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# INFLUENCE OF DEMOGRAPHIC FACTORS ON LEARNING OF MATHEMATICS AMONG SENIOR SCHOOL STUDENTS IN ILORIN WEST, KWARA STATE, NIGERIA

**[1]Olarewaju, Adijat Omoladun & [2]Makinde, Semiu Olawale PhD**
[1]Department of Science Education
[1,2]Al-Hikmah University Ilorin, Nigeria
https://orcid.org/0000-0001-9576-9135
olarewajuadijat@gmail.com ; aoolarewaju@alhikmah.edu.ng
+2348030794400
[2]Institute of Education,
https://orcid.org/0000-0001-5456-3464
makindesemiuedu@gmail.com; somakinde@alhikmah.edu.ng
+2347080045019
**Corresponding Author:** aoolarewaju@alhikmah.edu.ng

**Abstract**

*This study investigated the influence of demographic factors on Mathematics learning among senior school two (SS2) students in Ilorin West, Kwara State, Nigeria. The sample comprised 133 male and 189 female students from six public and private schools, selected using a random sampling technique. An ex-post-facto research design was employed, and data were collected using a 20-item multiple-choice Mathematics Performance Test (MPT) developed by the researchers. The MPT's internal consistency was measured using the Kuder-Richardson 20 (KR-20) formula, yielding a reliability index of 0.84. Experts in Mathematics education validated the instrument. The three research questions raised were answered with Mean and standard deviation. It was observed from the findings that no substantial gender disparity was noticed in Mathematics performance of students, as the mean difference between male and female was minimal. Students aged 13-15 and 16-18 scored similarly, with mean scores of 6.80 and 6.81, respectively, indicating comparable performance. However, students aged 19-21 had a significantly lower mean score of 4.22, suggesting decreased performance compared to younger groups. A notable difference was observed between school types, with private school students outperforming their public-school counterparts. Therefore, it was recommended that the stakeholders should promote collaborative learning, providing adequate teacher training, encouraging early Mathematics education, and discouraging gender bias to benefit the nation's educational outcomes.*

**Keywords:** *Demographic Factors, Learning, Mathematics, Stakeholders, Performance*

## INTRODUCTION

Mathematics is the cornerstone of several scientific disciplines. One may argue that science and mathematics are symbiotic and that teaching them together in the classroom through a cross-curricular approach produces the ideal blend. They are related and advantageous to one another. Mathematics is an essential subject in teaching and learning that plays a crucial role in shaping critical thinking, problem-solving skills, and cognitive development among students (OECD, 2019). A good understanding of the heterogeneous factors that impinge on the learning of mathematics becomes very important, mostly because it has significant implications for educational policies and practices. Variables such as population demographics, age, gender, socioeconomic status, and cultural background remain well-realized as probable influences on students' achievement in mathematics (Adeyemo, 2017; Vakil, 2018).

Despite numerous reports and recommendations, Mathematics remains widely regarded as one of the most demanding subjects although the underlying reasons for this perception may vary. The issue of underperformance in Mathematics persists across all educational levels (Gamazo & Martínez-Abad, 2020). Addressing this issue of poor performance should be considered a significant concern, warranting attention from both educators and the broader society. Therefore, the commitment of students to Mathematics plays a crucial role in their acquisition of mathematical knowledge and skills (Wardat et al., 2023). Students' commitment cultivates a sense of assurance in their capability to succeed in Mathematics, underscoring the crucial role of motivation in learning the subject (Aguilar, 2021). Wardat et al.(2023) discovered that individual-level variables, such as previous academic performance and self-perception held greater importance compared to factors related to the school environment such as school type, gender, school size, and teacher satisfaction are factors contributing to students' poor academic performance in Mathematics.

According to Chen (2019), the term 'demographic' essentially refers to writing about people or studying population characteristics. Demographic factors encompass specific details about individuals, including age, gender, religion, type of schooling, income, race, and other related information. The significance of these data varies depending on the focus of the study. Examining demographic factors involves statistical analysis of human populations concerning various characteristics such as geographical distribution, age distribution, population size, structure, and growth patterns. These factors, which encompass gender, nationality, educational attainment, type of schooling, place of residence, income level, and parental education, can be analyzed quantitatively. Tarteer and Ismail (2020) noted that factors related to students, such as their interest in Mathematics and study habits, along with factors associated with teachers, such as their personality traits and teaching abilities, as well as demographic factors like gender, age, school type, school location, and parental capabilities, contribute to low performance in Mathematics.

