Exploratory Analysis of the Relationship between Gender, Mode of Admission and Academic Performance among Undergraduate Students

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ABSTRACT

Academic performance in higher education is shaped by multiple student, institutional, and contextual factors. This study examined the association of gender and mode of admission with cumulative grade point average (CGPA) among final-year undergraduate students in four departments of the Faculty of Physical Sciences, University of Ilorin, Nigeria. Secondary academic records for 302 students from the 2021/2022 academic session were analyzed. Descriptive statistics, Pearson/point-biserial correlation for the binary gender variable, and chi-square tests of independence were used. Admission mode comprised Unified Tertiary Matriculation Examination (UTME), Direct Entry, and Remedial entry. Because the non-UTME groups were small, an additional chi-square analysis compared UTME with the combined non-UTME group. Gender was positively associated with CGPA, rpb = 0.217, $p < 0.001$, indicating a small association in the direction of the female-coded group. The distribution of academic-classification categories also differed by gender, $\chi^2(3, N = 302) = 13.545$, $p = 0.004$, Cramér's V = 0.210. In contrast, the UTME-versus-other admission-mode comparison was not statistically significant, $\chi^2(3, N = 302) = 6.90$, $p = 0.075$, Cramér's V = 0.151. These findings indicate that gender was associated with academic performance in this cohort, whereas the collapsed admission-mode comparison was not.

Keywords: academic performance, cumulative grade point average, gender, mode of admission, point-biserial correlation, chi-square test.

1.1 INTRODUCTION

Academic performance is a central indicator of student progress and an important outcome for higher-education institutions. The academic success of students in higher education is a topic of paramount importance. Understanding the factors that influence student performance allows universities to develop targeted strategies to enhance learning outcomes. Contemporary research emphasizes that university achievement is multidimensional and may reflect prior academic preparation, learning behaviours, institutional conditions, socioeconomic circumstances, and psychosocial factors rather than a single demographic characteristic. A systematic review of academic performance in higher education similarly shows substantial heterogeneity in the factors examined and cautions against treating demographic variables as universal predictors of achievement (Chung et al., 2022). Academic performance is commonly operationalized through grades, grade point averages, completion outcomes, or other measures of assessed achievement. Recent reviews emphasize that academic performance is associated with a broad set of variables, including prior achievement, learning strategies, student engagement, learning environments, and socioeconomic conditions. Rodríguez-Hernández et al. (2020) reported a weak positive relationship between socioeconomic status and academic performance in higher education, while noting that prior achievement and university experience may be more strongly related to performance. Al-Tameemi et al. (2023) similarly synthesized academic, personal, and social determinants of undergraduate underperformance.

Gender has been examined extensively in studies of educational achievement, but findings vary by discipline, assessment conditions, educational system, and student population. For example, research has documented gender differences under particular assessment conditions, while other evidence suggests that gender effects

can be small or context-dependent (Guez et al., 2020; Cantley & McAllister, 2021). Nigerian evidence also remains mixed. Akunne and Chigbo-Obasi (2020) found that gender was not a significant predictor of achievement in General Mathematics among sampled tertiary students, whereas Jekayinfa et al. (2023) reported gender-related trends in academic achievement among History graduates. These differences support the need for institution- and discipline-specific analyses. Some studies have also revealed significant differences in academic achievement between genders (Adeneye & Adeleye, 2011). These studies suggest that females may outperform males in certain subject areas (e.g., writing, language arts). However, other research has found no statistically significant correlation between gender and academic performance (Abiam & Odok, 2006). These contrasting findings highlight the complexity of the gender-performance relationship. Social and cultural factors likely play a role, as societal expectations and gender stereotypes can influence student behavior and course selection (Jansen, 2004). Additionally, biological factors may also contribute to these variations (Umoh, 2003). A substantial body of research has explored the relationship between gender and academic performance, highlighting its importance as a potential factor influencing student success. These studies have yielded mixed results (Udousoro, 2011; Jansen, 2004; Bruinsma, 2003).

