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Research Article

Predictive Validity of UTME on First-Year Chemistry Students' CGPA in Universities in South-East, Nigeria

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Abstract
The predictive validity of the Unified Tertiary Matriculation Examination (UTME) results on the first-year cumulative grade point average (CGPA) of chemistry education students in South-East Nigerian universities was investigated in this study. The study specifically examined whether gender and school type affect the association between UTME scores and students' academic success. Three research questions and three hypotheses served as the investigation's compass. The study design used was a correlational survey. In 2024–2025, 404 students (137 men and 267 women) were accepted into nine public institutions. Of these, 175 students (48 men and 127 women) were chosen at random from four universities. Students' UTME scores, gender, school type, and first-year CGPA were gathered from institutional records using a structured proforma. Regression analysis, the *t*-test, and the Hayes macro process were used to analyze the data at the significance level of 0.05. The results showed a weakly positive correlation between first-year CGPA and UTME scores, with UTME making a negligible contribution to the variation in students' academic achievement. UTME scores were not statistically significant predictors of first-year CGPA, according to the regression analysis. Additionally, there was no significant moderating effect of gender or kind of school on the association between academic achievement and UTME scores. The study comes to the conclusion that students' academic progress in chemistry instruction cannot be predicted by UTME scores alone. It is advised that universities implement extra screening procedures to enhance admissions decisions and that admission authorities examine the UTME framework to better reflect the competencies needed for university education.

Keywords: Academic Performance, CGPA, Chemistry Students, Predictive Validity, UTME Scores

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1. INTRODUCTION

In higher education, academic achievement is still a major concern, especially when it comes to the standards for student admission and advancement. Exam results and students' cumulative grade point average (CGPA) are two often-used measures of academic accomplishment. Exams are standardized instruments used to evaluate students' knowledge, cognitive abilities, and general academic competency in a particular field of study. They offer a thorough assessment of pupils' academic performance over time when combined with CGPA. In Nigerian colleges, CGPA is frequently used to determine academic standing and graduation results since it shows consistent performance across several semesters (Muhammad & Isaac, 2022; Ituma et al., 2025). Evidence indicates that Unified Tertiary Matriculation Examination (UTME) results have only a weak to moderate predictive validity for students' university achievement,

despite the structured nature of admission procedures at Nigerian universities, which include screening through the Unified Tertiary Matriculation Examination (UTME). According to empirical research conducted in Nigeria, CGPA at the entry level is significantly predicted by UTME and Post-UTME scores; however, this predictive strength diminishes in subsequent years of study, with many students who enter with high scores still recording low CGPAs in their first year (Odukoya et al., 2018; Odudu-Modebe et al., 2025). The predictive value of UTME results as a trustworthy predictor of future academic success in higher education institutions is called into question by this trend.

The issue is particularly significant in science-based disciplines such as chemistry Education, where academic demands are rigorous and require a strong foundation in both theoretical knowledge and practical skills. Chemistry education involves the teaching and learning of chemical concepts, processes, and applications within formal educational settings and is aimed at developing learners' problem-solving abilities, critical thinking skills, and scientific literacy (Arsyad et al., 2024). The significance of science and chemistry education in promoting innovation, technological advancement, and sustainable development in Nigeria has been highlighted by academics in recent years (Olofin et al., 2023). A chemically literate individual is expected not only to understand the composition and interactions of matter but also to apply such knowledge responsibly in everyday life, including awareness of chemical hazards and environmental safety. Consequently, the quality of chemistry education at the university level is critical, as it shapes the competence of future educators, scientists, and professionals in related fields. However, empirical evidence from Nigerian universities indicates persistent challenges in students' academic achievement in chemistry and other science-related programmes, with reports of low performance linked to instructional methods, inadequate laboratory exposure, and weak foundational knowledge (Ogiga & Alu, 2025).