Scholars and educators have shown enduring interest in investigating the various factors influencing students' performance in Mathematics. These factors encompass aspects related to students, families, schools, and peers, collectively impacting the academic quality of students' mathematical performance. Identifying the key variables that significantly influence academic performance is a complex and challenging task due to the multitude of factors involved. Various variables must be considered when pinpointing the factors affecting the quality of academic

achievement in mathematics. Tungala (2019) noted that students who were able to attain their goals have positive attitudes towards Mathematics and other problems to be solved.

Gender has been a focal point of research when examining mathematical achievement. Historically, studies have reported disparities in mathematical performance between males and females (Thomas et al., 2024). It is important to investigate whether these disparities persist in contemporary educational settings and understand the underlying factors contributing to any observed differences. Gender disparities in mathematical performance have been a recurring subject of investigation, but the persistence and nature of these disparities in modern educational settings demand a comprehensive reevaluation. Hathella and Priyanath (2021) observed that gender has no significance relationship with Mathematics performance. Another study observed that gender has influence in Mathematics performance (Lubienski et al, 2021). In this study, gender means the male and female in senior secondary two (SS2). Gender is among the demographic factors that influence students' learning in science examinations and Mathematics. (Omiko, 2017). In Nigeria educational system, this factor has been found to offer male students an unfair advantage over their female counterparts specifically in Mathematics as a course of study in tertiary institution (Sule & Sunday, 2024).

Igbo et al. (2015) conducted a study examining the impact of gender stereotypes as a predictor of academic performance among secondary school students and the researchers discovered a bias in favour of male students. Ajai (2018) found that the academic performance of students in Mathematics is independent of the joint predictive effect of gender, school location, subject combination and age. Age significantly influences students' learning of mathematics. As a key demographic factor, age can affect mathematics learning in senior secondary school students either positively or negatively. It is believed that Senior secondary students are believed by their Mathematics teachers to be able to use their logical reasoning to solve some difficult concepts like calculus, geometry, algebra, among others when compared to their junior students where they are given simple concepts in Mathematics like linear algebra, simple equations, simulations linear equations and so on. Despite the relevance of Mathematics, students in SSS performance are not encouraging nor improving. Age, as a fundamental demographic factor, potentially shapes cognitive development and may influence the acquisition of abstract mathematical concepts. Yet, the specific mechanisms by which age interacts with mathematical learning in the context of senior secondary education remain insufficiently explored.

The cognitive development of students varies with age, and this may impact their aptitude for mathematical concepts (Perry et al., 2018). Eze and Obi (2018) investigated the effect of age and gender on academic achievement in science subjects and it was revealed that age and gender have influence on students' achievement. Therefore, both educators and parents prioritize Mathematics learning and the engagement of students in mathematical activities. Hathella and Priyanath (2021); and Sule and Sunday (2024) also affirmed that demographic characteristics affect students' attitude in the ordinary-level mathematics examination. However, there are significant differences between mathematics performance and demographic factors. According to Hathella and Priyanath (2021) research findings, the influence of demographic characteristics and student attitudes on Mathematics revealed a noteworthy correlation with Mathematics performance, such as school type, parental educational attainment, occupational status, gender, and family income.

Research studies have shown that the type of school a student attends can have an influence on the learning of Mathematics. A study by Makinde (2020) found that students in private schools were more likely to use educational apps for learning mathematics compared to their counterparts in public schools. Additionally, on the influence of gender and school type of students on mathematics performance, Sule and Sunday (2024) found out that school type is a measure to gauge the quality of school performance and gender. They found out that a student from a private school was likely more superior to another student from a public school in Mathematics. Furthermore, in another study (Umodikawu, 2016; and Muhammad and Maitana, 2018), they established that there is significant change in Mathematics achievement of students of public and private schools; private students did well than their counterparts. Olasehinde and Olatoye (2014) found out there were differences in the achievement scores of public and private schools science achievement, that is, private students had a better science achievement than their public counterparts.

