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Exploring Science Students' Enrolment in Senior Secondary Schools as a Measure of Sustainable Development Goals (SDGs) on Gender Equality in Zamfara State

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Abstract

There are clear reasons why gender equality is a key component of the SDGs, and science education also has a bigger influence on achieving the goals. Hence, this study assessed SDG 4 (Gender equality) in senior secondary school science students' enrolment in Zamfara State. Ex post facto descriptive research was employed, and data was collected from 32 senior secondary schools (male schools = 16 and female schools = 16) through pro forma. The instrument was reliable since it was used to collect data from the existing record. The data collected were analysed using time series plots and charts. The result of findings shows that the trend of male students' enrolment in science decreases from 2015 to 2024, while that of female counterparts first increases, then decreases in 2021 till 2024. However, there is a gap between the male and female students' enrolment, which is in favour of male students. The gap decreases between 2015 and 2020 and increases again between 2021 and 2024. This has a serious implication on attaining SDG 4 (Gender equality). Therefore, among other things, the researchers recommended that the state government ought to promote the enrolment of female students in science disciplines to address the disparity in enrolment between male and female students, thereby aligning with the objectives of the Sustainable Development Goals.

Keywords: Exploring, Enrolment, Measure, Gender equality.

INTRODUCTION

In the world today, education impacts in-depth knowledge and understanding so as to advance the members of the society to new frontiers of knowledge in different way of life. According to Maryann and Cecilia (2019), education is a basic human right and is crucial to both an individual's and society's overall well-being. It has been recognised as a tool for socioeconomic, cultural, and political development and transformation, and it is crucial to encouraging behavioural change in humans. The economic transformation requires substantial reorganization of the economy, adoption of new technologies, and promoting sustainable patterns of consumption and production, protecting efficient management of human and material resources (Enrico and Lngeborg, 2015). One fundamental aspect of human development is education. It is the most crucial tool for empowerment and long-term progress in all aspects of wellbeing. Therefore, sustainable education means instruction that supports sustainable development (Lipscombe, 2008). UNESCO (2014) stated that as a result of education for sustainable development, individuals will have skills such as critical thinking, imagining future scenarios, and making decisions based on cooperation. Climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption are just a few examples of pressing sustainable development issues that are incorporated into education for sustainable development, which is a key component of sustainable development. As a result, education for sustainable development fosters skills including critical thinking, scenario planning, and cooperative decision-making (UNESCO, 2015). This signifies the importance of science education in attaining sustainable development.

Science is practical-orientated and has the ultimate goal of satisfying human needs or solving scientific problems. It generates knowledge through discoveries and equips the learners with the required skills with which to make life easier than it has ever been (Maryann & Cecilia, 2019). Science education

emphasizes skills for problem solving and decision-making that are needed for successful life in the 21st century. Since science has impacted every element of daily life, scientific education is very crucial in modern society. The scientific knowledge and abilities of a nation's citizens are essential for ensuring good health, combating disease, safeguarding the environment, producing food for its citizens, and creating new industries and technology. The present educational system, which shapes the thinking of both the younger generations and others, is the source for the rapid advancement of science and technology (Binod, 2021). As the basis for the numerous emerging technologies that are currently the backbone of international operations, science education is essential for the expansion of any nation's economy (Akinsowon & Osisanwo, 2014).

Today's society is increasingly being science- and technology-driven, with countries striving for attainment of sustainable development and improvement of quality of life for their citizens (Bernadette, Catherine & Mele, 2021). For Nigeria to drive her economy toward attaining sustainable development, there should be concerted effort toward the promotion of science education at all levels of education. It is in this regard that Nigeria's policy on education has one of its objectives as the provision of equal access to educational opportunities for citizens in the country at all levels of education and prioritising Science, Technology, Engineering, and Mathematics (STEM) education. This is a sign of recognition of the impacts of science education in achieving Sustainable Development Goals (SDGs).

