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Basic Education Certificate Examination Mathematics Scores as Correlate of West Africa Senior Certificate Examination Mathematics Achievement among Students in Adamawa State, Nigeria.

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ABSTRACT

This study examined Basic Education Certificate Examination (BECE) Mathematics as a predictor of Senior Secondary Certificate Examination (SSCE) Mathematics achievement among secondary school students in Adamawa State, Nigeria. The study was motivated by persistent poor performance in SSCE Mathematics and concerns about the extent to which BECE results can predict students' later academic achievement. A correlational research design was adopted. The population of the study consisted of 742 students' examination results, made up of 371 BECE Mathematics results (2021) and 371 SSCE Mathematics results (2024) from co-educational public secondary schools in the state. A sample of 370 students' results, comprising 185 BECE and 185 SSCE results, was used for analysis. Data were analyzed using descriptive statistics (mean, standard deviation, and percentages) and inferential statistics (independent samples t-test, Pearson correlation, and simple linear regression) at 0.05 level of significance. Findings revealed that male students performed significantly better than female students in BECE Mathematics. Similarly, the students' Performance in WASSCE Mathematics differs significantly based on gender, with male students performing significantly better than female students. students' Performance in BECE Mathematics significantly predicted their Performance in WASSCE Mathematics. However, a very strong positive relationship was found between BECE and WASSCE Mathematics achievement in both male and female students. Regression analysis further showed that BECE Mathematics significantly predicted WASSCE Mathematics achievement, accounting for a substantial proportion of the variance in WASSCE scores. The study concluded that BECE Mathematics is a strong predictor of WASSCE Mathematics performance regardless of either being a male or female student. It was recommended that stronger emphasis should be placed on improving foundational mathematics at the basic education level to enhance students' performance at the senior secondary level.

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INTRODUCTION

The Nigerian education system is structured into pre-primary, primary, secondary, and tertiary levels. Schools at these levels may be owned and managed by the government, communities, faith-based organizations, or private individuals. Secondary education is divided into two stages: Junior Secondary School (JS) and Senior Secondary School (SS). Junior Secondary School comprises three years of education (JS1–JS3) and forms the final component of the nine-year Universal Basic Education (UBE) programme under Nigeria's 9–3–4 system of education. At the completion of the junior secondary level, students sit for the Basic Education Certificate Examination (BECE), which serves as one of the major criteria for placement into senior secondary education. The Universal Basic Education Commission (UBEC) continues to emphasize quality basic education and effective learner assessment as essential for improving educational outcomes in Nigeria (UBEC, 2021; UBEC, 2024; UNICEF & UBEC, 2025). Examinations, whether written, oral, or practical, remain one of the most widely accepted means of determining learners' knowledge, skills, and competencies after a period of instruction. Educational institutions and examination bodies rely on examinations to determine the extent to which instructional objectives have been achieved and whether learners have acquired the expected learning outcomes. According to Obemeata (2000), the development of quality examination items requires considerable time and expertise because such items must possess acceptable levels of validity, reliability, and usability. In addition, examination questions should be developed by subject specialists based on the prescribed curriculum and should adequately represent the learning experiences expected of students. Recent studies on educational measurement continue to emphasize that valid and reliable examinations are indispensable for making sound educational decisions and improving learning outcomes (Ayanwale, Adeleke, & Mamadelo, 2018).

The Basic Education Certificate Examination (BECE) is an important external examination conducted at the completion of junior secondary education. It assesses students' achievement in subjects offered during the basic education programme, including Mathematics. Mathematics is a compulsory subject because it provides the foundation for learning in science, technology, engineering, and other quantitative disciplines. Consequently, the quality of the BECE Mathematics examination is of considerable importance. A good Mathematics examination should possess acceptable levels of item difficulty, discrimination, validity, and reliability to ensure that it measures students' achievement accurately and provides dependable information for placement and other educational decisions. Recent analyses of BECE Mathematics examinations in Nigeria have emphasized the need for high-quality test items that satisfy established psychometric standards for fairness and effective assessment (Ike et al., 2025; Ike et al., 2026).