Olutola et al. (2021) carried out a study to investigate the effects of type of school, gender, and age on the attitudes of students and on achievement in Mathematics by students in the senior school. Most students were said to perform poorly in the subject. The similarities of Reckber et al. (2018) were found that while the relationship of self-efficacy, anxiety, attitude, and Mathematics achievement in relation to gender and school type is statistically significant, type of school attended was a significant predictor of Mathematics achievement scores for students. Differences in educational achievement of Mathematics students studying at different school types are important for families and governments. Families who select private school option invest a serious portion of their family income in this manner (Ajai, 2018). Public schools' students belong to different backgrounds depending upon their demography. Teachers in both public and private schools wield significant influence, which can impact students' mathematics learning either positively or negatively. Additionally, the guidance provided by parents and teachers indirectly affects students' Mathematics performance (Nyabuto, & Njoroge, 2014).

Research indicated that parental and teacher guidance significantly influence a child's mathematical learning. Since parents have a big role in nurturing a positive attitude towards learning, teachers also try to mold students' Mathematics abilities through effective instruction, encouragement and feedback. Studying Mathematics enhances students' capacity to comprehend quantitative concepts and fosters the improvement of problem-solving and analytical abilities (Yayuk & As'ari, 2020). Furthermore, Ajisuksmo and Saputri (2017) emphasized the constructive nature of Mathematics in fostering students' abilities to reason and comprehend various subjects through logical, analytical, systematic, critical, and creative approaches. Andamon and Tan (2018) asserted that Mathematics holds universal significance and empowers individuals to effect change in the world. Michael (2015) highlighted the importance of mathematical understanding for all learners, enabling them to make practical sense of and apply mathematical concepts. Krishnakumar and Nogales (2020) indicated that possessing mathematical competencies enhances employability, leads to higher wages, and increases productivity in the workplace. Thus, there has been a growing interest in investigating affective factors in Mathematics performance for the last couple of decades (Hwang & Tu, 2021).

Michael (2015) described Mathematics performance as the successful attainment of specific objectives and goals within any academic pursuit related to fundamental Mathematics. According to the Program for International Student Assessment (PISA), Mathematics performance encompasses mathematical literacy, enabling individuals to creatively engage with

Mathematics across various contexts, thereby understanding its role in the world (Brief, 2020). The ability to accomplish mathematical tasks and objectives can be assessed through factors such as self-efficacy, study habits, and learning achievements (Hammad et al., 2022). In essence, Mathematics performance refers to students' proficiency in Mathematics, as highlighted by various authors. As emphasized by educational committees and commissions worldwide, mathematical knowledge holds significant importance and practical value, making it a universal subject across all school levels. Although, there exists a misconception about Mathematics, perpetuating the idea that it solely revolves around memorizing formulas and computations. This misconception has hindered students' efforts more than anything else.

Indrahadi and Wardana (2020) declared that socio-economic status students from lower socio-economic backgrounds may face additional challenges in accessing educational resources and support. Ethnicity or cultural background influence students' engagement with school symbolizes efforts toward learning of Mathematics (Moller et.al, 2014). The value placed on Mathematics and the variation in cultural attitude towards education have a great impact on students' learning and performance in any subject. Subjects taught effectively together can help students understand both areas in a more constructive manner and enable teachers to make connections to each topic and previous learning (Abu-Khurma, 2022). This will allow students to excel in these areas and have a profound understanding of both Mathematics and science subject.

In the realm of secondary education, Mathematics stands as a cornerstone of cognitive development and critical thinking. However, there exists a pressing need to delve deeper into the intricate interplay of demographic factors and their collective impact on the learning of Mathematics among senior secondary school students. Efforts by the stakeholders, including the government towards finding lasting solutions, yielded no result. Therefore, there is a need to examine the factors that are responsible for the consistent failure rate which has been a major problem in the educational industry. Mathematics is of paramount importance at the secondary school level, but its learning is affected by a variety of demographic factors. Researchers have pinpointed numerous factors contributing to low performance in Mathematics such as teacher's preparation, place of residence, school type, age, gender, parental educational background, parental occupation, family income, and household composition (Ajai, 2018; Sule & Sunday, 2024). However, there is little or no report of studies of students' demographic factor influence in Ilorin West, Kwara State, Nigeria.