In Nigerian higher education institutions, the cumulative grade point average (CGPA) is still the most commonly used indicator of academic achievement. It shows the weighted average of students' grades from every course they took throughout a study period. A standardized indicator of students' academic success, CGPA is computed by dividing the total number of credit units attempted by the total number of grade points received (Muhammad & Isaac, 2022). In most universities in South-East Nigeria, CGPA classifications range from first-class honours (4.50–5.00) to failure (0.00–0.99), with each category reflecting a specific level of academic competence. First-year CGPA is particularly important, as it often sets the foundation for subsequent academic performance. It also serves as an early indicator of students' adaptability to university life, learning environment, and academic expectations. However, several studies have reported that a significant proportion of first-year students struggle to maintain satisfactory academic performance, even after meeting the admission requirements (Gilar-Corbi et al., 2020; Mulaudzi, 2023; López et al., 2023). This situation has prompted researchers to examine the factors influencing students' academic outcomes, including the predictive role of UTME scores.

The Joint Admissions and Matriculation Board (JAMB) administers the UTME, a standardized test intended to evaluate applicants' preparedness for higher education in Nigeria. JAMB was founded in 1978 and is in charge of organizing admissions to colleges of education, universities, and polytechnics. The UTME is the main screening tool used to choose eligible applicants and guarantee consistency in the admissions procedure (Abdulkareem & Lennon, 2025). The UTME is anticipated to have a strong predictive link with students' academic achievement at the postsecondary level because of its crucial role in deciding university admission. Nevertheless, there have been conflicting empirical results regarding the predictive validity of UTME scores. Higher UTME scores are linked to better academic achievement, according to some research that found a positive and substantial correlation between students' CGPA and UTME scores (Ituma et al., 2023; Dan et al., 2023). However, other research has discovered weak, negative, or non-significant correlations between UTME scores and CGPA, suggesting that UTME might not be a trustworthy indicator of academic performance (Ala, 2026; Gbore, 2012). In a similar vein, Ibrahim (2023) found a negligible negative link between students' academic achievement and UTME results, casting doubt on the usefulness of UTME as the only admissions criterion. These contradictory results imply that factors other than UTME scores affect academic performance in higher education. As a result, there is an increasing need to investigate other factors that can modify or mediate the association between CGPA and UTME. Gender is one of these factors that educational research has focused a lot of attention on.

The socially constructed roles, behaviors, and expectations that come with being male or female in a particular society are referred to as gender. It affects people's attitudes, learning preferences, and level of academic involvement (Stoet & Geary, 2020). Gender disparities in academic performance have been

extensively discussed in the context of science education, with research yielding conflicting findings. According to certain studies, male students typically perform better than female students in science-related courses, such as chemistry (Ugwuanyi & Aderanti, 2023; Ugwuanyi et al., 2024). These results are frequently explained by things like differences in self-efficacy, unequal access to resources, and societal preconceptions. However, research has shown that in chemistry and other science courses, female students perform on par with or even better than their male counterparts (Oladejo et al., 2021). Furthermore, other researchers have discovered no discernible gender differences in academic attainment, indicating that performance gaps can be context-specific rather than universal (Costa et al., 2024; Zhang et al., 2024). The discrepancy in these results suggests that the impact of gender on academic achievement is still unclear and needs more research.

Apart from gender, school type has also been found to have an impact on students' academic performance. In this context, "school type" refers to the ownership and organizational structure of universities, which can be classified as state or federal establishments. State governments construct and oversee state universities, but the federal government funds and oversees federal institutions (Nigeria 234, 2025). Students' academic results may differ among various institutions due to differences in funding, facilities, personnel caliber, and learning environments. Divergent findings have also been found in studies looking at how school type affects academic achievement. According to certain studies, students at federal universities typically do better academically because of improved facilities, more skilled faculty, and improved learning materials (Mbazor, 2021; Ajayi, 2024). Other research, however, has not discovered any appreciable variations in academic performance between students attending federal and state institutions (Ala et al., 2025; Ogunode & Akpakwu, 2023). These discrepancies demonstrate the need for more empirical research on how school type affects kids' academic achievement.