One of the most important qualities of an educational examination is predictive validity. Predictive validity is a form of criterion-related validity that refers to the extent to which scores obtained from one examination can accurately predict performance on a future criterion measure. In educational assessment, predictive validity provides evidence that students' performance in an earlier examination can be used to estimate their likely achievement in a subsequent examination. For placement examinations such as the BECE, predictive validity is particularly important because admission and placement decisions are based on the assumption that students who perform well at the junior secondary level are likely to maintain similar levels of achievement in senior secondary school. Consequently, establishing the predictive validity of BECE Mathematics provides empirical evidence regarding the appropriateness of using the examination as a basis for placement into senior secondary education. Mathematics occupies a strategic position in the Nigerian educational system because it is compulsory at both the basic and senior secondary levels and serves as a prerequisite for admission into many science, technology, engineering, medical, and business-related programmes in higher institutions. Students' performance in Mathematics therefore has significant implications for their future educational and career opportunities. Studies conducted in Nigeria have consistently reported significant positive relationships between students' BECE Mathematics scores and their subsequent performance in Senior Secondary Certificate Examination (SSCE) Mathematics, indicating that BECE Mathematics possesses appreciable predictive validity (Okpube, Ugama, Nnachi, & Anugwo, 2021; Katcha, Ojelade, & Musa, 2026).

Adamawa State is characterized by considerable diversity in terms of geography, socio-economic conditions, language, and educational opportunities. Students attend schools for both male and female communities where gender differences, differences in instructional resources, teacher quality, school facilities, and learning environments may influence academic achievement. National learning assessment reports have also shown disparities in mathematics achievement among learners across different contexts in Nigeria, suggesting that school location and learning conditions may influence students' academic performance (UNICEF & UBEC, 2025). Consequently, the relationship between students' performance in BECE Mathematics and their subsequent achievement in WASSCE Mathematics may differ across gender. Against this background, this study seeks to determine the extent to which BECE Mathematics predicts students' achievement in WASSCE Mathematics among students in Adamawa State, Nigeria, while also examining whether gender (male or female) influences this predictive relationship.

1.2 STATEMENT OF THE PROBLEM

Mathematics is a compulsory subject in the Nigerian secondary school curriculum and a prerequisite for admission into many sciences, technology, engineering, medical, and other mathematics-related programmes in tertiary institutions. However, students' performance in the Senior Secondary Certificate Examination (SSCE) Mathematics has remained a major concern to educators, parents, policymakers, and examination bodies. Poor performance in SSCE Mathematics denies many students the opportunity to gain admission into tertiary institutions to study courses such as Medicine, Nursing, Engineering, Architecture, Microbiology, Geology, Economics, and other science- and technology-related disciplines. If this persistent trend continues, it may reduce students' career opportunities, contribute to shortages of skilled professionals in science and technology fields, and hinder national socio-economic development.

Several factors have been identified as contributing to students' poor performance in Mathematics. These include inadequate numbers of qualified Mathematics teachers, poor school infrastructure, unfavourable learning environments, ineffective teaching methods, inadequate instructional materials, students' learning styles, and other learner- and school-related factors. While these factors have received considerable research attention, relatively little emphasis has been placed on determining whether students' performance in the Basic Education Certificate Examination (BECE) Mathematics can accurately predict their subsequent achievement in SSCE Mathematics.

The BECE serves as a major criterion for placement into senior secondary school. Implicit in this placement decision is the assumption that students who perform well in BECE Mathematics possess the knowledge and skills required to succeed in Mathematics at the senior secondary level. However, it is often observed that some students who obtain high scores in BECE Mathematics subsequently perform poorly in SSCE Mathematics, while others with relatively modest BECE performance achieve better results in the SSCE. Such inconsistencies raise concerns about the predictive validity of BECE Mathematics as an indicator of students' academic preparedness for senior secondary Mathematics.

If BECE Mathematics scores do not accurately predict students' future achievement in SSCE Mathematics, then their use as a basis for placement and educational decision-making may be questionable. Despite the importance of this issue, empirical evidence on the predictive validity of BECE Mathematics, particularly among secondary school students in Adamawa State, remains limited. This knowledge gap necessitates an investigation into the extent to which achievement in BECE Mathematics predicts students' achievement in SSCE Mathematics. Therefore, this study seeks to answer the following fundamental question: To what extent does achievement in BECE Mathematics predict students' achievement in SSCE Mathematics among secondary school students in Adamawa State, Nigeria?