It is important for educators to consider the relationship between these demographic variables and mathematics learning to create conducive environments for learning, thus enhancing mathematics skills of all students in senior secondary schools. However, this area of demographic factors in mathematics learning has not been critically engaged by scholars, and therefore, there is a dearth of empirical evidence of how demographic factors like gender, age, and type of school influence mathematics learning, particularly in Ilorin West, Kwara State, Nigeria. Therefore, the main objective of this study aimed to examine the influence of demographic factors on mathematics learning among students in secondary schools in Ilorin West, Kwara State, Nigeria.

Specifically, the objectives are to:

i. examine the level to which gender influences acquisition of mathematics skills by senior secondary school students in Ilorin West Local Government Area of Kwara State, Nigeria;

ii. assess the influence of students' age range on mathematics learning among senior secondary school students in Ilorin West Local Government Area, Kwara State, Nigeria; and

iii. determine the influence of school type on senior secondary school students' learning of mathematics in Ilorin West Local Government Area of Kwara State, Nigeria.

**Research Questions**

The following question were raised and answered in this study.

1. To what extent does gender influence the acquisition of mathematics skills by senior secondary school students in Ilorin West Local Government Area of Kwara State, Nigeria?

2. How does the age range influence mathematics learning among senior secondary school students in Ilorin West Local Government Area of Kwara State, Nigeria?

3. What is the influence of school type on the mathematics learning among senior secondary school students in Ilorin West Local Government Area, Kwara State, Nigeria?

**METHOD**

An ex-post-facto descriptive research design type was adopted for this study. According to Adonai et al. (2018), an ex-post-facto study identifies relationships between variables without manipulating them, allowing the researcher to observe the influence of independent variables on dependent ones. This approach was suitable since variables like gender, age, and school type were pre-existing and unalterable. The study involved 322 senior secondary school students II (SS2) from six public and private secondary schools in Ilorin West, Kwara State, Nigeria. Participants were selected using purposive sampling, comprising 133 males and 189 females. The sample included 183 students from public schools and 139 from private schools, determined through multi-stage sampling techniques. The study is carried out in three public schools and three private schools in Ilorin West. Two classes were randomly selected from both the public schools at this stage. Finally, a simple random sampling technique was used in selecting the needed number of these students from the classes, which culminated in a total student for the study being 322 (133 males and 189 females).

The research utilized a "Mathematics Performance Test (MPT)" to collect data during the third term of the 2023/2024 academic session. The instrument was divided into two sections: Section A focused on demographic factors, while Section B contained the Mathematics Performance Test, a 20-item multiple-choice test based on the SS2 curriculum. Each question had five options (A-E), and correct answers were awarded 1 mark, while incorrect answers received 0 marks. The test was validated by Mathematics educators and experts in measurement and evaluation, achieving a reliability coefficient of 0.76 using the Kuder-Richardson 20 (KR-20) formula. This formula was appropriate as the test was administered once, and the items were scored

dichotomously. Research assistants, primarily Mathematics teachers, helped administer the MPT under the researcher's supervision to ensure all responses were collected. The collected data were analyzed using descriptive statistics of mean and standard deviation.

## RESULTS

**Research Question 1:** To what extent does gender influence the acquisition of mathematics skills by senior secondary school students in Ilorin West Local Government Area of Kwara State, Nigeria?

**Table 1**

*The mean and standard deviation of Mathematics performance test among male and female students*

| Gender | N | Mean | Std. Deviation |
|---|---|---|---|
| Male | 133 | 6.74 | 2.985 |
| Female | 189 | 6.73 | 3.488 |

In Table 1, the mean performance score for male students was 6.74 with a standard deviation of 2.981, whereas female students had a mean score of 6.73 with a standard deviation of 3.488. Statistically, the mean scores for both genders are very close, with a difference of only 0.01, suggesting nearly identical average performance in Mathematics. The standard deviation for female students (3.488) is slightly higher than that for male students (2.985), indicating more variability in the scores of female students compared to male students. Overall, this minor difference in average scores indicates that there is no significant gender gap in math performance among the sampled students.

**Research Question 2:** How does the age range influence mathematics learning among senior secondary school students in Ilorin West Local Government Area of Kwara State, Nigeria?

