



Inclusiveness of the Girl-Child in STEM Education in Public Senior Secondary Schools in Rivers State

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Abstract

This study investigated the inclusiveness of the girl-child in STEM education within public senior secondary schools in Rivers State, Nigeria. Through analysis of data collected from students and teachers, the research explored the factors influencing girls' engagement and achievement in STEM subjects. The sample of the study consisted of 74 teachers and students (teachers = 30 and students = 44) using a simple random sampling technique. The instrument for data collection was a researcher's self-developed questionnaire titled "Girl-Child Inclusion in STEM in Public Senior Secondary Schools in Rivers State Questionnaire" (GCSTEMPSSRSQ). The research questions were answered using mean and standard deviation while the null hypotheses were tested at 0.05 level of significance using the z-test statistics. Findings showed that family background plays a crucial role in shaping children's educational aspirations and choices, particularly in STEM fields. In conclusion, the study offered reasons for optimism and highlighted areas where targeted interventions and systemic changes are necessary to create a truly inclusive STEM learning environment for girls. The study recommended amongst others that government at all levels should implement and expand teacher training programs focused on gender-responsive pedagogy in STEM education.

Keywords: Gender and STEM Education, Public Secondary Schools, Family Influence, Pedagogical Practices, STEM Literacy.

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INTRODUCTION

Around the world, there is a strong emphasis on the fields of Science, Technology, Engineering, and Mathematics (STEM) as a means to stimulate economic growth through the development of a highly educated workforce. This global focus has led many countries to make significant investments in STEM education initiatives. These investments are largely driven by concerns about a potential future shortage of professionals who are qualified in these areas. In today's rapidly evolving technological landscape, it is becoming increasingly important for everyone to be able to engage with the world around them with minimal external assistance. This includes women, who make up a significant percentage of the world's population. Given their numbers, it is crucial to prioritize the education of women. This idea is encapsulated in the saying, "when you train a woman, you train a nation".

In 1996, UNESCO identified women and Africa as priorities in its Medium-Term Plan. As part of this focus, it launched a six-year Special Project on Scientific, Technical and Vocational Education of Girls in Africa. This project aimed to encourage girls to pursue education and equip them with the skills needed to achieve self-reliance. STEM plays a pivotal role in the development of any nation or economy. It underpins the various emerging technologies that the world now relies on. Therefore, the importance of promoting the involvement of girls in STEM cannot be overstated, given the significant roles they play in society.

In Nigeria, increasing the education of girls would lead to a healthier, more educated, more empowered, and more productive nation. This is because the girls of today will become the mothers of tomorrow, and their education will have a profound impact on the future of the nation. Therefore, investing in the education of girls, particularly in STEM, is not just beneficial for the girls themselves, but also for the future prosperity of the nation. The importance of educating the female population, particularly in Africa and specifically in Nigeria, is being underscored. However, it is crucial to acknowledge that numerous factors could potentially hinder this initiative. Empirical observations and various surveys have consistently shown that across the continent, there is a higher propensity for boys to choose subjects related to science and technology. Furthermore, their academic performance in these areas significantly surpasses that of their female counterparts. Upon completion of their education, a larger proportion of males pursue careers in Science, Technology, Engineering, and Mathematics (STEM) (UNESCO, 2006). The divergence in career paths between genders is not exclusive to other fields but is also evident in research. Women constitute a minority in the global pool of researchers. Despite the escalating demand for internationally comparable data on women in science, the availability and utilization of national data for policy formulation often remain constrained (UNESCO, 2013).

Statement of the Problem

In the contemporary world, Science, Technology, Engineering, and Mathematics (STEM) fields are increasingly recognized as critical for economic growth and competitiveness. Despite this, there is a noticeable gender disparity in STEM, with girls and women being underrepresented. The underrepresentation and limited participation of girls in Science, Technology, Engineering and Mathematics (STEM) education in public senior secondary schools across Rivers State has become a major barrier to engendering inclusiveness and equality of opportunity. Recent

statistics show that enrollment and completion rates for girls in key STEM subjects like Mathematics, Physics, Chemistry, Additional Mathematics and Technical Drawing are substantially lower compared to boys in majority of the public senior secondary schools in the state. This problem of low participation of the girl-child stems from interlinked social, institutional and economic factors. From a social standpoint, gender stereotypes and societal biases associated with the perceived capabilities and roles of girls serve to discourage many from pursuing interests in STEM right from basic education.