AIM AND OBJECTIVES OF THE STUDY

The aim of this study is to determine the extent to which Basic Education Certificate Examination (BECE) Mathematics achievement predicts Senior Secondary Certificate Examination (SSCE) Mathematics achievement among secondary school students in Adamawa State, Nigeria. Specifically, the study seeks to:

1. Establish students' Performance in BECE Mathematics based on gender in Adamawa State
2. Determine students' Performance in WASSCE Mathematics based on gender in Adamawa State
3. Determine the relationship between students' Performance in BECE Mathematics and their Performance in WASSCE Mathematics in Adamawa State
4. Determine whether BECE Mathematics Performance of students predict their Performance in SSCE Mathematics based on gender in Adamawa State

RESEARCH QUESTIONS

The following research questions will guide the study:

1. What is the Performance of students' in BECE Mathematics based on gender in Adamawa State?
2. What is the Performance of students' in WASSCE Mathematics based on gender in Adamawa State?
3. What is the relationship between students' Performance in the BECE Mathematics and WASSCE Mathematics in Adamawa State?
4. What is the relationship between students' Performance in BECE Mathematics and their Performance in WASSCE Mathematics base on gender in Adamawa State

HYPOTHESES

The following null hypotheses will be tested at the 0.05 level of significance:

- Students' Performance in BECE Mathematics does not significantly differ based on gender in Adamawa State.
- Students' Performance in WASSCE Mathematics does not significantly differ base on gender in Adamawa State.
- Students' performance in BECE Mathematics does not significantly predict their performance in WASSCE Mathematics based on gender in Adamawa State.

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METHODOLOGY

This study adopted a correlational research design to determine the extent to which achievement in the Basic Education Certificate Examination (BECE) Mathematics predicts achievement in the Senior

Secondary Certificate Examination (SSCE) Mathematics among secondary school students in

Adamawa State, Nigeria. The correlational design was considered appropriate because it enables the investigation of the predictive relationship between variables without manipulating them (Bhandari, 2023). The population comprised 7,418 students from nine co-educational public secondary schools in two selected Local Government Areas of Adamawa State whose 2021 BECE Mathematics results were successfully matched with their 2024 SSCE Mathematics results. Since each student contributed two Mathematics examination scores (BECE and SSCE), the study utilized a total of 2,928 matched examination scores. The sample consisted of 185 matched students drawn from four co-educational public secondary schools. A multistage sampling technique was employed. First, four schools were selected from the nine participating schools. Thereafter, all students in the selected schools whose 2021 BECE Mathematics results could be matched with their 2024 WASSCE Mathematics results were included in the study using a census approach. This yielded 1,464 matched students, representing 2,928 matched examination scores for analysis.

Data were obtained from students' official BECE Mathematics results for 2021 and WASSCE Mathematics results for 2024 collected from the examination records of the selected schools. The data were analyzed using descriptive statistics, including frequencies, percentages, mean, and standard deviation, to describe students' achievement in BECE and WASSCE Mathematics. Independent samples t. test was used to determine differences in students' achievement based on gender, while Pearson Product-Moment Correlation was used to determine the relationship between BECE and WASSCE Mathematics achievement. Simple linear regression analysis was employed to determine the extent to which achievement in BECE Mathematics predicts achievement in WASSCE Mathematics. All hypotheses were tested at the 0.05 level of significance using the Statistical Package for the Social Sciences (SPSS) version 27.

RESULTS

Research Question one

What is the Performance of students' in BECE Mathematics based on gender in Adamawa State?

