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Research Article

Gender and Subject Domain Differences in Academic Performance among Pre-service Teachers of Isa Kaita College of Education Nigeria

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ABSTRACT
This research intends to investigate gender differences in academic performance among NCE students in the School of Sciences, Isa Kaita College of Education in Dutsin-Ma. The population of the study comprises of 654 (male 433 and female 221). The study used a quantitative correlational study to establish relationships between gender and subject domain. Two indicators; questionnaire and the students' CGPA results obtain during NCE 1 and NCE 11. This study examined the gender and subject domain differences and the academic performances of pre-service teachers across all the school departments. The study is quantitative. All the departments in the School of Science were involved through a clustered random sampling. An independent sample t-test and Pearson Moment correlation (PPMC) were employed for the data analysis in the study. Results have shown that the mean CGPA for males was slightly higher than that of females, although the difference is not statistically significant. Similarly, there was no statistically significant difference in the subject domain scores between genders. Correlation analysis showed no significant associations between gender and subject domain scores. On the other hand, CGPA showed a very strong positive association with each other, meaning as the CGPA increases, the better one's overall academic achievement. The findings indicate that gender does not determine academic performance among pre-service teachers; rather, GPA is instrumental in predicting success in educational outcomes.

Keywords: Gender' Subject Domain; Pre-Service Teachers

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INTRODUCTION

Gender gaps in academic performance are evident even in science subjects like mathematics both internationally and nationally. According to Agbor and Abanyam (2019), these gaps have been attributed to home background, childhood training, parental and teacher expectations, and biological differences. Most specifically, male enrollment in basic and secondary education is lower compared to that of females. The gender differences in educational attainment have a great implication for labor market outcomes, which are reflections of the various attributes that both men and women bring into the workforce. Whereas substantial literature exists concerning gender differences in educational attainment, most studies focus on primary and junior secondary levels (Blau & Kahn, 2017; Bakhshi-Jahromi *et al*., 2017; Reilly *et al*., 2019; Steegh *et al*., 2019). However, analyses of gender performance disparities in higher education are rather scant. The term "subject domain" defines the area of learning within the broader framework of education (Kitson 2020; Sarkingobir *et al*. 2023; Gladushyna & Strieholt, 2023). As opine by Johnston et al. (2020); Ginting and Linarsih (2022), knowing subject domains is important in understanding knowledge boundaries and leads or guides educational deliver. In teaching, it requires pedagogical knowledge and deep content understanding (Jacob *et al*., 2020; Omar *et al*., 2020). This study investigates the gender grade differences of pre-service teachers on campus with particular regard to how gender and choice of subject relate to their academic performance. The research will also explore

the dwindling academic performance among pre-service teachers in Nigeria, as reported by Abanikannda et al. (2023), Ani *et al*. (2022), Daramola and Obimuyiwa (2023) and Samuel and Adekunle (2019). In addition, the variables of CGPA was be analyzed in relation to gender differences in academic performance.

Home background, childhood experiences, expectations from parents and teachers, and biological differences are some of the factors that contribute to gender differences in academic performance among pre-service teachers (Agbor & Abanyam, 2019). In many cases, males are lower in enrollment when compared to females in basic and secondary education. These inequalities in educational opportunities affect the labor market by influencing different employment opportunities because of the unique characteristics each gender brings into the work environment. While there is substantial literature documenting gender differences in educational attainment, most research focuses on the attainment at primary and junior secondary level of education (Blau & Kahn, 2017; Bakhshi-Jahromi et al., 2017; Reilly et al., 2019; Steegh et al., 2019), with limited analyses that focus on gender performance differences as far as higher education. We are interested in understanding the nature of the problem at hand by looking at how male and female students perform in several domains at Isa Kaita College of Education. Implied here is that we shall try to find out if there exist the grade differences between boys and girls, whether these grades change with the subjects that are pursued. This is because, through this research, we will be able to make out the role gender and the field of study a student engages in play in their academic performance, more so among the pre-service teachers found in Isa Kaita College of Education.