**Table 2:**

*The mean and standard deviation on the Mathematics performance test of students based on Age Range*

| Age Range (Year) | N | Mean | Std. Deviation |
|---|---|---|---|
| 13-15 | 138 | 6.80 | 3.492 |
| 16-18 | 175 | 6.81 | 3.108 |
| 19-21 | 9 | 4.22 | 2.587 |
| **Total** | **322** | **6.73** | **3.285** |

Table 2 shows that students in the 13-15 and 16-18 age ranges had very similar mean scores (6.80 and 6.81, respectively), indicating comparable performance in Mathematics. However, students in the 19-21 age range had a significantly lower mean score (4.22), suggesting lower performance compared to the younger groups. The standard deviations indicate that score

variability was highest among the 13-15 age group (3.492) and lowest among the 19-21 age group (2.587). Overall, the total mean score for all students was 6.73, with a standard deviation of 3.285, reflecting a moderate level of performance and variability across the entire sample.

**Research Question 3:** What is the influence of school type on the mathematics learning among senior secondary school students in Ilorin West Local Government Area, Kwara State, Nigeria?

**Table 3:**

*The mean and standard deviation of the Mathematics performance test of students based on School Type*

| Type of School | N | Mean | Std. Deviation |
|---|---|---|---|
| **Public** | 183 | 5.51 | 2.695 |
| **Private** | 139 | 8.34 | 3.309 |

Table 3 shows the mean and standard deviation of Mathematics performance scores of students according to the type of school. The average score of students from a private school is significantly higher (8.34) compared to students from a public school, who scored 5.51. This means that educational students coming from a private school have performed well on Math achievement. Maintaining a larger standard deviation, 3.309, in the scores of students from private schools is slightly higher than that of students from public schools, which is 2.695. This means that the variation in the scores of students in private schools is slightly greater than in public schools. Overall, these findings underscore a significant gap in mathematics performance between students attending public and private schools, with those in private schools achieving higher results than their counterparts in public schools.

**Discussion**

This research examined the influence of demographic factors on mathematics learning among secondary school students in Ilorin West, Kwara State, Nigeria. The study's results from the Mathematics Performance Test showed no substantial difference in the average scores between male and female students. This finding contrasts with Sule and Sunday's (2024) conclusion that male students tend to outperform female students in mathematics. This research found that gender does not influence Mathematics learning among these students, a conclusion that differs from previous studies by Igbo et al. (2015) and Hathella and Priyanath (2021), which suggested a significant gender association. Additionally, the study found that students' age influences their Mathematics performance. Ajai (2018) found that age affects academic performance in Mathematics but does not have a combined predictive effect. Similarly, Starr and Simpkins (2021) observed that older students tend to perform better in Mathematics than younger students due to age differences.

The research also found that the type of school attended significantly impacts Mathematics learning. This aligns with the findings of Reckber et al. (2018), who noted that school type is a significant predictor of academic achievement in Mathematics. Similarly, Makinde (2020) found that private school students are more likely to use educational apps for learning Mathematics

compared to public school students. Sule and Sunday (2024) also supported these findings by stating that the quality of the school influences academic performance. Additionally, this study agrees with Olasehinde and Olatoye (2014), who found significant differences in science achievement tests between public and private schools.

## Recommendations

The outcome of this study suggests the following recommendations:

1. Teachers ought to form diverse groups of male and female students for mathematics problem-solving tasks, aiming to foster equal engagement and performance across genders.

2. Researchers and Mathematics educators should work to inform parents about the expected age range for each class to optimize age-appropriate learning and improve Mathematics performance.

3. The government should improve the quality of public schools to match that of private schools by providing necessary facilities and qualified personnel to enhance student performance in Mathematics.

## Conclusion

In conclusion, this study investigated how demographic factors influence mathematics learning among secondary school students in Ilorin West, Kwara State, Nigeria. The findings revealed no significant gender disparity in Mathematics performance, contradicting some prior studies. However, the age of students was found to influence their Mathematics performance, with older students generally performing better than younger ones. Furthermore, the type of school attended significantly impacted Mathematics achievement, with private school students outperforming their public school counterparts. These results highlight the need for targeted interventions to promote gender balance, inform parents about age-appropriate learning, and improve the quality of public schools to enhance Mathematics education across different demographic groups.

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