The complexity of factors influencing students' performance in higher education is highlighted by the ongoing discrepancies in the literature about the predictive validity of UTME scores, as well as the impact of gender and school type on academic achievement. Moreover, there is a noticeable gap in the literature concerning studies that specifically focus on chemistry education students in South-East Nigerian universities. Most existing studies have either examined general student populations or focused on other disciplines, thereby limiting the generalizability of their findings to chemistry education. Given the importance of chemistry education in national development and the observed decline in students' academic performance, it is essential to investigate the extent to which UTME scores can predict first-year CGPA among chemistry education learners. A more thorough grasp of the variables impacting academic success in this field will also be obtained by looking at the moderating effects of gender and school type on this relationship.

In order to ascertain the predictive validity of UTME scores on the first-year CGPA of chemistry education students in South-East Nigerian universities, this study was conducted. It also seeks to determine whether this link is substantially moderated by gender and school type. By tackling these problems, the study hopes to add to the current conversation on academic achievement and admission practices in Nigerian universities. It also hopes to offer empirical data that can guide institutional decision-making, policy creation, and educational planning.

1.1. The Study's Objective

This study's main goal is to find out how South-East Nigerian university chemistry students' UTME results relate to their first-year CGPA. In particular, the study was intended to:

1. Find out how well UTME results predict chemistry students' first-year CGPA.
2. Examine whether gender moderates the relationship between UTME scores and first-year CGPA.
3. Investigate whether school type moderates the relationship between UTME scores and first-year CGPA.

1.2. Research Questions

The following research questions served as the study's compass.

1. What is the relationship between first-year CGPA in South-East Nigerian universities and chemistry students' UTME scores?
2. What role does gender play in predicting chemistry students' UTME scores and first-year CGPA at universities in South-East Nigeria?
3. Does the type of school affect the relationship between first-year CGPA and UTME grades for chemistry students in South-East Nigerian universities?

1.3. Hypotheses

To direct the investigation, the following null hypotheses were developed and evaluated at the 0.05 level of significance.

H_{01}: First-year CGPAs for chemistry students in South-East Nigerian universities are not significantly predicted by UTME scores.

H_{02}: The ability of UTME scores to predict first-year CGPA for chemistry students in South-East Nigerian universities is not significantly moderated by gender.

H_{03}: The ability of chemistry students' UTME scores to predict their first-year CGPA at South-East Nigerian universities is not significantly influenced by the type of school.

2. METHODS

2.1. Research Design

A correlational survey research design was used in the study. Because it is utilized to ascertain the link, correlation, or covariance between two or more variables without changing them, this design was deemed suitable. The degree and direction of correlations between variables as they naturally occur can be examined by researchers using correlational research (Putri et al., 2025).

2.2. Participants

The population comprised 404 chemistry education students (137 males and 267 females) in 2024/2025 who were admitted into nine public universities in South-East Nigeria. These students represent cohorts whose UTME scores and academic performance data were available for analysis. The sample size consisted of 175 chemistry education students, comprising 48 males and 127 females. This comprised all the chemistry education students in four public Universities (two federal and two state institutions). In order to guarantee that every member of the population has an equal chance of being drawn, two universities were chosen from the four federal universities using a simple random sample procedure (balloting with replacement). Similarly, two of the five state institutions were chosen using a similar procedure.

2.3. Research Instruments

Data were collected using a researcher-developed proforma titled "Chemistry Students' Entry Qualifications and CGPA Proforma (CSEQCP)". The proforma was used to extract relevant secondary data, including UTME scores, gender, school type, and first-year CGPA, from institutional records. The proforma is divided into six (6) sub-sections: university name, serial number, registration number, gender (male and female), UTME scores, and first-year CGPA. The use of a documentary proforma is considered appropriate in predictive validity studies where objective academic records are required instead of self-reported data, thereby improving data reliability (Podsakoff, 2003). The face and content validation of the instrument were scrutinized by three experts in educational measurement and chemistry education. The validation ensured that the items adequately captured all required variables for the study, including alignment with university grading systems and admission records.