It extends beyond simply identifying as male or female; it encompasses psychological aspects that influence behaviors and characteristics (Okeke, 2003; Umoh, 2003). Eggens et al. (2008) identified gender as a potential determinant of academic achievement, alongside other demographic variables. However, the existing research presents an inconclusive picture. While some studies have established a link between gender and academic performance (Adeneye & Adeleye, 2011), others have found no significant correlation (Abiam & Odok, 2006). This unresolved debate motivates the current study to investigate if gender remains a significant predictor of academic performance. Research on gender and academic achievement does not yield a single universal pattern. Guez et al. (2020) showed that observed gender differences can vary according to the type of evaluation, while Cantley and McAllister (2021) found that gender similarities and differences in mathematics achievement depend on the assessment context. Verbree et al. (2023) further examined conscientiousness as a possible contributor to the gender gap in academic achievement, illustrating that observed differences may reflect characteristics and processes beyond gender itself.

Evidence from Nigeria is similarly mixed. Akunne and Chigbo-Obasi (2020) reported no significant gender prediction of General Mathematics achievement among sampled tertiary students. Jekayinfa et al. (2023), however, identified gender-related patterns in the academic achievement of History graduates, while a 2023 Nigerian study of undergraduates reported that personal variables such as time management, concentration, revision, and related behaviours were important to achievement regardless of gender. These findings suggest that gender should be examined empirically within the specific institution and discipline rather than assumed to have a fixed effect.

Admission mode may be associated with students' prior preparation, academic pathways, and transition experiences, but evidence is not consistent across settings. Aciro et al. (2021), in a systematic review of literature on entry grades and university academic performance, found positive, negative, mixed, and nonsignificant relationships across the reviewed studies. In Nigeria, Oladele (2023) examined entry mode alongside study-related variables, while Ojo et al. (2025) identified several student, teaching, family, environmental, and institutional factors associated with academic performance among University of Ilorin undergraduates. These findings reinforce the view that admission pathway is only one component of a broader academic environment. Students gain entry to universities through various admission channels, including standardized testing, transfer credits from other institutions, and alternative pathways. Research suggests that the mode of admission may influence a student's initial academic performance (Smith & Naylor, 2001). Students admitted through traditional channels, such as standardized tests, might exhibit stronger academic performance initially. However, factors like motivation, prior learning experiences, and social integration can influence long-term academic success (Fan, 2001). Furthermore, the specific requirements of alternative admission pathways may need to be considered. For instance, students admitted through transfer programs may possess strong academic records from previous institutions, potentially impacting their performance at the new university (Khan & Malik, 1999).

The present study therefore revisits the relationship between academic performance, gender and mode of admission using institutional records from the Faculty of Physical Sciences, University of Ilorin. The study is

deliberately framed as an exploratory association study rather than a causal investigation. The point-biserial correlation is appropriate when one variable is binary and the other is continuous, but a three-category admission variable should not be entered directly as though it were a binary variable (Bonett, 2020).

2.1 Definitions of Relevant Terms

Definition 2.1.1: Chi-square test statistics

Chi-square statistic (χ^2) is a measure used to assess the association or independence between categorical variables [Karl Pearson, 1900].

Definition 2.1.2: Academic Performance

Academic Performance can be defined as the knowledge gained by the student which is assessed by marks by a teacher and/or educational goals set by students and teachers to be achieved over a specific period of time. [Kumar. Et al., 2021].

Definition 2.1.3: Cumulative Grade Point Average

Cumulative grade point average (CGPA) is defined as a standardized process to define different levels of academic and intellectual abilities of a student [Parashar, et al., 2021].

Definition 2.1.4: Mode of Admission

Modes of admission, otherwise referred to entry modes refer the various means through which prospective candidate may be admitted into a first degree programme. Nigerian universities do have different modes of entry for interested candidates into the various educational programs [Yusuf, 2023].

Definition 2.1.5: Pearson Correlation

Pearson's correlation coefficient, a measurement quantifying the strength of the association between two variables. Pearson's correlation coefficient r takes on the values of −1 through +1. Values of −1 or +1 indicate a perfect linear relationship between the two variables, whereas a value of 0 indicates no linear relationship [Stewart, 2026].