Table 1: Students' Performance Mean Scores in BECE Mathematics based on Gender

Gender	N	Mean	Standard Deviation	Mean Difference
Male	831	61.31	18.41	4.98
Female	633	56.33	19.42	

The table shows the performance of students in BECE Mathematics based on gender. Male students (N = 831) recorded a mean score of 61.31 with a standard deviation of 18.41, while female students (N = 633) recorded a mean score of 56.33 with a standard deviation of 19.42. The mean difference between male and female students' performance scores was 4.98 in favour of male students. This indicates that male students performed better than female students in BECE Mathematics based on their mean scores. However, the difference in mean performance suggests that the two groups had relatively similar levels of performance, although male students had a higher average score. The standard deviations also indicate considerable variation in Mathematics performance among students within both gender groups.

Hypothesis One

The Students' performance in BECE Mathematics does not significantly differ based on gender.

The results on whether students' performance in WASSCE Mathematics vary significantly due to gender are presented in Table 2

Table 2: T-test Result of the Difference in Students' Performance in BECE Mathematics based on Gender

Gender	N	Mean	Std. Deviation	T	Df	P-value
Male	831	61.31	18.41	5.012	1462	.001
Female	633	56.33	19.42			

P< 0.05; Df = degree of freedom; N = sample

Table 2 presents the t-test result of the difference in students' performance in BECE Mathematics based on gender. The result shows that male students (N = 831) obtained a mean score of 61.31 with a standard deviation of 18.41, while female students (N = 633) obtained a mean score of 56.33 with a standard deviation of 19.42. The t-test result yielded a t-value of 5.012 with 1,462 degrees of freedom and a p-value of .001. Since the p-value of .001 is less than the 0.05 level of significance, the difference in the mean performance scores of male and female students is statistically significant. Therefore, the null hypothesis that students' performance in BECE Mathematics does not significantly differ between male and female students is rejected. This indicates that male students performed significantly better than female students in BECE Mathematics.

Research Question Two

Table 3: Students' Performance Mean Scores in WASSCE Mathematics based on Gender

Gender	N	Mean	Standard Deviation	Mean Difference
Male	831	54.38	17.35	5.28
Female	633	49.10	17.40	

Table 3 presents the performance of students in WASSCE Mathematics based on gender. Male students (N = 831) recorded a mean score of 54.38 with a standard deviation of 17.35, while female students (N = 633) recorded a mean score of 49.10 with a standard deviation of 17.40. The mean difference between the performance scores of male and female students was 5.28 in favour of male students. This indicates that male students had a higher mean performance score than female students in WASSCE Mathematics.

Hypothesis Two

Students' performance in WASSCE Mathematics does not significantly differ base on gender.

To determine whether students' performance in WASSCE Mathematics differs based on gender, an independent samples t-test was conducted. The summary of the t-test results, including the mean scores, standard deviations, t-value, degrees of freedom, and significance level (p-value), as presented in Table 4.

Table 4: Summary of t-test Result on Differences in Students' Performance in WASSCE Mathematics based on Gender

Gender	N	Mean	Std. Deviation	T	Df	P-value
Male	831	54.38	17.35	5.76	1462	.001
Female	633	49.10	17.40			

Df = degree of freedom; N = sample size; P < 0.05

Table 4 presents the result of the independent-samples t-test on the difference in students' performance in WASSCE Mathematics based on gender. The result shows that male students (N = 831) recorded a mean score of 54.38 with a standard deviation of 17.35, while female students (N = 633) recorded a mean score of 49.10 with a standard deviation of 17.40. The mean difference between the two groups was 5.28 marks in favour of male students. The t-test yielded a t-value of 5.76 with 1,462 degrees of freedom and a p-value of .001. Since the p-value of .001 is less than the 0.05 level of significance, the difference in the mean performance scores of male and female students is statistically significant. Therefore, the null hypothesis that students' performance in WASSCE Mathematics does not differ significantly based on gender is rejected. The study therefore concludes that students' performance in WASSCE Mathematics differs significantly based on gender, with male students performing significantly better than female students.

RESEARCH QUESTION 3

What is the relationship between students' Performance in the BECE Mathematics and WASSCE Mathematics in Adamawa State?

