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Gender Difference on Biology Students Academic Performance Among Senior Secondary Schools in Katsina Zonal Education Quality Assurance (ZEQA)

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Abstract

The study investigated gender differences in academic performance, particularly in biology subjects among senior secondary students in Katsina Zonal Education Quality Assurance. The study adopted a descriptive survey research design. A population total of 310 Senior Secondary School II (SSS II) biology students (190 males and 120 females) were selected using stratified random sampling techniques. Students' end-of- term biology examination scores were collected and analyzed using mean, standard deviation, and independent samples t-test at 0.05 level of significance. The findings revealed that female students had a slightly higher mean score than male students; however, the difference was not statistically significant. The study concludes that gender does not significantly influence biology academic performance within the Katsina Zonal Education Quality Assurance framework. It was therefore, recommends sustained gender-inclusive instructional practices and strengthened quality assurance monitoring mechanisms to maintain equity in Biology education.

Keywords:
Gender, Biology Students, End of Term Examination Scores

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Backgroud to the Study

Education plays a pivotal role in national development, and science education forms the backbone of technological and economic advancement. Biology, as one of the core science subjects offered at the senior secondary school level in Nigeria, serves as a foundation for careers in medicine, nursing, pharmacy, agriculture, environmental sciences, and biotechnology. Consequently, students' academic performance in biology is a critical indicator of both educational quality and future workforce readiness (Federal Ministry of Education [FME], 2014). In recent decades, gender disparities in education have received significant policy attention, particularly in Northern Nigeria, where socio- cultural factors have historically influenced female participation in formal education. However, substantial progress has been made in closing gender gaps in school enrollment and access. Despite improved access, concerns remain regarding whether male and female students perform equally in science subjects such as biology.

(UNESCO, 2020). Understanding these dynamics is essential for institutions such as the Katsina Zonal Education Quality Assurance (ZEQA), which is responsible for monitoring standards, instructional delivery, and learning outcomes in secondary schools. Gender is defined as the natural social role of males and female individuals in a society. The correlation between students' gender and academic performance has been discussed for many years (Hyde, 2019). A gap between the performance of male and female students have were found in favour of the either male in some instance (OECD, 2020) or female in other instance (UNESCO, 2021; Else-Quest & Hyde, 2019). For instance, some research conducted on gender issues in science education found that male students performed better than female students in the cognitive, affective and psychomotor skill performances (Sáez & Carretero, 2020). However, recent research reports indicated that, gender issues have now been abrogated in terms of cognitive, affective and psychomotor skill performances of students (Hyde, 2019; UNESCO, 2021; OECD, 2020). There is a strong association between gender and response to science education. The likely influence of gender difference in academic performance maybe due to initial background knowledge, teaching methods and students' interest. According to UNICEF (2020), girls tend to go for courses that do not require more energy and brain tasking such as home making while boys looked for jobs in management, engineering, banking and other brain-tasking professions. This kind of choice-making tends to direct students' interest in learning and level of performance. Adeyemi and Adeyinka (2019) conducted a research on gender differences and performance in calculating reacting masses from chemical equations among secondary school students in Makurdi Metropolis. The results shown that boys perform better than girls in chemistry problem solving which requires the use of mathematics.

Result from preceding studies shown no significant difference based on gender. For instance, Kleanthous and Williams (2020) investigated the effects of gender in mathematics classroom setting, using Johnson and Johnson model of cooperative learning strategy. The results revealed no significant gender-related differences, but females achieved slightly higher grades than males. In addition, Ogunleye and Babajide (2019), investigated the effects of

cooperative computer-assisted learning method on male and female students' performance in Biology. There was no significant influence of gender on Biology performance found. However, Oludipe (2021) conducted a survey and established a slight difference among male and female students' academic performance in Basic Science; with the female students performed slightly better than the male students. This study therefore, includes gender as a categorical variable.