The Sustainable Development Goals (SDGs) is a 2030 agenda established by the United Nations in September 2015, and this was adopted by all 193 member states. The aim is to end poverty, to protect the planet, and to ensure that all people living today and future children enjoy peace and prosperity (Morton *et al*., 2017). This is to be achieved within the next 15 years, ranging from 2016 to 2030. SDGs is a global agenda since it caters to all the countries in the world. The agenda was designed to give a clear road map in achieving sustainable development for all the member countries (Anyim, 2021). A statement in the ICLEI-Local Government for Sustainability report (2015, p. 1) assured that the development will be universally applicable to all countries and cannot leave anyone behind. Among the 17 goals of the SDGs, Goal 4 (Quality education) was linked to the other 16 goals. From the analysis of the relationship between Goal 4 and the other 16 goals done by Abera (2023), it seems that science education is in the forefront to make the agenda come to reality. For example, Goal 1 (End Poverty) can be realised through the basic knowledge of science for self-establishment to earn income; Goal 2 (End Hunger) can be realised when the knowledge of science is applied to improve agriculture; Goal 3 (Good Health) can be achieved because science education informs students to be aware of diseases and prevention. In general, science education contributes to the achievement of SDGs from different perspectives. According to Maryanti *et al*., (2022), the three perspectives involved are:

i. Playing an important role in supplying an adequate student with a comprehension of the complexities, reasons, and causes of the global competitiveness and challenges. For example, we can know from water scarcity, climate change, energy transition, and biodiversity loss.
ii. Looking for new strategies to combine and integrate science, knowledge, and skills into realistic conditions and explaining ways to relate knowledge to values and attitudes relating to sustainability; and
iii. Having a mandatory to overcome subjects and disciplinary borders to understand a problem with comprehensive manners. It also provides specific knowledge to solve the current problems. (pp. 167-168)

In certain important parts of the world, it has been noted that giving girls an education in science and mathematics is advantageous for long-term social and economic growth (John & Chia, 2022). John and Chia went on to say that women can benefit from science education in a number of ways for their long-term social and economic development. SDG 5 (Gender Equality) aims to empower women and girls to reach their maximum potential by 2030. Measuring gender equality in science education is one of the criteria used to determine SDG 5.

Gender equality refers to the equal rights, opportunities, and outcomes for girls and boys and women and men. Gender equality in education improves quality, gives both boys and girls a suitable learning environment, and guarantees that secondary school graduates are aware of gender equality. This aligns with the Sustainable Development Goals (SDGs), which outline the global commitment to "leaving no one behind." With the poorest and most marginalised women and girls at the centre of development efforts, the SDGs strongly encourage nations to concentrate on attaining gender equality (SDG target 5) as well as inclusive and high-quality education (SDG goal 4). The idea that there are gender-specific experiences that need to be taken into consideration when it comes to topics like poverty, nutrition, health, and education is reflected in the inclusion of gender (Odera & Mulusa, 2020). Additionally, gender equality in education has a multiplier effect that affects future prospects and results for poverty alleviation, economic progress, and excellent health and well-being. Equalisation of gender is one of the major challenges of developing countries in the 21st century. According to Filho (2023), gender inequality is existing everywhere across the world and Women experience a series of disadvantages in comparison to

men. Some societal segments view women and girls as an inferior or inconsequential class. Men govern and regulate the socioeconomic status of women in civilisations where men predominate. On the other side, women are typically dependent on men because of the absence of stable economic situations. The only path to gender equality is to empower women and others (John & Chia, 2022).

