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Factors Influencing Female Students' Perceptions of Their Choice of Science Subjects at Senior Secondary Schools in Makurdi Metropolis, Benue State, Nigeria

Aladi Helen Ogah[1], Joy Okache Omaga[1], Michael Terfa Angura[1] & Ochanya Maryrose Nyinebi[2]

[1] Department of Science and Mathematics Education, Benue State University, Makurdi, Nigeria
[2] Government Secondary School, Garki, Federal Capital Territory (FCT), Abuja, Nigeria
Correspondence: Michael Terfa Angura, Department of Science and Mathematics Education, Benue State University, Makurdi, Nigeria.

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Abstract

The study investigated female students' perceptions of selecting science subjects at senior secondary schools in Makurdi Metropolis, Benue State, Nigeria. A descriptive survey design was employed for the research. Two research questions and one hypothesis guided the investigation. The population included all female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS), approved by the Benue State Ministry of Education, with a sample of 1,500 students drawn from 50 schools using stratified random sampling. The Female Students' Choice of Science Subjects Questionnaire (FSCSSQ), developed by the researchers with a reliability coefficient of 0.80, was validated by two Science Education experts and one in Test and Measurement, and used to collect data. The data were analysed through descriptive statistics such as means and standard deviations to answer the research questions, while an independent sample t-test was conducted to test the hypothesis at a 0.05 level of significance. The results showed that factors such as peer influence, drug abuse, and early marriage, among others, significantly affect female students' choice of science subjects. There was a significant difference in how female students in BSS and DSS perceived these factors ($p<0.05$). The study recommended, among others, that the Ministry of Education and other relevant stakeholders should provide well-equipped laboratories, necessary textbooks, and other learning materials to support practical science education in both boarding and day secondary schools to attract more female students to the choice of science subjects. Ensure proper counselling for female students regarding science subject choices, and provide adequate science teachers and facilities in both boarding and day secondary schools to encourage more female students to choose science subjects. Relevant stakeholders should ensure science teachers are competent, enthusiastic, and supportive to make subjects more appealing to female students.

Keywords: female students, perception, choice, science subjects

1. Introduction

The study of science has been recognized worldwide as a key driver for advancement and development across all areas of human

endeavour. Core science subjects such as Biology, Chemistry, and Physics have become essential for students aiming for science-based careers in both developed and developing countries. Consequently, nations around the globe are striving to develop both male and female students in these fundamental sciences from primary through secondary education. To ensure gender balance in science-related careers like medicine, pharmacy, engineering, and geology (Chavatzia, 2020), both boys and girls are given equal opportunities to acquire scientific attitudes and process skills necessary for self-reliance and societal adaptation at each education level. Nevertheless, the perception among female students regarding their choice of science subjects remains a concern for many scholars, as most secondary school science classes—especially in developing countries like Nigeria—are predominantly male-dominated (Adams & Salome, 2014). Abe and Chikoko (2020) further assert that in most science classes, the number of boys exceeds that of girls. They emphasize that girls' perceptions of science subjects influence whether they approach them with confidence or develop a phobia, at any educational level.

Given the importance of science for both individual and national progress, it is essential to examine gender differences in science education, particularly the barriers or factors affecting female students' perceptions and enrolment in science at the secondary level, to promote gender equality in science-oriented careers. Archer, DeWitt, and Soderstrom (2017) assert that science, as a multidimensional field of study, especially at the secondary school level, is divided into three core subjects: chemistry, biology, and physics. While chemistry primarily concerns matter and its properties, biology deals with the scientific study of living things, their interactions, and their relationships with the natural environment. Physics involves the study of matter, energy, and their interactions. The authors highlight that chemistry, biology, and physics are foundational sciences that play a crucial role in both human progress and national development. These subjects provide the tools and knowledge necessary to address global challenges, foster technological innovation, and improve the quality of life. The subjects are interconnected, with advances in one often leading to breakthroughs in others.

According to Bello et al. (2020), National Academy of Sciences, Engineering and Medicine (NASEM, 2018), Chemistry, Biology and Physics are essential to humanity and in so many ways; chemistry is essential for addressing global challenges like climate change, water scarcity, and food security. It enables the development of sustainable technologies and processes. Chemistry is at the heart of medical advancements, including drug discovery, diagnostics, and the development of new materials for medical devices. Biology is fundamental to understanding the human body and its functions, enabling advancements in medicine, public health, and disease prevention. Biology helps us understand ecosystems, biodiversity, and the impact of human activities on the environment. Physics provides the fundamental principles that underpin technological advancements, from communication technologies to renewable energy sources. Physics helps us understand energy resources, develop renewable energy technologies, and optimize energy efficiency and so on. These subjects are useful to every human being, both males and females.