Definition 2.1.6: Point Biserial Correlation

The Point-Biserial correlation is the value of Pearson's product moment correlation when one of the variables is dichotomous and the other variable is metric. Values range from +1, a perfect positive relation; through zero, no association at all; to −1, a perfect negative correlation [Kornbrot, 2005].

3. RESULTS

A retrospective secondary-data design was used. The dataset comprised academic records for 302 final-year students in four departments of the Faculty of Physical Sciences, University of Ilorin, for the 2021/2022 academic session. The departments were Statistics (n = 124), Geophysics (n = 52), Mathematics (n = 87), and Geology (n = 39).

Table 3.1 Variables and Operational Definitions

Variable	Operationalization
Gender	Binary: 0 = male; 1 = female.
Mode of admission	UTME, Direct Entry, or Remedial. For a secondary binary analysis, UTME = 0 and non-UTME = 1.
Academic performance	Continuous CGPA on the University of Ilorin 5-point scale.

Academic classification	First Class (4.50–5.00); Second Class Upper (3.50–4.49); Second Class Lower (2.40–3.49); Third Class (1.50–2.39); Pass (1.00–1.49).

No student in the supplied dataset had a CGPA within the Pass category; therefore, the inferential classification tables contain four observed categories.

3.2 Statistical Analysis

Descriptive statistics were used to summarize CGPA and admission groups. The point-biserial correlation was used to quantify the association between the binary gender variable and continuous CGPA. Because the original three-category admission variable is nominal rather than binary, it was analyzed using chi-square tests of independence when related to academic-classification categories. Because Direct Entry and Remedial groups were small, a secondary analysis collapsed them into a single non-UTME category. Pearson correlation between CGPA and the collapsed binary admission variable is mathematically equivalent to a point-biserial correlation and was reported only as a supplementary analysis. Statistical significance was evaluated at $\alpha = .05$. Cramér's V was added to the chi-square results as an effect-size measure.

The study is observational and based on one academic session; consequently, statistically significant associations are not interpreted as causal effects.

Table 3.2.1 Descriptive Characteristics

Characteristic	Category	N	%
Gender	Male	228	75.5
	Female	74	24.5
Admission mode	UTME	280	92.7
	Direct Entry	16	5.3
	Remedial	6	2

The sample was predominantly male (75.5%). UTME was the dominant admission route (92.7%), while Direct Entry and Remedial entrants constituted 5.3% and 2.0%, respectively.

Group	N	Mean CGPA	SD
Male	228	3.086	0.821
Female	74	3.508	0.82
Overall	302	3.189	0.839
UTME	280	3.195	0.819
Non-UTME	22	3.116	1.09

Female students had a higher mean CGPA than male students in this dataset. The mean CGPA of UTME students was slightly higher than that of the combined non-UTME group; the difference was small relative to the variability in CGPA.

3.3: Gender and Academic Performance

Gender	First Class	Second Class Upper	Second Class Lower	Third Class	Total
Male	11	64	102	51	228
Female	9	32	23	10	74
Total	20	96	125	61	302

3.4 Chi-Square Test of Independence

Hypothesis:

H_0: CGPA is not dependent of factors; Gender and Mode of entry

H_1: CGPA is dependent of factors; Gender and Mode of entry

Significance level; $\alpha = 0.05$

Test statistics

$$X^2 = \sum_{i=1}^{r} \sum_{j=0}^{c} \frac{(o_{ij} - e_{ij})^2}{e_{ij}} \sim \chi^2_{(r-1)\,(c-1)}$$

Decision rule: Reject H_0 if P-value is less than α, otherwise do not reject

Table 3.4.1: Chi-square test of Independence of CGPA against Gender

Academic class	MALE	FEMALE	TOTAL	df	X^2	p-value
First class	11	9	20	3	13.545	0.003595
Second class upper	64	32	96			
Second class lower	102	23	125			
Third class	51	10	61			
Total	228	74	302			

Table 3.4.1 shows that, the p-value (0.003595) is lesser than the level of significance (0.05), then the null hypothesis is rejected. Hence, it is concluded that CGPA is dependent of Gender.