Statement of the problem

The pursuit of Sustainable Development Goals (SDGs) has become a global imperative, with gender equality being a central focus. Science education is no doubt having a significant contribution in achieving SDGs, and its advantages can be harvested at both lower and higher educational levels. As it is important to invest heavily in science education to create more jobs, improve national income, and increase national pride, the rate of students' enrolment in science education also needs to commensurate with the effort in order to make the majority of the population capable of contributing to the national growth and development. In Nigeria, particularly in the North, Zamfara state is among those where the trajectory of girl child education is not much of a pleasant one, and it can prevent the attainment of SDG 5 and has an effect on national development (Akporehe & Uviovo, 2021). Idoko (2021) observed that there is a large number of women with no formal education and a low rate of female adult literacy. Gender norms and cultural practices often limit girls' opportunities for education, particularly in science subjects, which are critical for achieving SDG 4 (quality education) and SDG 5 (gender equality). For all nations, closing the gender gap in science education among science students in senior secondary schools is crucial since failing to do so could further entrench gender inequality in society and result in the loss of enormous human resources that could support national growth. Understanding the enrolment patterns of science students can provide insights into these challenges and inform strategies to promote gender equality in science education. Hence, this study found out the pattern of students' enrolment in science education at senior secondary schools as a measure of SDG 4 (Gender equality) in Zamfara state.

Objective of the Study

The following were the specific objectives of the study:

1. Found out the trends of science students' enrolment in senior secondary schools based on gender in Zamfara state
2. Compared the enrolment of male and female science students in senior secondary schools in Zamfara state.
3. Found out the trends of male science students' enrolment in senior secondary schools on class levels in Zamfara state.
4. Found out the trends of female science students' enrolment in senior secondary schools based on class levels in Zamfara state.

Research Questions

The following were the research questions raised and answered in the study:

1. What are the trends of science students' enrolment in senior secondary schools based on gender in Zamfara state?
2. What is the difference between the male and female science students' enrolment in senior secondary schools in Zamfara?
3. What are the trends of male science students' enrolment in senior secondary schools based on class levels in Zamfara state?
4. What are the trends of female science students' enrolment in senior secondary schools based on class levels in Zamfara state?

METHODOLOGY

The study was a descriptive research design of the ex-post-facto type. The population of the study comprises all public secondary schools, which comprise 214 schools (male schools = 31; female schools = 33; co-educational schools = 150) in Zamfara state. Purposive sampling and stratified random sampling techniques were used to select 32 schools (male schools = 16 and female schools = 16). These enabled the researchers to select single-sex schools and consider the schools that have started operating since 2015. The research instrument used to collect data for the study is the pro forma. This was used to collect information on the record of science students' enrolment. The instrument was validated by an expert in the department of science education. Since the data for the study was extracted from the existing record and was not modified by the researchers, the instrument was reliable. The data obtained in the study was analysed using descriptive statistics. All the research questions were answered using time series plots and charts.

RESULTS

Research Question 1: What is the trends of science students' enrolment in senior secondary schools based on gender in Zamfara state?

Table 1: Trend of science students' enrolment in senior secondary school

Years	Number of students enrolled	
	Male	Female
2015	9516	5800
2016	9294	7422
2017	8996	7676

2018	9856	8324
2019	8834	8354
2020	9054	8480
2021	8914	7140
2022	9000	6114
2023	8680	6304
2024	8524	4384