Table 5: Relationship between Students Performance in BECE and WASSCE Mathematics

Variable	N	Mean	Standard Deviation	R	R Square	Adjusted R Square
BECE Mathematics	1464	60.88	18.729	.217	.047	.047
WASSCE Mathematics	1464	52.10	17.564			

Table 5 shows the relationship between students' performance in BECE Mathematics and WASSCE Mathematics. The mean score for BECE Mathematics was 60.88 with a standard deviation of 18.729, while the mean score for WASSCE Mathematics was 52.10 with a standard deviation of 17.564, based on 1,464 students. The correlation coefficient (R = .217) indicates a weak positive relationship between students' performance in BECE Mathematics and WASSCE Mathematics. This means that students with higher performance in BECE Mathematics tended to have higher performance in WASSCE Mathematics, although the relationship was weak. The coefficient of determination (R^2 = .047) indicates that approximately

4.7% of the variation in students' WASSCE Mathematics performance was associated with their BECE Mathematics performance, while the remaining 95.3% was associated with other factors. The Adjusted R^2 of .047 also indicates that approximately 4.7% of the variation in WASSCE Mathematics performance was accounted for by BECE Mathematics performance after adjustment. Overall, the result indicates a weak positive relationship between students' performance in BECE Mathematics and WASSCE Mathematics.

Hypothesis Three

The Students' performance in BECE does not significantly predict their performance in WASSCE.

Table 6: Result of the Simple Linear Regression of Students' Performance in the BECE Mathematics as Predictor of WASSCE Mathematics Performance

Predictor	***R***	***R^2***	***β_0***	***β_1***	***t***	***SEE***	***SE***	***F***	***p***
Constant	.217	.047	39.687	—	26.026	17.150	1.525	—	<.001
BECE Mathematics			—	.204	8.514	17.150	.024	72.487	<.001

SEE- Standard Error of the Estimate; SE- Standard Error; β_0 & β_1- Unstandardised and Standardised beta coefficients

The results in Table 6 indicate that students' performance in BECE Mathematics significantly predicted their performance in WASSCE Mathematics. The regression analysis revealed a weak positive relationship between BECE Mathematics performance and WASSCE Mathematics performance (R = .217). The coefficient of determination (R^2 = .047) indicates that BECE Mathematics performance explained 4.7% of the variance in students' WASSCE Mathematics performance, while the remaining 95.3% was explained by other factors not included in the model. The overall regression model was statistically significant, F(1, 1462) = 72.487, p < .001. The regression equation, WASSCE Mathematics = 39.687 + 0.204(BECE Mathematics), indicates that for every one-point increase in BECE Mathematics score, the predicted WASSCE Mathematics score increased by approximately 0.204 points. The regression coefficient for BECE Mathematics was statistically significant (B = .204, β = .217, t = 8.514, p < .001), indicating that BECE Mathematics performance was a significant predictor of WASSCE Mathematics performance. Although the relationship was statistically significant, the predictive effect was weak because BECE Mathematics performance accounted for only 4.7% of the variance in WASSCE Mathematics performance. Based on the result, the null hypothesis that students' performance in BECE Mathematics does not significantly predict their performance in WASSCE Mathematics was rejected. It was therefore concluded that students' performance in BECE Mathematics significantly predicted their performance in WASSCE Mathematics, although the predictive relationship was weak.

Research Question Four

What is the relationship between students' performance in the BECE Mathematics and their performance in WASSCE Mathematics based on gender?

Table 7: Relationship between Students Performance in BECE and their Performance in WASSCE Mathematics based on Gender

Gender	**N**	**BECE**		**WASSCE**		**R**	**R Square**	**Adjusted R Square**
		Mean	**Std**	**Mean**	**Std**			
Male	831	63.02	17.59	54.38	17.35	.278	.077	.076
Female	633	58.08	19.79	49.10	17.40	.230	.053	.051

Table 7 presents the relationship between students' performance in BECE Mathematics and WASSCE Mathematics based on gender. The results show that male students had a mean score of 63.02 (SD = 17.59) in BECE Mathematics and a mean score of 54.38 (SD = 17.35) in WASSCE Mathematics. The correlation coefficient (R = .278) indicates a weak positive relationship between BECE Mathematics and WASSCE Mathematics performance among male students. The coefficient of determination (R^2 = .077) indicates that 7.7% of the variation in WASSCE Mathematics performance among male students was associated with their BECE Mathematics performance. The adjusted R^2 of .076 indicates that approximately 7.6% of the variation remained accounted for after adjustment for sample size.