This trend is very unfortunate because, within the last few years, the academic performance of pre-service teachers in COEs has continued to fall drastically in Nigeria (Abanikannda *et al*., 2023; Ani *et al*., 2022; Daramola & Obimuyiwa, 2023; Samuel & Adekunle, 2019). This trend has resulted in considerable academic underachievement among these trainees, affecting their performance during training (Mee-Mee *et al*., 2020; Ji *et al*., 2022; Manasia *et al*., 2019) and their effectiveness as educators post-graduation (Amaechi & Obiweluozor, 2020; Darling-Hammond *et al*., 2017; Murray, 2016). While the Nigerian teacher education aims at equipping trainees with adequate intellectual and professional knowledge, many pre-service teachers have not been able to demonstrate the expected competencies for teaching at the basic education level (Amaechi & Obiweluozor, 2020; Adebis, 2017). Since this is a foundational level, weaknesses at this level have the tendency to weaken the entire system of education. Various hypotheses have been put forward to explain this poor performance, one of which is the possible involvement of gender-related differences influenced by psychological and biological factors. Studies have shown that gender differences appear in anxiety, examination stress, self-efficacy, and metacognitive awareness (Chuang *et al*., 2015; Morán-Soto & González-Peña, 2022), but these factors also do not completely explain the observed gender gap among pre-service teachers. This study, therefore, seeks to explore the relationship between gender difference, CGPA among NCE I and II students, subject domain preferences, and secondary school grades at Isa Kaita College of Education Dutsinma with a view to appreciating how these variables affect academic performance.

The Purpose of Study

The purpose of present study was to find out the contribution of gender and subject domain in the sciences, as well as their interaction with respect to academic performance by pre-service teachers at Isa Kaita College of Education. Specifically, the study purports to investigate the gender difference in academic performance, analyze the subject domain variations, and determine the relationship between academic performance and gender, based on factors that influence performance, using the predictive value of gender and subject domains on academic outcomes. These objectives are therefore explored in the research to give an understanding of how gender and subject preferences influence the academic performances of pre-service teachers, given the decline in performance that is observed within Nigerian Colleges of Education, as reported by Abanikannda et al. (2023), Ani et al. (2022), Daramola & Obimuyiwa (2023), and Samuel & Adekunle (2019). Being open to these dynamics will better help in addressing some of the challenges that face education and consequently the training of the future educators.

MATERIALS AND METHODS

This is a quantitative correlational study according to Creswell and Zhang (2009), quantitative methods involve measurements that are objective, with statistical analysis or numerical data collection. The study consists of all NCE II and NCE III science students in the School of Sciences at Isa Kaita College of Education Dutsin-Ma. The total populations are 654 students: 433 males and 221 females. In ensuring that good representation of the sample, a cluster random sampling technique was employed to ensure broad, unbiased selection of participants from amongst the given academic cohorts. The sample size of this study comprised 65 students. According to Bujng *et al.* (2018),

the sample size is sufficient for a correlational study with this population. The population included both male and female students in NCE III and NCE II at the College, hence providing good analysis of any influences resulting from gender on the study variables. Such design helped to vivify the exploration of the research problem being studied since no variable was manipulated. The inclusion of gender as a factor thus acknowledges the consideration of possible gender differences in school achievement as part of science education. For data collection, Pre-service teachers' academic records, categorized by subject domains, including grades or GPAs, segregated by gender, and a Survey questionnaire, namely gender inclusive pre service teachers academic experience and subject domains covering demographic information, educational history, study habits, and age was used.

Moreover, the pre-service teachers investigated were classified according to their departments within the School of Sciences. The departmental distribution facilitated a finer scale of the academic environment since some topic domains might have an effect on the variables in this study. Statistical methods which the researchers uses during the data analysis phase are the mean, standard deviation, t-test, and Pearson Product-Moment Correlation.