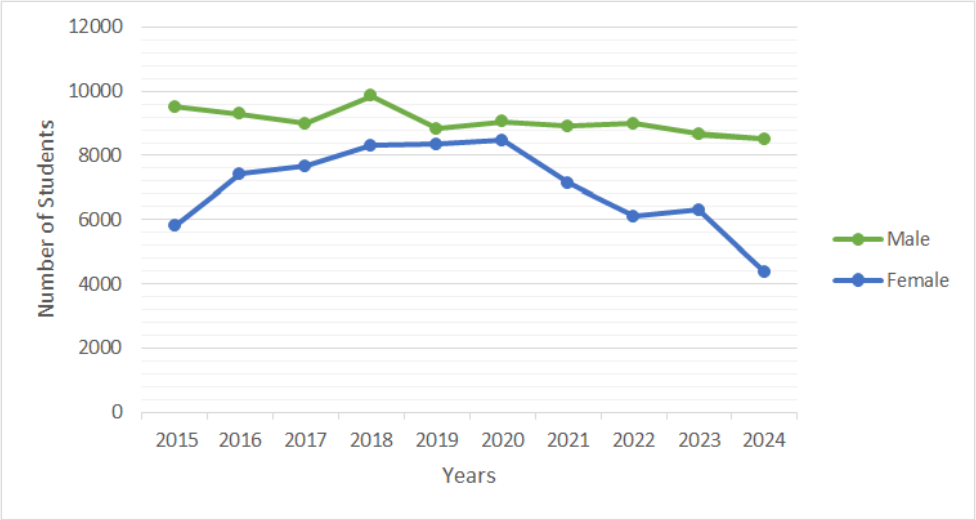

Figure 1: Time series plot on male and female science students' enrolment in senior secondary schools

From Table 1, it shows that the enrolment of males slightly decreases from 2015 to 2024. Though there was an increment in 2018, 2020, and 2022, as the enrolment of male science students for these years was 9856, 9054, and 9000, respectively. This also shows that these increments decrease as the year goes on. Contrary to the male enrolment, the enrolment of female science students increases from 2015 to 2020 and starts to decrease again from 2021 to 2024. There was a slight increment in 2023 (6304) compared to 2022 (6114) and a drastic decrease in 2024 (4384). The time series plot in figure 1 shows the nature of the trends of male and female science students' enrolment. This shows that the enrolment of male students is inversely related to the year; that is, as the year increases, the enrolment decreases. But the nature of female enrolment between the period under study is parabolic, with an initial increment and later decrease.

Research Question 2: What is the different between the male and female science students' enrolment in senior secondary schools in Zamfara state?

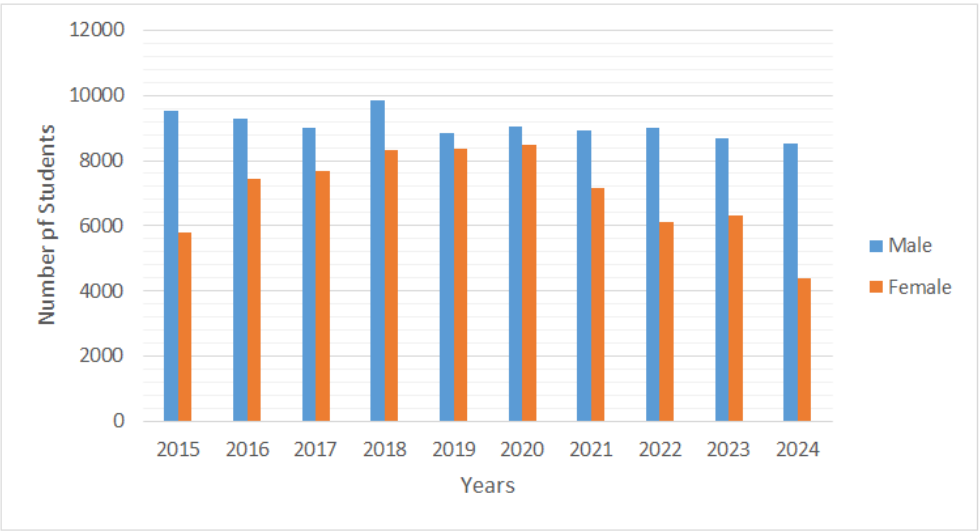

Figure 2: Chart showing the different between the male and female science students' enrolment from 2015 – 2024

Figure 2 shows that from 2015 to 2024, the enrolment of males in science at senior secondary schools in Zamfara state is greater than that of their female counterparts. This shows that there is a gap between the number of males and females in science at senior secondary schools. The gap started to decrease from 2015 till 2019 and 2020, where the enrolments are very close. The gap started to increase again in 2021 till 2024.