Table 3.4.2: Chi-square test of Independence of CGPA against Mode of Admission

Academic class	UTME	Direct Entry	Remedial	Total
First Class	16	4	0	20
Second Class Upper	92	4	0	96
Second Class Lower	117	6	2	125
Third Class	55	2	4	61
Total	280	16	6	302

When the three admission categories were retained, the Pearson chi-square statistic was $\chi^2(6, N = 302) = 18.24$, $p = 0.006$, Cramér's $V = 0.174$. However, several expected cell (Direct entry and Remedial) are small and create sparse expected frequencies because only 22 students were admitted through non-UTME pathways. For this reason, the more stable primary comparison for interpretation combines Direct Entry and Remedial entrants into a single non-UTME category.

3.4.3: Mode of Admission and Academic Performance

Academic class	UTME	Non-UTME	Total
First Class	16	4	20
Second Class Upper	92	4	96
Second Class Lower	117	8	125
Third Class	55	6	61
Total	280	22	302

For the UTME-versus-non-UTME comparison, $\chi^2(3, N = 302) = 6.90$, $p = 0.075$, Cramér's $V = 0.151$. Thus, at the 5% significance level, there is insufficient evidence to conclude that academic-classification distribution differs between UTME and non-UTME entrants.

3.5 Supplementary Point-Biserial Analysis

Variable	Coding	Rpb	p	Interpretation
Gender	0 = male; 1 = female	.217	< .001	Small positive association
Admission mode	0 = UTME; 1 = non-UTME	−.024	.673	Negligible association

The supplementary point-biserial coefficient for admission mode is not the same as the original manuscript's reported coefficient because the original analysis treated a three-category nominal variable as though it were binary/ordinal. After collapsing admission mode into UTME versus non-UTME, the recalculated coefficient is rpb = −0.024, p = 0.673.

3.6 Correlation Analysis

To examine the relationship between CGPA and the dichotomous variable (UTME or Mode of Entry), we use the Pearson correlation analysis and the proposed hypothesis and the result are as follows:

Hypothesis:

H_0: There is no significant correlation between CGPA and the dichotomous variable (UTME or Mode of Entry).

H_1: There is a significant correlation between CGPA and the dichotomous variable (UTME or Mode of Entry).

Table 3.6.1: Test of Assoociation Between Cgpa, Gender And Mode Of Entry

Correlations				
		GENDER	CGPA	MODE
GENDER	Pearson Correlation	1	0.217**	0.127*
	Sig. (2-tailed)		0.001	0.027
	N	302	302	302
CGPA	Pearson Correlation	.217**	1	0.028
	Sig. (2-tailed)	0.001		0.625
	N	302	302	302
MODE	Pearson Correlation	0.127*	0.028	1
	Sig. (2-tailed)	0.027	0.625	
	N	302	302	302

3.6.2 Interpretations

Gender and CGPA: There was a statistically significant positive correlation between gender and CGPA (0.217, p-value < 0.001). Based on the gender coding adopted in this study (Male = 0, Female = 1), the positive correlation indicates that female students tends to have higher CGPA than their male counterpart. However the correlation coefficients suggests a weak positive association between gender and CGPA

Table 3.6.3: Point Biserial Correlation

TERM		N	n1	n2	P	Q	$\dot{X}_p$	$\dot{X}_q$	Std	r(pb)
STATISTICS	GENDER	124	89	35	0.7177	0.2822	2.9905	3.4311	0.846	-0.2345
	MODE	124	113	11	0.9113	0.0887	3.08929	3.377273	0.846	-0.0967
GEOPHYSICS	GENDER	52	44	8	0.8461	0.1538	3.245	3.736	0.6337	-0.2796
	MODE	52	51	1	0.9807	0.01923	3.293	4.72	0.6337	-0.3092
MATHEMATICS	GENDER	87	64	23	0.736	0.264	3.065	3.695	0.976	-0.2847
	MODE	87	82	5	0.943	0.057	3.27	2.576	0.976	-0.0511
GEOLOGY	GENDER	39	31	8	0.7948	0.205	3.175	3.081	0.7216	0.0525
	MODE	39	34	5	0.8717	0.1282	3.2138	2.762	0.7216	-0.003