This analytical strategy was supported by the use of the Statistical Package for the Social Sciences. The average and standard deviation describe core tendency and variability, thereby providing a foundation for understanding the general trends. On the other hand, the t-test and PPMC allow one to assess statistically significant differences across groups and how close two variables are to each other and in which direction or those coming from different departments. This enhances the rigors, hence the validity of the study in the investigation of their correlation and possible discrepancies in academic performance of pre-service science teacher students at Isa Kaita College of Education Dutsin-Ma.

RESULTS

The current study examined the influence of gender on academic performance for pre-service teachers, using descriptive statistics, an independent sample t-test and PPMC as the instrument of investigation.

Table 1 showed that, the male CGPA mean scores is slightly higher (M = 3.00, SD = 1.31, SEM = 0.28), compared to their female counterparts with a mean CGPA (M = 2.90, SD = 1.38, SEM = 0.45). This means that male students have a CGPA less variability in performance and more reliable. It could be seen that female students has a better subject mean (M = 2.78, SD= 1.09, SEM = 0.36) than their male counterparts (M =2.00, SD= 1.20, SEM = 0.25). It could also be seen that male students has a better performance mean (M = 29.55, SD = 5.27, SEM = 1.12) than their female counterparts (M = 28.89, SD = 4.48, SEM = 1.49) . Table 1 shows the mean, standard deviation and standard error of the mean.

Table 2 showed that the difference between the mean CGPA scores of male (M = 3.00, SD = 1.31, SEM = 0.28) and female students (M = 2.90, SD = 1.38, SEM = 0.45) is not significant ($t = (14) = 0.194$, $p = 0.849 > .05$). Similarly, the difference between the subject domain mean scores of male (M =2.00, SD= 1.20, SEM = 0.25) and female students (M = 2.78, SD= 1.09, SEM = 0.36), is not significant ($t = (16) = 1.749$, $p = 0.099 > .05$)

Also, male students' performance (M = 29.55, SD = 5.27, SEM = 1.12) is not significantly different ($t = (17) = 0.351$, $p = 0.730 > .05$) from that of female students (M = 28.89, SD = 4.48, SEM = 1.49). Table 2 shows the independent t-test of the students CGPA and the subject Domain.

Table 3 showed the mean and standard deviation of the Gender (M = 1.29, SD = 0.46), Subject domain (M =2.23, SD = 1.20), CGPA (M = 2.97, SD = 1.31) and Performance (M= 29.35, SD = 4.99) of the students and the Pearson correlation between gender and Subject domain is not significant $r(29) = .29$, $p = 0.103 >.05$ in and between gender and CGPA is not significant $r(29) = -0.04$, $p = 0.85 > .05$, also between Gender and Performance is not significant $r(29) = -0.06$, $p = 0.75 > .05$. a significant difference exist between CGPA and Performance $r(29) = 0.77$, $p < 0.05$. The result indicated a strong positive correlation between CGPA and Performance. This indicates that students with higher GPAs tend to have better overall performance. This is a significant finding, as it suggests that academic performance is a reliable predictor of overall achievement. Gender is not significantly related to any other variable.

Table 3 the Pearson product moment correlation analysis conducted comparing the difference between the variables.

Table 1: The mean, standard deviation and standard error of the mean

Group	Gender	N	Mean	SD	SEM
CGPA	Male	22	3.00	1.31	0.28
	Female	9	2.90	1.38	0.45
Subject	Male	22	2.00	1.20	0.25
	Female	9	2.78	1.09	0.36
Performance	Male	22	29.55	5.27	1.12
	Female	9	28.89	4.48	1.49