Research Question 3: What is the trends of male science students' enrolment in senior secondary schools based on class level in Zamfara state?

Table 2: Trends of male science students' enrolment in senior secondary schools based on class level

Year	Number of students enrolled		
	SS1	SS2	SS3
2015	3172	3358	2986
2016	3182	3178	2934
2017	3166	2804	3026
2018	3478	3224	3154
2019	3114	2882	2838
2020	3092	2984	2978
2921	2880	3118	2916
2022	2922	2962	3116
2023	2888	2856	2936
2024	2968	2832	2724

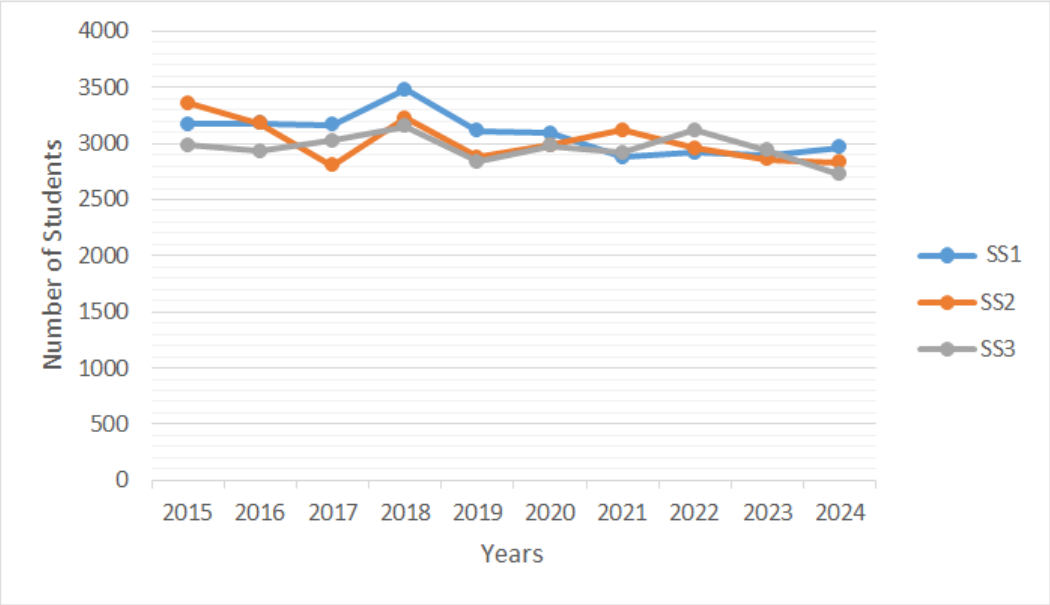

Figure 3: Time series plot of male science students' enrolment on class level

Table 2 and Figure 3 show the trends of male students' enrolment in science at senior secondary schools based on class level. It was revealed that the trends of male students' enrolment in SS1, SS2, and SS3 are the same. This shows that the number of male students graduating in SS3 was determined by students' entrance in SS1.

Research Question 4: What is the trends of female science students' enrolment in senior secondary schools based on class level in Zamfara state?

Table 3: Trends of female science students' enrolment in senior secondary schools based on class level

Years	Number of students enrolled		
	SS1	SS2	SS3
2015	1756	1858	2186
2016	2468	2526	2428
2017	2556	2618	2502
2018	2660	2704	2960

2019	2886	2862	2606
2020	2942	2922	2616
2021	2156	2256	2728
2022	1818	2074	2222
2023	2078	2286	1940
2924	1578	1398	1408

