection between mental health challenges and declines in academic interest, attitude, and performance. Adeyemi (2020) reported a strong negative relationship between anxiety, depression, and students' interest in chemistry. Similarly, Bruffaerts (2019) and Brambila-Tapia et al. (2020) found moderate negative correlations between psychological distress and students' attitudes toward science, indicating that mental health conditions meaningfully hinder students' engagement with chemistry courses. In Nigeria, Ojochegebe and Okafor (2024) highlighted that mental health concerns moderately correlate with academic performance among chemistry undergraduates at Nnamdi Azikiwe University. Nonetheless, findings across studies differ, particularly regarding the moderating role of gender. While some studies suggest that gender may influence how mental health affects academic interest, others report nonsignificant moderation effects (Kumar, 2022; Smith, 2021).

Notably, much of the existing research focuses broadly on secondary school students or general university populations, leaving chemistry education undergraduates—who represent the future workforce in science education—less examined. Furthermore, previous studies seldom consider the unique academic demands, laboratory exposure, and cognitive load associated with chemistry education programs. These gaps highlight the need for a more targeted investigation.

The persistent fluctuations in CHM 111 outcomes, combined with rising mental health concerns among university students, underscore the urgency of exploring how mental health issues relate to academic interest specifically within chemistry education programs. Understanding this relationship is essential not only for improving student success but also for informing curriculum design, student support services, and institutional mental health interventions. Therefore, this study investigates mental health issues as correlates of interest in chemistry courses among Chemistry Education undergraduate students in Southeast Nigerian universities.

Method

This study adopted a survey correlational research design. A correlational design is appropriate when examining the relationship between two or more variables without manipulating or altering them. The study was conducted in Southeast Nigeria, and the population consisted of all Chemistry Education undergraduate students in federal universities within the southeastern geopolitical zone. A sample of 2,500 students was drawn using proportionate stratified random sampling, ensuring equal representation from all federal universities in the region. The use of stratified sampling ensured that the sample accurately reflected the structure and distribution of the target population.

Instruments

Two instruments were employed for data collection: the Chemistry Mental Health Inventory (CMHI) and the Chemistry Interest Inventory (CII). The CMHI was adapted from the Mental Health Issues Scale developed by Obikezie et al. (2023) and consisted of three sections (A–C). Section A gathered demographic information, while Section B comprised ten items distributed across four clusters (A–D) designed to measure various mental health concerns relevant to the study. All items were structured using a 4-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD).

Similarly, the Chemistry Interest Inventory (CII) was adapted from the Chemistry Interest Inventory Scale (CIIS) used by Obikezie (2023). It also included demographic items in Section A, followed by thirty-six items across four clusters (A–D) in Section B that assessed students' academic interest in chemistry courses. The CII used the same 4-point Likert response format as the CMHI, ensuring consistency in data measurement across both instruments.

Validity and Reliability

The two instruments were validated by three experts: (1) A measurement and evaluation specialist from the Department of Educational Foundations; (2) An educational psychology specialist from the same department; and (3) A Chemistry Education expert from the Department of Science Education

Reliability testing was conducted using Cronbach's alpha on a pilot sample of 50 Chemistry Education undergraduates from a state university in Delta State (outside the study area). CMHI and CII yielded reliability coefficients of 0.87 and 0.77, indicating acceptable internal consistency.

Table 1. Summary of Research Instruments and Reliability

Instrument	Source	No. of Items	Scale	Pilot Sample (N)	Cronbach's Alpha	Interpretation
Chemistry Mental Health Inventory (CMHI)	Adapted from Obikezie et al. (2023)	10	4-point Likert	50	0.87	High reliability
Chemistry Interest Inventory (CII)	Adapted from CIIS (Obikezie, 2023)	36	4-point Likert	50	0.77	Acceptable reliability

Data Collection Procedure

Both CMHI and CII were converted into Google Forms and distributed digitally through research assistants in all federal universities in Southeast Nigeria. Hard copies were also printed and administered to students who lacked access to the online forms. The researchers ensured that 500 respondents were sampled from each federal university, totaling 2,500 participants.

Data Analysis

The data for this study were analyzed using several complementary statistical procedures. First, the Pearson Product-Moment Correlation Coefficient (r) was used to address the research questions and determine the strength and direction of the relationship between variables. The interpretation of the correlation values followed the guidelines of Nworgu (2015), where coefficients between ± 0.80 and ± 1.00 indicate a high positive or negative relationship, values between ± 0.31 and ± 0.79 indicate a moderate relationship, and values between ± 0.00 and ± 0.30 indicate a low relationship. This technique provided insight into how strongly mental health and students' interest in chemistry are related.

Linear regression analysis was then employed to test the null hypotheses at the 0.05 significance level. This analysis helped determine the predictive power of the independent variable on the dependent variable, showing whether mental health significantly predicts students' interest in chemistry. Through regression analysis, the study was able to identify the extent to which the independent variable contributes to variations in academic interest.