Table 2: Independent t-test of Students CCGPA and subject Domain

Variable	G	N	M	SD	SEM	Df	T	Sig. (2-tailed)
CGPA	Male	22	3.00	1.31	0.28	14	0.194	0.849
	Female	9	2.90	1.38	0.45			
Subjects	Male	22	2.00	1.2	0.25	16	1.749	0.099
	Female	9	2.78	1.09	0.36			
Performance	Male	22	29.55	5.27	1.12	17	0.351	0.730
	Female	9	28.89	4.48	1.49			

Table 3: Pearson Moment Correlation

Var	M	SD	Pearson Correlation				Sig			
			Gen	Sub	CGPA	Perf	Gen	Sub	CGPA	Perf
Gen	1.29	0.46	1	0.29	-0.04	-0.06	1	0.10	0.85	0.75
Sub	2.23	1.2	0.29	1	-0.20	-0.21	0.10	1	0.27	0.26
CGPA	2.97	1.31	-0.04	-0.20	1	0.77	0.84	0.27	1	0.00
Perf	29.35	4.99	-0.06	-0.20	0.77	1	0.74	0.26	0.00	1

Key: Var = Variable, Gen = Gender, Perf = Performance, Sub = Subject Domai

DISCUSSION

This research revealed no significant difference in academic achievement between the genders, thus giving a pointer to the possible influence of gender on education this finding is in line to that of Agbor and Abanyam (2019); Abanikannda et al. (2023); Daramola and Obimuyiwa (2023) that found no significant difference between gender and performance. A finding slitly diffedrent from the present study by Blau and Kahn (2017); Bakhshi-Jahromi *et al.* (2017) and Reilly *et al.* (2019) found that psychological gender differences are only small or insignificant in size. In their studies Reilly *et al* (2019); Kitson (2020) found that gender stereotypes self-concept and interest were important in the mechanisms leading to poor female participation rates in mathematics and other fields. Contrary to the present study Borgonovi and Greiff (2020); Borgonovi *et al.* (2023) found that, not only cognitive aspects of problem solving is more disparate across cultures, but also the societies which recorded less gender equality reported much bigger disparities in cognitive aspects while registering relatively smaller disparities in the attitudinal aspects.

The implications of the findings indicate that even though male students have a higher mean CGPA compared to female students, these differences are not statistically significant and meaning that gender alone has not been an influential factor in academic performance. This lack of significant difference therefore suggests that educational interventions are best targeted at improving the general academic environment for all students, rather than focusing on gender-specific strategies. The results also point to female students performing particularly well in particular subject domains, which may suggest that pedagogical approaches should be differentiated to capitalize on these strengths. Thus, the very insignificant relationships between gender and other performance further support the need for further research into other factors that may reveal academic success, both from individual characteristics and institutional support systems. This suggests, therefore, that high standards in a range of academic disciplines must be maintained to sustain performance in terms of CGPA-performance relationships, since high CGPA values relate to high general performance. This therefore means that a supportive learning environment that encourages

excellence may engender benefits for all students irrespective of gender. Finally, addressing the root causes of disparities in academic performance-such as psychological influences and quality of education-will be key players in the determination of better outcomes for pre-service teachers in Nigeria.

CONCLUSIONS

The study contributes to theories on educational achievement by observing that gender, subject specialization, and academic performance relate to one another in a complicated manner. It, therefore, affirms that gender performance differences are related to the nature of the subject matter. Institutions have to develop support programs with consideration for dimensions of gender and subject domain. Situating interventions in meeting specific needs based on gender and academic focus can improve student outcomes. Policy recommendations can reflect findings in relation to gender. It is an expansive view, which, in theory and practice, instructs on gender and specialization of subjects within educational settings and impacts performance.

The theoretical practical implications of these findings includes among others, that the study contributes to the theories on educational achievement by highlighting that there is a complex interrelation between gender, subject specialization, and academic performance. It thus affirms that gender performance differences are related to the nature of the subject matter. Institutions should design support programs considering the dimensions of gender and subject domain. Situating interventions for meeting specific needs, based on gender and academic focus, can improve student outcomes. Policy recommendations should reflect gender-related findings.

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