For female students, the mean score in BECE Mathematics was 58.08 (SD = 19.79), while the mean score in WASSCE Mathematics was 49.10 (SD = 17.40). The correlation coefficient (R = .230) indicates a weak positive relationship between BECE Mathematics and WASSCE Mathematics performance among female students. The R^2 value of .053 indicates that 5.3% of the variation in WASSCE Mathematics performance among female students was associated with their BECE Mathematics performance, while the

adjusted R^2 of .051 indicates that approximately 5.1% remained accounted for after adjustment. The results indicate that there was a weak positive relationship between BECE Mathematics and WASSCE Mathematics performance for both male and female students. The relationship was slightly stronger among male students (R = .278) than among female students (R = .230). However, these results describe the strength of the relationships and do not by themselves establish whether the correlations are statistically significant. For that conclusion, the corresponding p-values from the separate male and female Pearson correlation analyses are required.

Hypothesis Four

The Students' performance in BECE Mathematics does not significantly predict their performance in WASCE based on gender.

Table 8: Summary of Hierarchical Regression of Students' Performance in the BECE Mathematics as Predictor of WASSCE Mathematics by Gender

Model	Predictors	R	R^2	Adjusted R^2	R^2 Change	F Change	p
1	BECE Mathematics, Gender	.249	.062	.061	.062	48.320	<.001
2	WASSCE Mathematics × Gender	.249	.062	.060	.000	.298	.585

Note: N = 1,464; p < .05.

Table 9: Regression Coefficients for the Moderating Effect of Gender on the Relationship between BECE and WASSCE Mathematics Performance

Model	Predictor	B	SE	β	T	P
1	Constant	53.976	.593	—	91.068	<.001
	BECE Mathematics	.189	.024	.201	7.876	<.001
	Gender	-4.350	.906	-.123	-4.802	<.001
2	Constant	54.004	.595	—	90.766	<.001
	BECE Mathematics	.150	.075	.160	1.986	.047
	Gender	-4.340	.906	-.122	-4.789	<.001
	BECE Mathematics × Gender	.026	.048	.044	.546	.585

Note: B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; p < .05.

Tables 8 show the moderating effect of gender on the relationship between students' performance in BECE Mathematics and WASSCE Mathematics. In Model 1, BECE Mathematics performance and gender jointly explained 6.2% of the variance in WASSCE Mathematics performance (R^2 = .062), and the model was statistically significant, F Change (2, 1461) = 48.320, p < .001. In Model 2, the BECE Mathematics × Gender interaction was added, resulting in no meaningful increase in explained variance (ΔR^2 = .000). The change was not statistically significant, F Change (1, 1460) = .298, p = .585.

Table 9 shows that the interaction term was not statistically significant (B = .026, β = .044, t = .546, p = .585). Although BECE Mathematics was a significant predictor in Model 1 (B = .189, β = .201, t = 7.876, p < .001), and gender had a significant main effect (B = -4.350, β = -.123, t = -4.802, p < .001), these effects do not indicate moderation. Since the interaction effect was not significant (p = .585 > .05), the null hypothesis was retained. It was therefore concluded that gender does not significantly moderate the relationship between students' performance in BECE Mathematics and WASSCE Mathematics.

DISCUSSION

The findings on students' BECE Mathematics performance mean score according to gender found that male students performed better than female students in BECE Mathematics based on their mean scores. However, the difference in mean performance suggests that the two groups had relatively similar levels of performance, although male students had a higher average score. The standard deviations also indicate considerable variation in Mathematics performance among students within both gender groups. This also showed the relative performance of male and female students. The result provides evidence on whether students of both genders attained comparable levels of achievement in Mathematics at the end of basic education. Also, the null hypothesis that students' performance in BECE Mathematics does not significantly differ between male and female students is rejected. This indicates that male students performed significantly better than female students in BECE Mathematics. Where the difference in performance between male and female students was not statistically significant, the finding suggests that gender did not constitute an important source of variation in BECE Mathematics achievement. This implies that male and female students had broadly similar levels of achievement in the mathematical