Murphy and Taylor (2017) opine that girls' perceptions of the choice of science subjects in secondary schools could be traced to several factors, such as peer influence, parental pressure, drug abuse, science phobia, early marriage, sexual harassment, poor science background, teacher factors, among other things. The authors maintained that it is only privileged girls at the secondary school level who overcome these factors and consider science subjects like chemistry, biology and physics as favourite subjects. Ezeudu (2018) argued that girls have the same cognitive abilities like boys if not more, thus if properly supported with affective characteristics of the learning process like little attention from science teachers to attract the girl's participation in the class, attendance to class, punctuality, neatness, politeness, self-control, relationship with others, curiosity, honesty, humility, tolerance, leadership and courage. The number of girls in science classes obviously would surpass that of boys. Akram et al. (2024) and Pekrun (2020) stated that both boys and girls receive equal attention and motivation influences from the teachers regarding the choice of science subjects, particularly at the secondary school level. The authors observed that females have a higher achievement motivation compared to males. It is

therefore quite disturbing that discrepancies still abound between the affective disposition of male and female students towards the choice of science subjects. Many scholars have investigated the factors influencing girls' perception of the choice of science subjects.

Naugh (2024) examined the factors which influence the choice of science subjects in Mauritius among girls at the end of the third year of secondary education, the level at which science is a compulsory subject. This low uptake of science subjects by girls beyond the compulsory level is a matter of concern. The study provided insights into teachers' teaching approaches, the behaviour and interest of pupils in the lessons and other factors such as pupils' perceptions of science, their self-identity and role models, and the extent to which parents and peers influence the choice of subjects among girls. The majority of the girls' experiences of science were negative, and this deterred them from taking science beyond the compulsory level, although they were aware of its importance. Teachers had positive opinions about girls' ability to do science, but stated that the lack of infrastructure facilities did not allow them to involve the pupils in practical work as much as they would wish. However, brighter girls' decisions to study sciences were not outweighed by these factors. Parents felt that they did not influence their daughters in the choice of subjects or eventual careers, though they held science in high esteem.

Musingarabwi and Maeresera (2020) explored the perceptions of female students of a secondary school regarding the influence of gender stereotypes on their choice of mathematics and on prospects of pursuing it at the tertiary level after they have completed it at the advanced level. Involving a purposive sample of twenty students, this qualitative case study employed slight quantitative data analysis. Questionnaires, focus group discussions, and interviews were used to collect data. The study established that the majority of students were aware of common stereotypical conceptions that society ascribed to the learning of mathematics by girls. Gender had little impact on the decision to learn mathematics at the advanced and tertiary levels. Although some participants perceived mathematics as being more appropriate for boys than girls, most participants indicated that the choice of mathematics at the advanced level and prospects of studying it at the tertiary level were not so much about gender as they were about several factors. Bahago, Fadipe and Uchenna (2022) investigated the characteristics that influence secondary school female students' choice of science disciplines and the need for counselling in Niger State, Nigeria. The study discovered that certain elements have a strong influence on female students' decisions to pursue science topics and have a sustained power over female students' choice and continuation of science subjects. Female Science students should be given more privileges, particularly in terms of accessing scholarships. Female students should be exposed to vocational counselling services, and educational practices that favour the girl child should be embraced and encouraged more so.

Oguru (2024) examined the inclusiveness of girl-children in STEM education within public senior secondary schools in Rivers State, Nigeria. The findings indicated that family background plays a vital role in shaping children's educational aspirations and choices, especially in STEM fields. The selection of science subjects or the placement of students into pure science classes follows established criteria that, without gender bias, base placements on previous performance in lower classes and provide equal learning opportunities. The primary issue is the reluctance of most girls, particularly at the secondary level, to study or enroll in core science subjects such as chemistry, biology, and physics. The challenge of achieving gender balance in major scientific careers, such as medicine, pharmacy, and engineering, remains a global concern in both developed and developing nations. Therefore, the problem of this study is formulated as follows: What are the perceptions of female students regarding the choice of science subjects at senior secondary schools in Makurdi metropolis, Benue State, Nigeria?