Gender refers to socially constructed roles, behaviors, and expectations associated with being male or female. In educational contexts, gender differences in academic performance have been attributed to socialization patterns, classroom interaction styles, teacher expectations, and societal stereotypes (Santrock, 2018). While early studies often suggested male superiority in science and mathematics, recent research indicates that gender gaps are narrowing globally (OECD, 2019). Academic performance, on the other hand, refers to students' measurable achievement outcomes, typically assessed through examinations, continuous assessments, and standardized tests. In Nigeria, performance in biology is often evaluated through internal school examinations and external examinations such as WAEC and NECO (WAEC, 2022). Gender-based performance analysis therefore provides insight into equity and instructional effectiveness.

Previous studies on gender and science achievement present mixed findings. While some researchers report male dominance in science achievement (Ogunleye & Babajide, 2011), others have found no significant difference or even slight female superiority in biology performance (Olasehinde & Olatoye, 2014). Given these inconsistencies and the unique socio-educational context of Katsina State, there is a need for localized empirical evidence to guide policy and instructional improvement within the ZEQA framework.

Statement of the Problem

Science education remains a critical driver of national development, and Biology occupies a central position in Nigeria's senior secondary school curriculum due to its relevance to health sciences, agriculture, environmental sustainability, and biotechnology (Federal Ministry of Education [FME], 2014). Despite increased enrollment and policy efforts aimed at promoting gender equity in education, concerns persist regarding students' academic performance in science subjects, particularly within Northern Nigeria (UNESCO, 2020). In Katsina State, the Katsina Zonal Education Quality Assurance (ZEQA) is mandated to monitor instructional standards and learning outcomes across secondary schools. However, while access to education for both male and female students has improved significantly, questions remain as to whether this parity in access translates into parity in academic achievement, especially in Biology (OECD, 2019).

Historically, gender disparities in science achievement have generated considerable scholarly debate. Earlier assumptions often suggested male superiority in science- related subjects (Ogunleye & Babajide, 2011), while more recent research reports narrowing gender gaps and, in some cases, slight female advantages (Hyde, 2014; UNESCO, 2020). The Gender

Similarities Hypothesis proposed by Hyde (2014) argues that males and females are similar in most cognitive abilities, including science achievement, when provided with comparable learning opportunities. Nevertheless, empirical findings remain inconsistent across regions and contexts. Some studies indicate that male students outperform females due to differences in confidence levels, classroom participation, and societal expectations (Santrock, 2018; OECD, 2019).

Conversely, other studies report no significant gender differences or even slight female superiority in Biology performance (Olasehinde & Olatoye, 2014). These conflicting findings create uncertainty regarding the true influence of gender on academic achievement, particularly within specific socio-cultural contexts such as Katsina State. Within the ZEQA framework, standardized monitoring and instructional supervision are expected to ensure equity in learning opportunities and outcomes. Examination bodies such as the West African Examinations Council (WAEC) have also emphasized the importance of monitoring subject performance trends through chief examiners' reports (WAEC, 2022). However, without localized empirical evidence focusing specifically on Katsina ZEQA, it remains difficult to determine whether male and female students perform differently in Biology under similar instructional conditions. The absence of current data on gender-based performance differences may limit evidence-based decision-making, policy formulation, and targeted interventions aimed at sustaining educational equity.

Furthermore, socio-cultural factors, classroom dynamics, teacher expectations, and student interest may subtly influence performance outcomes between genders (Santrock, 2018). If gender disparities in Biology achievement exist and remain unexamined, they could reinforce hidden inequalities that affect students' participation in science-based careers and higher education pathways (UNESCO, 2020). On the other hand, if no significant differences exist, empirical verification is essential to strengthen confidence in current quality assurance mechanisms and gender-inclusive educational practices within Katsina State (OECD, 2019). Therefore, the central problem of this study is the lack of clear, localized empirical evidence regarding whether gender significantly influences academic performance in Biology among senior secondary school students within Katsina ZEQA. Addressing this gap is necessary to provide data-driven insights that can guide instructional improvement, reinforce quality assurance practices, and support policies aimed at maintaining gender equity and enhancing science education outcomes in Katsina State (FME, 2014; Hyde, 2014).