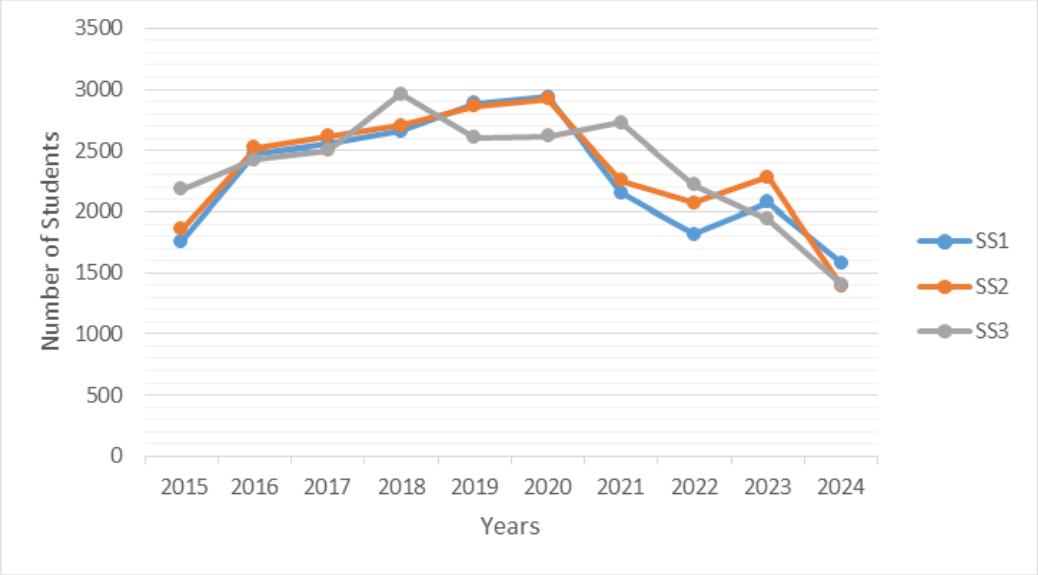

Figure 4: Time series plot of female science students' enrolment on class level

As shown in Table 3 and Figure 4, the enrolment of females in science at senior secondary schools in SS1, SS2, and SS3 follows the same pattern as the trend. This indicates that the number of female science students graduating in SS3 also depends on the number of students entering in SS1.

DISCUSSION OF FINDINGS

The findings of this study revealed that starting from 2015, which marked the year the SDGs were launched, the enrolment of male students in science at senior secondary schools continued to slightly decrease while the enrolment of female students had a great improvement till 2019 and 2020. This finding is the same as the finding of Isma'il *et al*., (2023), which revealed that as the female students' enrolment in STEM courses at the Federal University of Gusau for the period of 6 years (2014/2015 to 2019/2020) increased, that of male students declined. Since the same trend was observed in the same period of years, it means the number of students offering STEM courses at higher institutions depends on the number of graduating science students at secondary schools. It was also observed from the finding that from 2021, both male and female students' enrolment continued to decrease till 2024. This unpleasant situation of students' enrolment could be as a result of the threat of banditry in the state. Tukur and Abdullahi (2023) found that banditry has significant effects on educational development, especially on students' enrolment in secondary schools in Zamfara state. In line with this, Kitabu and Mohammed (2023) noted that the number of students enrolled in secondary schools has significantly dropped compared to the school enrolment before the incident of the banditry. As a result of fear of an unsafe environment in the schools, parents gradually withdraw their children from schools, leading to a downturn of students' enrolment and attendance in the schools. The displacement of people from their communities as a result of armed banditry also worsens the situation. Moving away from the community compels students out of the schools, and this leads to a reduction of the number of students in schools. Madubuegwu and Abah (2023) pointed out that education deprivation in the North-West has been worsened by armed banditry due to mass displacement of people in the communities. In all the negative impact of banditry activities, parents find it difficult to enrol their children in public schools (Saadu & Lawal, 2023). This has serious implications for national development, as Maryann & Cecilia (2019) noted that the knowledge of science equips students with the skills that are capable of improving individual lives and the nation at large.