1.1 Purpose of the Study

The purpose of the study is to explore factors influencing female students' perceptions of choosing science subjects at senior secondary schools in Makurdi Metropolis, Benue State, Nigeria. Specifically, the study aims to;

1) Find out the extent to which factors influencing female students' perception affect their choice of science subjects at the

senior secondary school.

2) Find out the extent to which factors influencing female students' perception affect their choice of science subjects in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS).

1.2 Research Questions

The following research questions were answered in the study.

1) What is the extent to which factors influencing female students' perception affect their choice of science subjects at the senior secondary school?

2) What is the extent to which factors influencing female students' perception affect their choice of science subjects in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS)?

1.3 Research Hypothesis

The following hypothesis guided the study.

1) There is no significant difference in how female students in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS) perceive factors influencing their choice of science subjects.

2. Methodology

A descriptive survey design was employed in this study to examine female students' perception of choosing science subjects at senior secondary schools in Makurdi Metropolis, Benue State, Nigeria. The population consisted of all female students in approved Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) by the Benue State Ministry of Education, with a sample of 1500 selected from 50 schools through stratified random sampling. The Female Students' Choice of Science Subjects Questionnaire (FSCSSQ), developed by the researcher, which had a reliability coefficient of 0.80 and was validated by two experts in Science Education and one in Test and Measurement, was used to gather data. The instrument, containing Sections A and B, was based on a modified four-point Likert scale with ratings of 4, 3, 2, and 1: each item in the two sections was scored as follows — Great Extent (GE) = 4 points, range 3.50–4.00; Moderate Extent (ME) = 3 points, range 2.50–3.49; Less Extent (LE) = 2 points, range 1.50–2.49; No Extent (NE) = 1 point, range 0.50–1.49. Any item with a mean of 2.50 or above was deemed acceptable, while items with a mean below 2.50 were considered to reflect a lesser extent. The researcher, assisted by a trained research assistant, administered the questionnaires. Data were analysed using descriptive statistics, including mean and standard deviation, and the three null hypotheses were tested at a 0.05 significance level using an independent t-test.

3. Results

3.1 Research Question 1

What is the extent to which factors influencing female students' perception affect their choice of science subjects at the senior secondary school? The answer to research question one is presented in Table 1.

Table 1. Mean rating scores on the extent factors influence female students' perception of the choice of science subjects at the senior secondary school

S/N	Factors	No	(No. 1500)	
		$\bar{X}$	SD	DEC
1	Peer influence	2.64	1.12	ME
2	Parental Pressure	2.58	1.19	GE
3	Drug Abuse	3.70	1.14	ME
4	Intelligent Quotient (IQ)	2.60	1.15	ME
5	Early Marriage	4.00	1.16	GE
6	Family Background	2.60	1.21	ME
7	Poor Science Background	2.73	1.22	ME
8	Teacher's factor	4.00	1.17	LE
9	School Factor	4.00	1.19	LE
10	Poor Counseling	3.35	1.20	LE
		4.00		

Key: Great Extent (GE) =4, Moderate Extent (ME) = 3, Less Extent (LE) = 2, No Extent (NE) =1 (Survey, 2025).

The result in Table 1 revealed the extent to which factors influencing female students' perception affect their choice of science subjects at the senior secondary school in Makurdi Metropolis, Benue State. The result shows a recorded higher mean of 4.00, which implies factors such as peer influence, parental pressure, and drug abuse, among others, affect female

students' perception of the choice of science subjects at the senior secondary school to a great extent.

3.2 Research Question 2

What is the extent to which factors influencing female students' perception affect their choice of science subjects in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS)? The answer to research question two is presented in Table 2.

Table 2. Mean rating scores on the difference in the perception of science subjects by female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS)

S/N	Factors	BSS (No. 695)			DSS (No.805)		
		$\overline{X}$	SD	DEC	$\overline{X}$	SD	DEC
1	Peer influence	3.50	1.19	ME	3.80	1.13	GE
2	Parental Pressure	2.00	1.12	LE	2.50	1.18	ME
3	Drug Abuse	2.50	1.16	ME	3.80	1.16	GE
4	Intelligent Quotient (IQ)	3.66	1.13	ME	3.70	1.19	GE
5	Early Marriage	3.70	1.19	GE	3.60	1.15	GE
6	Family Background	2.10	1.11	LE	3.80	1.17	GE
7	Poor Science Background	3.60	1.17	ME	4.00	1.12	GE
8	Teacher's factor	2.20	1.19	LE	3.00	1.14	ME
9	School Factor	4.00	1.12	LE	2.60	1.17	ME
10	Poor Counseling	3.45	1.18	LE	2.60	1.18	ME
		3.39			**4.50**		
	Grand Mean = 4.00						

Key: Great Extent (GE) =4, Moderate Extent (ME) = 3, Less Extent (LE) = 2, No Extent (NE) =1 (Survey, 2025).