2.4. Procedures

Data were obtained from the registry units of the selected universities after obtaining official permission. Information on UTME scores, gender, school type (public/private secondary school background), and first-year CGPA was extracted using the proforma. Although the study relied on archival data, consistency checks were performed by cross-verifying students' records across departmental and faculty databases to ensure accuracy. This aligns with methodological recommendations for secondary data studies in educational research (Mandasin, 2022).

2.5. Data Analysis

The statistical package for social sciences (SPSS) version 31.0 and Andrew Hayes Process version 5.0 were used to analyze the data using both descriptive and inferential statistics. Research question 1 was answered using the coefficient of determination (R^2) to calculate the percentage of CGPA variance that UTME scores account for. To ascertain whether gender and school type significantly moderated the prediction of UTME results on CGPA, research questions 2 and 3 were examined using the Hayes macro method (moderation analysis). The t-test was used to test hypothesis 1. At the 0.05 level of significance, interaction effects in the Hayes Macro Process were used to test hypotheses 2 and 3. Regression and moderation analysis are in line with recent research on educational outcomes and predictive validity (Dagdagui, 2022). When the p-value for any hypothesis was less than or equal to 0.05, the null hypothesis was rejected; otherwise, it was accepted. According to recognized recommendations, values of 0.20–0.39 indicate weak correlation, 0.40–0.59 indicate moderate correlation, 0.60–0.79 indicate strong correlation, and 0.80 and above indicate extremely strong correlation (Schober et al., 2018).

3. RESULTS

Research Question 1: What is the relationship between first-year CGPA in South-East Nigerian universities and chemistry students' UTME scores?

Table 1. Simple Linear Regression Analysis of Predictive Potential of Chemistry Students' UTME Grades on Their First Year CGPA

Model	R	R Square	Adjusted R Square	Std Error of the Estimate
1	.088[a]	.008	.004	.74157

a. Predictors: (Constant), UTME

Table 1 indicates that the correlation coefficient for the association involving chemistry students' UTME results and their first-year CGPA at universities in South-East Nigeria is (r =.088), and a coefficient of determination of (r^2 =.008). This suggests that there was a low positive association between UTME scores and chemistry students' first-year CGPA. Furthermore, the coefficient of determination (r^2 =.008) indicates that UTME results have a 0.8% predictive potential on first-year CGPA for chemistry students in South-East Nigerian universities. As a result, just 0.8% of the positive variation in chemistry students' first-year CGPA at universities in South-East Nigeria is ascribed to their UTME scores, while 99.2% is assigned to other factors.

H_{01}: There is no statistically significant difference in the predictive capacity of UTME scores on first-year chemistry students' CGPA at South-East Nigerian universities.

Table 2. T-Test Examination of Predictive Potential of Grades of Chemistry Students on Their First Year CGPA

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.833	.625		2.936	.004
	UTME	.004	.003	.088	1.144	.254

a. Dependent Variable: CGPA

Table 2 shows that the unstandardized coefficients of.004, t of 1.144, and p-value of .254 were achieved. This means that chemistry students' UTME scores were not significant predictors of their first-

year CGPA at Nigerian universities in the South-East (t = 1.144, p =.254). Because the associated value of .254 is above the significance level of 0.05, the hypothesis is therefore accepted.

Research Question 2: What role does gender play in predicting chemistry students' UTME scores and first-year CGPA at universities in South-East Nigeria?

Table 3. Hayes Macro Process Analysis of the Moderating Effect of Gender on the Predictive Ability of Chemistry Students' UTME Scores on Their First Year CGPA

Model	Gender	R	R Square	R	T	P
1	Male	.066[a]	.004	.009	1.259	.213
	Female	.150[a]	.002			

a. Predictors: (Constant), UTME

Table 3 shows that the predictive power (r^2= .004 or 0.4%) of UTME scores on male chemistry students' first year CGPA in universities in South-Eastern Nigeria is less than the predictive power (r^2= .022 or 2.2%) of UTME scores of female chemistry students' first year CGPA in universities in South-Eastern Nigeria. Thus, compared to their male counterparts, female chemistry students' first-year CGPA was more accurately predicted by UTME scores. However, the moderating influence of gender on the prediction capacity of UTME results on the CGPA of first-year chemistry students in South-Eastern Nigerian universities has a modest correlation value (r =.009).