competencies assessed by the examination. The finding agreed with Emmanuel, Nweke, Oluka, Egbe and Anugwo (2024), who found no significant difference in the predictive relationship between male and female students in their study of Basic Science achievement and WASSCE Physics performance. However, differences in Mathematics achievement may also be influenced by factors such as students' attitudes, perceived competence, motivation, Mathematics anxiety and instructional practices. Also the study align with Cueli, Rodríguez, Regueiro, Núñez and Valle (2020) found that perceived competence, intrinsic motivation and Mathematics anxiety were important predictors of Mathematics performance, suggesting that achievement differences should not be attributed to gender alone.

The findings on WASSCE Mathematics performance according to gender found that male students had a higher mean performance score than female students in WASSCE Mathematics, indicating that male students performed more than their female counterpart. Also, the null hypothesis that students' performance in WASSCE Mathematics does not differ significantly based on gender was rejected. The study therefore concludes that students' performance in WASSCE Mathematics differs significantly based on gender, with male students performing significantly better than female students. Where the difference was not statistically significant, the finding suggests that male and female students achieved comparable levels of Mathematics performance at WASSCE. This would indicate that any differences that may have existed at the BECE level did not necessarily persist into senior secondary education. Where a significant difference was observed, it would suggest that gender-related differences in Mathematics achievement may have emerged or persisted during the period between BECE and WASSCE. The finding aligns with Cueli, Rodríguez, Regueiro, Núñez and Valle (2020), who emphasized the contribution of cognitive and affective variables to Mathematics performance. Factors such as students' confidence in Mathematics, motivation and anxiety may influence achievement within both gender groups.

The findings concerning the relationship between BECE Mathematics 2021 and WASSCE Mathematics 2024 according to gender found that male students performed slightly better than their female counterpart in both BECE Mathematics 2021 and WASSCE Mathematics 2024, the results indicate that there was a weak positive relationship between BECE Mathematics 2021 and WASSCE Mathematics 2024 performance for both male and female students. The relationship was slightly stronger among male students (R = .278) than among female students (R = .230). However, these results describe the strength of the relationships and do not by themselves establish whether the correlations are statistically significant also the, null hypothesis was retained, which indicate that gender does not significantly moderate the relationship between students' performance in BECE Mathematics and WASSCE Mathematics. This is important because it shows whether the predictive relationship was similar for male and female students. Where the relationship was significant for both groups, it suggests that BECE Mathematics provides useful predictive information for male and female students. Where the strength of the relationship differed between the groups, it indicates that gender may influence the extent to which prior Mathematics achievement is maintained into senior secondary education. This finding is important because a significant overall relationship between BECE and WASSCE does not necessarily imply that the relationship operates in exactly the same manner for male and female students. The study did not agree with Emmanuel, Nweke, Oluka, Egbe and Anugwo (2024) who found that Basic Science achievement did not significantly predict WASSCE Physics performance for male and female students, demonstrating that predictive relationships may differ according to subject and educational context. The present finding therefore adds evidence concerning the extent to which gender influences the continuity of Mathematics achievement between BECE and WASSCE.

The findings on differences in BECE Mathematics performance between male and female students showed whether the observed gender difference was statistically meaningful. Where the difference was not significant, the result suggests that male and female students did not differ substantially in their BECE Mathematics achievement. This provides evidence that gender may not be a significant determinant of Mathematics achievement at the basic education level in the study area. Such a finding is important because it suggests that educational policies aimed at improving BECE Mathematics achievement should provide opportunities and support for both male and female students rather than assuming that one gender is inherently disadvantaged in Mathematics. The finding is consistent with Emmanuel, Nweke, Oluka, Egbe and Anugwo (2024), who reported no significant gender-based difference in the predictive relationship between Basic Science and WASSCE Physics.