The finding of this study also revealed that within the years under study (2015-2024), male students' enrolment in science at senior secondary schools was greater than that of their female counterparts. This is in agreement with a study conducted by Momoh *et al*., (2020), which found out that there was more male enrolment in senior secondary schools in Nigeria than female between 2014 and 2016. Adejimi and Nzabalirwa (2021) also found similar results in their study that the

majority of the students enrolled in the department of Mathematics and Science between the 2014/2015 session and 2018/2019 were male. It was observed in this study that the gap between the enrolment of male and female students in science at secondary schools in Zamfara state reduced gradually from 2015 to the minimal in 2019 and 2020. This shows that efforts have been made in the state to reduce gender disparity in the enrolment in science. But, suddenly, the gap gradually increases in 2021 and continues to increase till 2024. This is an indication that despite the efforts made by the state to balance the enrolment of males and females in schools, the issue of banditry seriously affected the female enrolment more than the male enrolment. This is in consistency with the finding of Ahmed *et al*., (2024), who found that banditry severely undermines girl-child education in Kastina state because the hostile environment caused by bandits affected female students, resulting in reduced enrolment rates in schools.

In addition, this revealed that the trend of male students' enrolment in science at senior secondary schools in Zamfara state is similar in SS1, SS2, and SS3. The same observation was in female students' enrolment. This means that the rate at which both male and female students enter SS1 for science determines the rate of their exit in SS3. This finding is in contrast with Arowolo *et al*., (2016), which shows that there is a general upward trend in the rate of dropouts of senior secondary students in the North from 2003–2005. This means that in this period, there were more students going into SS1, and few were graduating at SS3. Therefore, the indication of the finding in this study is that there was improvement in maintaining students stay till SS3.

Implication of the findings on SDG 5 (Gender equality)

Having more students doing science at senior secondary schools is a great success in achieving SDGs since most of the students will be participating in STEM at higher education. Science and technology have a greater impact on national development. Consideration of gender perspective in achieving sustainable national development is important. As a result, the 2030 SDGs agenda provides that the follow-up process at all levels must be gender sensitive. From the finding of this study, it was observed that there was improvement in bridging the gender gap in science students' enrolment in Zamfara State between 2015 and 2020, and that was a great achievement in attaining SDG 5. But, suddenly, there was a setback in 2021, in which the gap started to widen and become wider in 2024. This gap will be a disadvantage to female participation in the labour market and will be responsible for contributing largely to gender disparities in poverty. According to Filho *et al*., (2023), attaining SDG 5 is a top priority that raises global well-being. In addition, as a component of the Sustainable Development Goals (SDGs), women and their rights to equality particularly in relation to equal access to resources, equal participation in public, economic, and social spheres, and women's empowerment have a significant role in the 2030 Agenda (Rudolf, 2020). Hence, it is important to address gender equality in the enrolment of students in science at senior secondary schools in Zamfara state.

CONCLUSION

It was concluded from the findings of this study that generally there is a decrease in the enrolment of students in science at senior secondary schools in Zamfara State. In addition, the gender gap in science student enrolment reduced in the period 2015–2020 but started widening again since 2021. This calls for the attention of individuals, stakeholders, and state governments in order to be in the direction of SDGs.

RECOMMENDATION

As a result of findings in this study, the following recommendations were made by the researchers:

1. There is a need to encourage more students to enrol for science at senior secondary schools to increase the number of students going for STEM courses at higher education.
2. State government should encourage female children to enrol in science to bridge the gap between male and female students' enrolment.
3. State government should set a mechanism to mitigate banditry that is likely creating fear for parents in enrolling their children in schools, especially female children.
4. The conducive environment and effective teaching should be provided to maintain the number of students entering SS1 to graduate in SS3.
5. The society should be enlightened on the necessity to shift perspectives concerning gender roles and capabilities and the importance of implementing affirmative actions to support female students in the field of science.

Conflict of Interest: The researchers declared no conflict of interest

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