Additionally, the lack of visible female role models in STEM fields means that many girls lack the engagement and encouragement needed to build their self-efficacy in STEM subjects. Institutionally, many public secondary schools lack the infrastructural facilities, teaching capacities and gender-sensitive pedagogical approaches required to make STEM education more inclusive for girls. Economic barriers also exist, with the high costs of STEM education prohibiting girls from poorer backgrounds. The low participation of girls in STEM subjects in senior secondary school effectively hinders inclusion and diversity in critical STEM professions. It also propagates gender discrepancies in opportunities for social mobility and economic participation. Ultimately, Rivers State loses out on the innovation and creativity that a diversity of perspectives brings to building a progressive knowledge economy. Addressing this multi-faceted problem requires firm commitment and concerted interventions from parents, schools, education administrators, government agencies and wider society. The inclusiveness of the girl-child in STEM education is central to actualizing gender equality and equitable access to economic opportunities, now and in the future. It is against this backdrop that this study strives to investigate factors influencing the engagement of girl-child in STEM education in public senior secondary schools in Rivers State.

Aim and Objectives of the Study

This study is aimed at investigating factors influencing the engagement of girl-child in STEM in public senior secondary schools in Rivers State. Specifically, the study sought to:

- Determine the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State.
- Assess the influence of effective pedagogical practices on the engagement of girl-child in STEM in public senior secondary schools in Rivers State.
- Examine the extent of girl-child STEM literacy in public senior secondary schools in Rivers State.

Research Questions

The following research questions guided this study:

- What is the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State?
- What is the influence of effective pedagogical practices on the engagement of girl-child in STEM in public senior secondary schools in Rivers State?
- What is the extent of girl-child STEM literacy in public senior secondary schools in Rivers State?

Hypotheses

The following null hypotheses were formulated to guide the study:

- **H0₁:** There is no significant difference between the mean rating of teachers and students on the influence of family background in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.
- **H0₂:** There is no significant difference between the mean rating of teachers and students on the influence of effective pedagogical practices in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.
- **H0₃:** There is no significant difference between the mean rating of teachers and students on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State.

CONCEPTUAL CLARIFICATION/REVIEW OF RELATED LITERATURE

Concept of STEM

STEM, an acronym for Science, Technology, Engineering, and Mathematics, is a widely used term without a clear definition among educators. It's used to label any event, policy, or practice involving one or more STEM disciplines. It's adopted globally to emphasize the need for education in these fields to prepare students for higher education and the workforce. While often interpreted as focusing more on science and mathematics, it also includes behavioral sciences like psychology, economics, sociology, and political science. STEM education aims to integrate these disciplines to solve real-world problems and develop new beneficial processes or products. It's expected to build students' understanding of the interrelated nature of these subjects. However, many schools focus more on science and mathematics, overlooking the importance of engineering and technology.

Ideal STEM education involves interdisciplinary and transdisciplinary approaches, applying knowledge and skills from multiple STEM disciplines to real-world problems. Originally called SMET, this initiative by the National Science Foundation aimed to equip students with critical thinking skills, making them creative problem solvers and more marketable in the workforce. Participating in STEM education is perceived to give students an advantage, whether they pursue higher education or not. As such, this study seeks to examine and integrate findings from this body of research. An emerging body of research that examines STEM integration from an interdisciplinary and transdisciplinary approach is beginning to take shape in the field as opined by Honey, Pearson and Schweingruber, (2014), and this future research will provide greater insights into effective STEM pedagogical practices in school education. It will be helpful to review each discipline and its role within STEM education. The following provides a review of each STEM discipline and its role in education.

Science: Science is the exploration of the natural world, encompassing physics, chemistry, and biology. It is a body of knowledge built over time and a process that generates new insights. This knowledge informs engineering design. Scientific knowledge, based on evidence from numerous studies, forms well-tested theories that explain data and predict future

outcomes. Despite differences in practices across scientific domains, all share a commitment to data and evidence as the basis for claims. Scientists must examine, review, and evaluate their knowledge and ideas, and critique those of others. This includes assessing data quality, modeling theories, developing new testable questions, and modifying theories and models as needed.

Technology: Technology, though not strictly a discipline, encompasses the system of people, organizations, knowledge, processes, and devices involved in creating and operating technological artifacts. Historically, technology has been created to meet human needs and wants. Much of today's technology is a product of science and engineering, with technological tools used in both fields. The Next Generation Science Standard (NGSS, 2013) emphasizes integrating technology and engineering into science education, elevating engineering design to the same level as scientific inquiry. The core ideas of engineering and technology are given equal status with other major science disciplines, promoting the "engineering design" problem-solving process.