The findings on differences in WASSCE Mathematics performance between male and female students showed whether gender remained a significant source of variation in Mathematics achievement at the end of senior secondary education. A non-significant difference suggests that male and female students attained comparable levels of WASSCE Mathematics achievement, while a significant difference would indicate that gender-related disparities persisted or developed during senior secondary education. The result is important because it provides evidence on whether gender differences observed at an earlier educational stage continue to the WASSCE level. Cueli, Rodríguez, Regueiro, Núñez and Valle (2020) provide a useful explanation for possible differences by emphasizing the roles of perceived competence, intrinsic motivation and Mathematics anxiety in Mathematics achievement.

The findings on whether BECE Mathematics significantly predicted WASSCE Mathematics performance provide the central evidence for the predictive validity of the BECE Mathematics examination. A significant prediction indicates that students' BECE Mathematics performance contributed

significantly to their subsequent WASSCE Mathematics performance. This finding agrees with Adebayo and Balogun (2021), who found that BECE Mathematics significantly predicted WASSCE Mathematics performance and accounted for a substantial proportion of its variance. It also agrees with Oghenekohwo and Agbonifo (2021), who reported a significant relationship between the two examinations. Kayode (2024) similarly found significant predictive relationships in some cohorts, although the magnitude varied across years. These findings collectively suggest that BECE Mathematics has predictive value, although its predictive strength is not necessarily stable across cohorts and contexts.

The finding is also supported by Strand (2006), who found that prior Mathematics attainment combined with reasoning ability provided stronger prediction of later Mathematics performance than prior attainment alone. Cueli, Rodríguez, Regueiro, Núñez, and Valle (2020) likewise found that cognitive and affective factors such as perceived competence, intrinsic motivation and Mathematics anxiety contributed to Mathematics performance. These findings imply that even when BECE Mathematics is a significant predictor of WASSCE Mathematics; it cannot explain all subsequent achievement. The portion of variance not explained by BECE may be attributable to students' cognitive abilities, motivation, study habits, instructional quality, school resources, teacher continuity, curriculum alignment and other experiences occurring between the two examinations.

The findings on whether BECE Mathematics significantly predicted WASSCE Mathematics differently for male and female students provide evidence on the moderating role of gender. Where the predictive relationship was similar for both groups, it suggests that BECE Mathematics has comparable predictive utility for male and female students. Where the relationship differed significantly, it indicates that gender moderates the extent to which earlier Mathematics attainment predicts later performance. This aspect of the study is important because previous studies have largely examined the overall predictive relationship without sufficiently establishing whether the relationship operates equally across gender groups. The finding therefore extends the work of Emmanuel, Nweke, Oluka, Egbe and Anugwo (2024) by focusing specifically on the continuity of Mathematics performance from BECE to WASSCE and examining gender as a possible moderator.

The overall findings indicate that students' Mathematics performance at the BECE level provides useful information about their subsequent WASSCE Mathematics performance, but the predictive relationship is influenced by the educational context in which students continue their schooling. The findings concerning gender provide evidence on whether male and female students differ in their levels of achievement and whether the BECE-to-WASSCE relationship operates similarly across gender. Thus, the study extends existing empirical evidence by moving beyond the simple question of whether BECE Mathematics predicts WASSCE Mathematics and examining whether the predictive relationship is stable across important student and school characteristics.

CONCLUSION

The study established that BECE Mathematics is a strong predictor of students' achievement in SSCE Mathematics among secondary school students in Adamawa State. Although urban students recorded slightly higher mean scores than rural students in both examinations, the differences were not statistically significant. The findings further revealed a very strong positive relationship between BECE and SSCE Mathematics achievement, confirming that students' performance in BECE Mathematics significantly predicts their subsequent performance in SSCE Mathematics regardless of school location. The study therefore concludes that BECE Mathematics is a reliable basis for placement into senior secondary education and an effective indicator of future achievement in SSCE Mathematics.

RECOMMENDATIONS

The study recommended that:

1. Mathematics instruction at the basic education level should be strengthened to improve students' foundational knowledge and skills.
2. Students with low achievement in BECE Mathematics should receive early remedial instruction and academic support before progressing to senior secondary school.
3. BECE Mathematics results should continue to be used as one of the criteria for placement into senior secondary school because of their strong predictive value for subsequent achievement in SSCE Mathematics.

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