The result in Table 2 extent to which factors influencing female students' perception affect their choice of science subjects in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS). The result shows that the female students in BSS perceive the factors influencing them to a moderate extent, with a mean of 3.39, while the DSS students perceived the factors affecting their choice of science subjects to a great extent, with a mean of 4.50.

3.3 Hypothesis

There is no significant difference in how female students in Day Secondary Schools (DSS) and Boarding Secondary Schools (BSS) perceive factors influencing their choice of science subjects. The answer to the hypothesis is presented in Table 3.

Table 3. t-test of independent samples on the extent digital technologies are available in GSS and PSS

Variables	N	Mean	SD	t	df	P-value	Decision
BSS	695	2.8300	0.5114				
				0.050	1498	0.02	Rejected
DSS	805	3.9940	0.5323				

The t-test of independent samples on the extent female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) perceived factors in their choice of science subjects recorded a t-test value of 0.052 with a p-value of 0.02. This is less than a 0.05 level of significance ($p=0.02<0.05$). Thus, the null hypothesis is rejected. This means there is a

significant difference in the extent female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) perceived factors in their choice of science subjects.

4. Discussion

The result in Table 1 of research question 1 is on the extent to which factors influence female students' perception of the choice of science subjects at the senior secondary schools in BSS and DSS in Makurdi Metropolis, Benue State. The result shows that the BSS and DSS recorded higher means of 4.00 and 3.99, respectively. This implies that factors such as peer influence, parental pressure, and drug abuse, among others, affect female students' perception of the choice of science subjects at the senior secondary school in both BSS and DSS to a great extent. The result is agreement with Oguru (2024), who discovered that factors such as family background affect female students' choice of science subjects in school. The result in Table 2 of research question 2 is on the difference in the perception of choice of science subjects by female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) perceived factors to their choice of science subjects. The result shows that the female students in BSS perceive the factors influencing them to a moderate extent, with a mean of 3.39, while the DSS students perceived the factors affecting their choice of science subjects to a great extent, with a mean of 4.50.

The t-test of independent samples on the extent female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) perceived factors in their choice of science subjects recorded a t-test value of 0.050 with a p-value of 0.02. This is less than a 0.05 level of significance ($p=0.02<0.05$). Thus, the null hypothesis is rejected. This means there is a significant difference in the extent female students in Boarding Secondary Schools (BSS) and Day Secondary Schools (DSS) perceived factors in their choice of science subjects. The finding aligns with Bahago, Fadipe and Uchenna (2022), whose study revealed a significant difference in the female students' choice of science subjects due to factors such as peer groups, family background, IQ, students' ability to access adequate instructional materials, and the lack of career guidance/counselling services, all influence female students' choice of science topics.

5. Conclusion

Going by the findings of this study, it is a combination of personal, peer influence, parental pressure, drug abuse, and early marriage that significantly impact female students' perceptions and choices of the choice of science subjects at the senior secondary school in both BSS and DSS to a great extent. Key factors often include peer and parental influence or support, drug abuse, intelligence quotient, early marriage, poor science background, teacher quality and teaching methods, the school's learning environment (especially laboratory facilities), perceptions about science subjects and gender.

6. Recommendations

Based on the findings of this study, the following recommendations were made:

1) The Ministry of Education and other relevant stakeholders should provide well-equipped laboratories, necessary textbooks, and other learning materials to support practical science education in both boarding and day secondary schools to attract more female students to the choice of science subjects.
2) The Ministry of Education, school administrations and other relevant stakeholders should ensure science teachers are competent, enthusiastic, and supportive to make subjects more appealing to female students.
3) Science teachers should be enthusiastic and supportive, parents should actively engage with their children's science education, and schools should ensure access to modern teaching tools.
4) Science teachers should ensure the use of more engaging teaching methods, such as "science by doing," to improve understanding and interest.
5) The Ministry of Education and other relevant stakeholders should ensure proper counselling for female students at the senior secondary schools on the choice of science subjects.

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