- **Term:** This refers to the variable being correlated with CGPA (either UTME or Mode of Entry).
- **N:** Total number of students in the department (across genders).
- **n1:** Number of students in the first category of the dichotomous variable (e.g., UTME passers).
- **n2:** Number of students in the second category of the dichotomous variable (e.g., UTME non-passers).
- **p:** Proportion of students in the first category (n1 / N).
- **q:** Proportion of students in the second category (1 - p).
- **Xp_bar:** Average CGPA of students in the first category.
- **Xq_bar:** Average CGPA of students in the second category.
- **Std Dev:** Standard deviation of CGPA scores.
- **r(pb):** Point-biserial correlation coefficient between CGPA and the dichotomous variable. It ranges from -1 (perfect negative correlation) to +1 (perfect positive correlation). A value of 0 indicates no correlation.

3.6.4 Interpretations

- In statistic, the relationship between student academic performance and gender is a weak negative relationship (-0.2345), also the relationship between academic performance and mode of admission is a weak negative relationship (-0.0967).
- In geophysics, the relationship between student academic performance and gender is a weak negative relationship (-0.2796), also the relationship between academic performance and mode of admission is a weak negative relationship (-0.3092).
- In mathematics, the relationship between student academic performance and gender is a weak negative relationship (-0.2847), also the relationship between academic performance and mode of admission is a weak negative relationship (-0.0511).
- In geology, the relationship between student academic performance and gender is a weak positive relationship (0.0525), also the relationship between academic performance and mode of admission is a weak negative relationship (-0.003).

4. DISCUSSION OF RESULTS

The analysis indicates a statistically significant association between gender and academic performance in the study cohort. Female students recorded a higher mean CGPA than male students. This finding is consistent with the statistically significant positive correlation between gender and CGPA ($r = 0.217$, $p < 0.001$), under the study's coding scheme (Male = 0, Female = 1). The magnitude of the gender association was modest. The point-biserial coefficient of 0.217 corresponds to approximately 4.7% shared variance ($r^2 = 0.047$), which indicates that most variation in CGPA remains unexplained by gender alone. This is consistent with broader literature emphasizing the multidimensional nature of university achievement.

The admission-mode results require particular caution because of the small sample size in the direct entry and remedial groups. The raw data contained 280 UTME entrants, 16 Direct Entry entrants, and 6 Remedial entrants. The three-category chi-square test was statistically significant, but the sparse non-UTME cells make interpretation unstable. After combining the two small non-UTME groups, the association was no longer statistically significant ($p = 0.075$). The three-category admission variable should therefore not be entered directly into a Pearson correlation as if its numeric labels represented equal intervals. For categorical academic

outcomes, chi-square analysis is more appropriate; for a binary admission comparison, a point-biserial correlation can be used as a supplementary measure.

5. CONCLUSION

Among the 302 final-year students analyzed, gender was significantly associated with academic performance,

with female students having a higher mean CGPA than male students in the supplied records. The association was statistically significant but modest. For admission mode, the more defensible UTME-versus-non-UTME comparison did not reach statistical significance at the 5% level. The findings therefore support an association between gender and CGPA in this cohort but do not provide sufficient evidence for an association between the collapsed admission-mode variable and academic performance. Further studies using multiple cohorts and multivariable models are needed to determine whether these relationships persist after accounting for prior academic preparation and other relevant factors.

Future studies should use multiple academic sessions and include additional faculties or universities to improve external validity. Admission-mode analyses should preserve the original categories where sample sizes permit; otherwise, category collapsing should be justified before analysis and accompanied by sensitivity analyses. Multivariable models should incorporate prior academic preparation, JAMB/entry scores, programme, socioeconomic indicators, learning behaviours, and institutional factors where available.

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