Additionally, Hayes' PROCESS Macro was used to examine gender as a moderating variable. This method allowed the researcher to assess whether the relationship between mental health and interest in chemistry changes depending on gender. PROCESS provided a more nuanced understanding of variable interactions compared with traditional analytical techniques.

A standard decision rule was applied when interpreting the hypotheses: if the p -value was ≤ 0.05 , the null hypothesis was rejected, indicating a statistically significant effect or relationship. Conversely, if the p -value was greater than 0.05, the null hypothesis was retained, meaning there was not enough statistical evidence to confirm a significant effect. This framework ensured that conclusions were drawn based on recognized principles of inferential statistics.

Results

The data collected for this study were analyzed and presented in alignment with the stated research questions and hypotheses. Findings are summarized in the tables below and explained in detail to provide both statistical and practical interpretations.

Research Question 1

What is the relationship between Chemistry education undergraduate students' mental health issues and their academic interest in Chemistry courses in southeast universities?

Research Hypothesis 1

There is no significant relationship between Chemistry education undergraduate students' mental health issues and their academic interest in Chemistry courses in southeast universities.

Table 1. Pearson Correlation Coefficient between Undergraduate Students' Mental Health Issues and Interest in Chemistry Courses

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Magnitude & Direction	Sig	Decision
1	.045a	.002	.002	22.80194	Low positive relationship	.023	Significant

a. Predictors: (Constant), Undergraduate Chemistry Students Mental Health

The analysis presented in Table 1 indicates a low positive relationship between mental health issues and academic interest in Chemistry courses ($r = 0.045$). Although the p-value ($p = .023$) shows that the relationship is statistically significant at the 0.05 level, the effect size is notably small. The R Square value (.002) reveals that only 0.2% of the variance in academic interest is explained by mental health issues.

This finding highlights a clear distinction between statistical significance and practical significance. While the large sample size likely contributed to the statistical significance, the relationship itself is extremely weak in practical terms. Thus, students' mental health status—whether characterized by anxiety, stress, or emotional strain—provides almost no meaningful predictive power regarding their interest in Chemistry courses.

Based on the statistical result, the null hypothesis of no significant relationship was rejected. However, the practical implication suggests that although mental health issues are related to interest, the influence is negligible.

Research Question 2

What is the relationship between Chemistry education undergraduate students' mental health issues and academic interest in Chemistry courses as moderated by gender?

Research Hypothesis 2

There is no significant moderating effect of gender on the relationship between undergraduate students' mental health issues and academic interest in Chemistry courses in southeast universities.

Table 2. Hayes PROCESS Analysis of Mental Health Issues and Academic Interest Moderated by Gender

Model Summary							
R	R-sq	MSE	F(HC4)	df1	df2	p	Decision
.058	.003	519.661	2.485	3.000	2496.000	.059	Not significant

As shown in Table 2, the moderating effect of gender produced a very low correlation value ($r = 0.058$). The R Square (.003) indicates that only 0.3% of the variance in academic interest is explained by the combined effect of mental health issues and gender. This represents an extremely small effect size, providing minimal practical explanatory value.

Furthermore, the p-value of .059 is slightly above the conventional significance threshold of 0.05. Although marginal, this result indicates that the interaction between gender and mental health does not reach statistical significance. In other words, there is no reliable evidence that

the relationship between mental health issues and academic interest differs meaningfully for male and female students.

The negligible effect size reinforces this statistical conclusion. Even if gender had shown a significant moderating role, its practical impact would have been extremely limited. Therefore, in this context, gender does not meaningfully alter how mental health issues relate to students' interest in Chemistry courses.

Consequently, the null hypothesis for Research Hypothesis 2 was upheld, confirming that the relationship between mental health issues and academic interest is not significantly moderated by gender.

Discussion

This study examined the relationship between Chemistry education undergraduate students' mental health issues and their academic interest in Chemistry courses in southeast universities. The discussion addresses two major areas: (1) The influence of mental health issues on students' academic interest in Chemistry courses and (2) The moderating influence of gender on the relationship between mental health issues and academic interest.

Influence of Mental Health Issues on Undergraduate Students' Academic Interest in Chemistry Courses

The findings revealed a low positive relationship between Chemistry education undergraduates' mental health issues and their academic interest in Chemistry courses. Although the correlation value was small, the relationship was found to be statistically significant, indicating that mental health issues—such as stress, anxiety, or emotional fatigue—have a measurable, though weak, association with students' interest in Chemistry.

This suggests that even minimal changes in students' mental health may correspond with slight shifts in their academic interest. The significance of the relationship, despite the weak effect size, may be attributed to the large sample size as well as the increasing pressure placed on students within demanding STEM programs. Stress arising from perceived course difficulty, high academic expectations, and inadequate coping mechanisms may subtly influence how students engage with Chemistry-related content.