H_{02}: Gender has no substantial moderating effect on the predictive capacity of chemistry students' UTME scores on their first year CGPA at South-East Nigerian universities.

Table 3 shows that a p-value of .213 was observed when t = 1.259. This indicates that the prediction ability of chemistry students' UTME on their first year CGPA at South-East Nigerian universities was not statistically significantly moderated by gender (t = 1.259, p =.213). As a result, the null hypothesis (p>.05) is not rejected.

Research Question 3: Does the type of school affect the relationship between first-year CGPA and UTME grades for chemistry students in South-East Nigerian universities?

Table 4. Hayes Macro Process Analysis of the Moderating Influence of School Type on the Predictive Power of Chemistry Students' UTME Scores on Their First Year CGPA

Model	Gender	R	R Square	R	T	P
1	State	.071	.005	.012	1.681	.095
	Federal	.191	.036			

a. Predictors: (Constant), UTME

Table 4 shows that the predictive power (r^2= .005 or 0.5%) of UTME scores on chemistry students' first year CGPA in Nigerian state universities in South-East is lower than the anticipated power (r^2= .036 or 3.6%) of UTME scores on chemistry students' first year CGPA in South-East Nigeria's federal universities. Hence, UTME scores predict chemistry students' first year CGPA at federal universities in South-Eastern Nigeria better than the UTME scores of chemistry students' first year in state universities. However, in South-East Nigerian institutions, the moderating effect of school type on the prediction capacity of UTME scores on the first-year CGPA of chemistry students is (r =.012), which is very low.

H_{03}: The moderating impact of school type on the predictive power of UTME on chemistry students' first year CGPA at the South-Eastern Nigeria Universities is not significant.

Table 4 shows that at t = 1.681, a p-value of.095 was achieved. This means that school type has no significant moderating influence on the predictive capacity of chemistry students' UTME on their first-year CGPA at South-East Nigerian universities (t = 1.681, p =.095). Thus, the null hypothesis is not rejected (p >.05).

4. DISCUSSION

The study's conclusions showed a weakly positive correlation between first-year Chemistry students' CGPA and UTME scores. Only 0.8% of the variation in students' academic achievement could be explained by their UTME scores, according to the coefficient of determination (r^2 =.008). This suggests that UTME scores have minimal predictive power on students' academic achievement at the university level. Furthermore, UTME scores were not statistically significant predictors of first-year CGPA, according to the regression analysis. This suggests that students who do well on the UTME do not always have high CGPAs throughout their first year of college. This finding is consistent with earlier studies reviewed in this study, which reported weak or non-significant relationships between UTME scores and academic performance in higher institutions (Ala, 2026; Akomolafe, 2019; Ibrahim, 2022). In a similar vein, educational assessment studies like Ituma et al. (2023) and Dan et al. (2023) recognized that while UTME scores may exhibit some degree of correlation with CGPA, their predictive power is frequently restricted. The outcome, however, runs counter to research by Odukoya et al. (2018) and Odudu-Modebe et al. (2025), who found a strong positive correlation between students' CGPA and UTME scores. The discrepancy in these results could be explained by variations in institutional contexts, disciplinary focus, and sample characteristics.

Additionally, the study looked at how gender affected the association between first-year CGPA and UTME scores. Findings showed that although UTME scores slightly predicted female students' CGPA more than male students, the moderating effect of gender was not statistically significant. This suggests that the ability of UTME results to predict students' academic achievement in chemistry instruction is not substantially impacted by gender. This result is consistent with previously reviewed research that found no discernible gender disparities in academic achievement (Costa et al., 2024; Zhang et al., 2024). It also supports the position of gender studies scholars such as Stoet and Geary (2020), who emphasized that gender differences in academic outcomes are often context-dependent. The outcome, however, runs counter to research by Ugwuanyi and Aderanti (2023) and Ugwuanyi et al. (2024), which found that male students do better in scientific courses than female students. The discrepancy across studies implies that sociocultural and institutional factors may have different effects on gender's impact on academic attainment.