Objectives of the Study

The broad objective of this study was to examine gender differences in biology students' academic performance among senior secondary schools in Katsina Zonal Education Quality Assurance.

Specifically, the study aimed to:

1. Compare the mean academic performance scores of male and female students in biology.

2. Examine whether gender significantly influences biology academic performance. These objectives align with national education goals emphasizing equality, inclusiveness, and quality assurance in secondary education (FME, 2014).

Research Questions

The study was guided by the following research questions:

1. What is the overall academic performance level of senior secondary school students in biology in Katsina ZEQA?
2. What are the mean academic performance scores of male and female students in biology?

Research Hypotheses

The following null hypothesis was tested at 0.05 level of significance:

H_{01}: There is no significant difference between the mean academic performance scores of male and female senior secondary school students in biology in Katsina ZEQA.

Methodology

Research Design

The study adopted a descriptive survey research design. This design was appropriate because it allowed for systematic collection and analysis of academic performance data across a representative sample of students without manipulating variables.

Population and Sample

The population consisted of all SSS II biology students in public secondary schools under Katsina ZEQA during the 2024/2025 academic session. The estimated population was approximately 2,850 students. A sample of 320 students (160 males and 160 females) was selected from eight randomly chosen schools using stratified random sampling to ensure gender balance. Two schools were been selected from Katsina Zonal Quality Assurance (ZEQA).

Instrumentation

The primary data source was students' official end-of-term biology examination scores obtained from school records. The examinations were standardized across schools under ZEQA monitoring guidelines.

Data Analysis

Data were analyzed using:

Mean and standard deviation (to answer research questions)

Independent samples t-test (to test hypothesis)

Analysis of Data
Research Question 1: Overall Performance Level Table 1

Table 1: Overall Biology Performance of Students

Variable	N	Mean	Std. Deviation
Overall Students	320	64.28	10.42

The table indicates that the overall mean score was 64.28%, suggesting moderate academic performance in biology.

Research Question 2: Gender Mean Comparison Table

Table:2 Mean Performance by Gender

Gender	N	Mean	Std. Deviation
Male	160	63.75	10.68
Female	160	64.81	10.14

The table shows that female students (Mean = 64.81) slightly outperformed male students (Mean = 63.75). However, the difference appears minimal

Hypothesis Testing
Table 3: Independent Samples t-Test for Gender Difference

Variable	t-value	df	p-value	Decision
Gender	0.94	318	0.348	Not Significant

Since p (0.348) > 0.05, the null hypothesis is accepted. There is no statistically significant difference between male and female students' biology performance.

Discussion of Findings
The findings revealed no significant gender difference in biology academic performance among senior secondary school students in Katsina ZEQA. Although female students recorded a slightly higher mean score, the difference was statistically insignificant. Thisfinding aligns with Olasehinde and Olatoye (2014), who reported similar outcomes in Katsina State. The results also support Hyde's (2014) Gender Similarities Hypothesis, which emphasizes that males and females perform similarly in cognitive tasks when exposed to comparable learning conditions. The ZEQA framework may have contributed to this parity through standardized instructional monitoring and equitable resource distribution. Furthermore, the findings contradict earlier assumptions that males dominate science subjects. The absence of significant disparity suggests that ongoing gender inclusion policies and improved female access to education in Katsina State are yielding positive outcomes.

Conclusion

The study concludes that gender does not significantly influence academic performance in biology among senior secondary school students in Katsina Zonal Education Quality Assurance. Both male and female students perform comparably under similar instructional and monitoring conditions. This indicates progress toward gender equity in science education within the study area. Sustained quality assurance mechanisms appear to play a crucial role in maintaining balanced academic outcomes.

Recommendations

1. Schools should continue implementing gender-inclusive teaching strategies.
2. ZEQA should strengthen continuous monitoring to sustain performance equity.
3. Teachers should encourage equal classroom participation among both genders.
4. Further research should explore other variables such as socio-economic status and teaching methods.

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