However, this finding contradicts several previous studies. Adeyemi (2020) reported a *strong negative correlation* between mental health issues and students' interest in Chemistry, showing that poor mental health substantially reduces academic engagement. Similarly, studies by Bruffaerts (2019) and Brambila-Tapia et al. (2020) found *moderate negative correlations*, demonstrating that anxiety and depression negatively affect students' attitudes, performance, and willingness to learn Chemistry.

Conversely, the present study aligns with Ojochegebe and Okafor (2024), who also reported a *low positive relationship* between mental health issues and interest in Chemistry. However, unlike the present findings, they found *no significant difference* between the variables. The statistical significance observed in this study may be explained by contextual factors such as increased academic competition, financial stress, teaching quality, and the perceived career value associated with Chemistry-related fields within the southeast region.

By establishing a statistically significant relationship—albeit weak—this research contributes to the body of literature suggesting that mental health issues cannot be ignored

when evaluating students' learning behaviors. It supports the perspective that even subtle mental health challenges may influence students' motivation, persistence, and engagement in Chemistry courses.

Influence of Mental Health Issues on Academic Interest as Moderated by Gender

The second major finding indicates that gender does not significantly moderate the relationship between mental health issues and academic interest in Chemistry courses. Although the analysis showed a very low positive relationship, the moderating effect of gender was weak and statistically non-significant.

This result implies that male and female students experience the influence of mental health issues on academic interest in similar ways. Regardless of gender, students with higher levels of anxiety, stress, or other psychological distress tend to exhibit comparable patterns of academic engagement. Therefore, gender-based differences do not meaningfully alter the mental health-interest dynamic in this context.

This finding contradicts Ojochegebe and Okafor (2024), who reported that gender significantly moderated the relationship, with differences observed between male and female students' responses to mental health stressors. It also diverges from studies by Smith (2021) and Kumar (2022), which emphasized that mental health issues negatively affected interest in Chemistry irrespective of gender, highlighting a universal detrimental impact.

The non-significant moderation observed in the present study may be due to several possible reasons:

- A weak effect size, indicating that any gender influence is negligible.
- Measurement error or limited variability in the instruments.
- A relatively homogeneous educational environment, where both male and female students receive similar academic and psychological support.
- Cultural and contextual factors within southeastern universities that promote equal learning experiences across genders.

Overall, this study supports the body of research suggesting that gender does not substantially shape how mental health issues impact students' interest in Chemistry. It positions mental health as a universal concern that affects academic interest similarly across demographic groups.

Implications of the Findings

The weak but significant relationship between mental health issues and interest in Chemistry implies that students' psychological well-being subtly influences their academic persistence and enthusiasm for Chemistry courses. Although gender does not play a moderating role, the findings highlight the broader need for institutional mental health support systems that benefit all students irrespective of gender.

For universities in southeast Nigeria, the results suggest that: (1) Mental health interventions should be integrated into academic support services, as even mild distress can affect students' interest and long-term engagement in STEM fields; (2) Teaching strategies and classroom environments should be designed to reduce anxiety, academic pressure, and stress-related triggers that undermine interest in Chemistry; (3) Gender-neutral mental health programs are appropriate, as male and female students are similarly affected by psychological challenges; and (4) Counseling units and academic advisors should collaborate to identify early signs of declining interest linked to mental health concerns.

Together, these implications emphasize the need for proactive, inclusive, and supportive educational policies that protect and promote students' mental well-being as part of enhancing academic engagement in Chemistry.

Conclusion

Based on the findings of this study on Chemistry education undergraduate students' mental health issues as a correlate of their interest in Chemistry courses in southeast universities, it can be concluded that there is a low positive relationship between students' mental health challenges and their academic interest in Chemistry. Although the relationship is weak, it is statistically significant, indicating that mental health issues—even at mild levels—play a measurable role in shaping students' academic motivation and engagement in Chemistry courses.

The study further revealed that gender does not significantly moderate the relationship between mental health issues and academic interest. While a low positive association was observed in the moderation model, this effect was not statistically meaningful. This suggests that male and female students experience similar patterns regarding how mental health influences their academic interest in Chemistry within the southeastern Nigerian university context.

Overall, the study underscores that students' mental well-being, even when effects appear small, remains an important factor in supporting academic engagement in Chemistry education programs.

Authors' Contribution

The authors declare that there is no conflict of interest associated with this article. Nnoli, J. N. led the research team and contributed to the overall organization of the study, including the design of the research framework and coordination across institutions. Obikezie, M. C. handled the technical aspects of the study, including data processing, statistical analysis, and the development of the literature review. Abumchukwu, A. A. was responsible for supervising data collection and overseeing the proofreading and refinement of the manuscript. All authors contributed intellectually to the study and collectively reviewed, revised, and approved the final manuscript.

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