The study also looked into the moderating effect of school type on the association between first-year CGPA and UTME scores. The findings revealed that UTME scores had slightly higher predictive power in federal universities compared to state universities. However, the moderating effect of school type was not statistically significant. This suggests that the association between UTME results and students' academic success is not much influenced by the type of school. This result is in line with previous research examined in this study, which indicated no discernible variations in pupils' academic performance according to the type of school (Ala et al., 2025; Ogunode & Akpakwu, 2023). However, it contradicts findings by Mbazor (2021) and Ajayi (2024), who reported that students in federal universities perform better due to better funding, infrastructure, and academic resources. The observed differences may be due to variations in institutional quality, learning environments, and resource availability across different universities.

5. CONCLUSION

With a focus on the moderating effects of gender and school type, this study investigated the predictive validity of UTME scores on the first-year CGPA of Chemistry education students in South-East Nigerian institutions. The results show that while there is a slight positive correlation between UTME scores and students' first-year CGPA, UTME's predictive potential is negligible and statistically irrelevant. This suggests that UTME scores by themselves are unreliable predictors of students' academic achievement in university-level chemistry study. Furthermore, the study established that neither gender nor school type significantly moderates the relationship between UTME scores and academic performance. Although slight variations were observed—such as marginally higher predictive power among female students and students in federal universities—these differences were not statistically meaningful. This supports the idea that academic achievement in higher education is impacted by a variety of intricate interactions that go beyond grades on standardized entry exams.

This study has limitations despite its contributions. The results may not be as applicable to other fields, areas, or private institutions because the sample was limited to Chemistry education students at certain public universities in South-East Nigeria. Furthermore, the study relied on archival data, which, while trustworthy, prevented the inclusion of other potentially significant factors such as students' motivation, study habits, socioeconomic background, and learning environment.

In light of the study's conclusions, the researchers advise that: (1) University admission authorities (JAMB and institutions) should reduce overreliance on UTME scores and incorporate additional criteria such as post-UTME performance and O-level grades. (2) Universities should establish or reinforce academic support services such as tutoring programmes, remedial classes, and mentoring schemes, especially for first-year Chemistry students. (3) JAMB should periodically review the UTME to ensure better alignment with university-level competencies, particularly in science-related disciplines. (4) Departments of Chemistry Education should implement continuous monitoring of students' academic progress from the first semester. (5) A replication of this work embracing a wider geographical area and a larger sample size is essential to ensure greater reliability and generalization. (6) The study could be undertaken in other subject areas like physics, biology, mathematics, integrated science, etc.

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Research Ethics. The ethical guidelines governing educational research in Nigeria were followed in the conduct of this study. Prior to the start of data collection, approval was acquired from the relevant institutional research ethics committees of the participating universities. All procedures complied with applicable institutional guidelines and data protection regulations. Due to the study's reliance on archival academic records, student privacy and confidentiality were rigorously upheld throughout the investigation. Data were utilized only for academic study, and no personal identifiers were revealed. The Ethics Committee of the Department of Science Education of the University of Nigeria, Nsukka, Nigeria, provided ethical approval (REC/DSE/UNN/24/0094).

Data Availability Statement. Secondary institutional records (UTME scores, gender, school type, and first-year CGPA) from particular universities in South-East Nigeria comprised the data used in this study. The dataset is not publicly accessible due to institutional privacy regulations and ethical limitations affecting student academic records. However, with consent from the collaborating institutions and upon reasonable request, the corresponding author may make anonymised data public.

Conflicts of Interest. Regarding the publishing of this paper, the authors affirm that they have no conflicts of interest. The study was carried out independently, free from any commercial, financial, or personal ties that might have affected the results or how they were interpreted.

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