Engineering: Engineering is a body of knowledge and a problem-solving process, often under constraints like the laws of nature, time, money, available materials, ergonomics, environmental regulations, manufacturability, and reparability. It uses science, mathematics, and technological tools. The goal of engineering is to solve problems stemming from human needs or desires. This involves defining the problem, specifying what's needed, and designing a solution. This process helps students apply their understanding of science and consider engineering as a career. Like scientists, engineers work individually and cooperatively, requiring specialized knowledge. Therefore, both engineering practices and core ideas are included in this framework.

Mathematics: Mathematics studies patterns and relationships among quantities, numbers, and space. Unlike science, which uses empirical evidence, mathematics uses logical arguments based on foundational assumptions to validate claims. These logical arguments are integral to mathematics. While mathematical knowledge continues to grow like in science, it isn't overturned unless the foundational assumptions change. Mathematics includes numbers and arithmetic, algebra, functions, geometry, statistics, probability, and is used in science, engineering, and technology.

Importance of STEM in Secondary Education

Secondary education in Nigeria, introduced by Christian Missions in the mid-19th century, was initially a 5-year program, later changing to a 6-3-3-4 system in 1982, and then a 9-3-4 system with the 2004 introduction of UBE (Nwangwu et al., 2005). Serving as a bridge between primary and tertiary education, it aims to prepare students for societal living and higher education (Ekundayo, 2010). Incorporating STEM into secondary schools can enhance the quality of education, given science's central role in society and development. Access to scientific knowledge and skills is crucial for individual and national progress. Neglecting quality science education at the secondary level could hinder a nation's growth and global competitiveness.

Girl-Child Inclusion and Participation in STEM

Closing the gender gap in STEM is crucial for national development and gender equality (UNESCO, 2006). With technology's rapid advancement, it's vital for everyone, including women, to interact with the world independently. Given women's significant population share, their education, especially in STEM, is essential. More female education in Nigeria would lead

to a healthier, more educated, and more productive nation (British Council, Nigeria 2012). While progress has been made toward gender equality in STEM, further efforts are needed for sustainable change, including educating about the imbalance and implementing gender equality policies (Payam, 2013). Stereotypes may deter girls from science, affecting their self-perception and workplace success. Despite girls performing as well as boys in science, they engage less often in science subjects, potentially leading to an over-representation of boys in science fields.

Factors Influencing Lack of Interest towards STEM

Despite increased access to STEM education for girls in Nigeria, they remain under-represented in many degree programs, particularly in engineering, physics, and computer science. Even with better access to education, the number of women in the science and technology workforce is decreasing due to various factors.

Individual Interest: Interest is a stable motivational disposition towards specific objects, characterized by increased attention and usually positive emotions. In the STEM context, interest in science signifies a student's ongoing engagement with science subjects. However, girls and women often require more effort to maintain interest in STEM due to the abstract nature of the subjects.

Situational Interest: By contrast, is triggered by the environment, and is characterized by a state of actual attraction or curiosity as well as increased attention. Situational interest comprises two phases. The environment plays a larger role in making STEM interesting for women as various environmental factors could readily discourage girls and women, such as:

The teachers' factor: Teachers' perceptions and attitudes can discourage girls, often leading to their dropout. In some rural areas, teachers expect boys to pursue university courses like medicine and engineering, while girls are expected to become secretaries or teachers. This affects how girls are taught, especially in STEM, impacting their performance. With one in three women worldwide being illiterate, boys outnumber girls in schools. Teachers often pay more attention to boys, giving them more hands-on opportunities, while girls receive less attention. Even STEM textbooks predominantly use boys as examples.

The home factor: Balancing family responsibilities and a successful science career is a significant challenge for women, often leading them to sacrifice career advancements for family. The demands of childcare and running a research lab are often viewed as incompatible. Women planning to have children drop out of academic research at double the rate of men, particularly when they need to meet research goals.

Curriculum Development: Early emphasis on programming in Computer Science can discourage both females and males, potentially deterring those interested in its broader, multidisciplinary applications. This initial experience might diminish their interest before they realize the field extends beyond programming.

Closing the Gender Gap in STEM

To reduce the existing gap in gender representation in STEM and encourage women folk to choose careers in STEM, the following issues would need to be addressed:

- Adequate preparation of the girl for STEM. Good mathematics skills are essential for success in STEM; hence they must be intimated of the need for mathematics and encouraged to face it with a mindset of being able to handle it well. The teachers are to be trained on how to relate with the female students who may be starting with the fear of the preconceived notion of STEM.
- The perception that STEM is primarily meant for males needs to be corrected. This would require promoting a positive image of women in STEM.
- Society should be sensitized to the importance of removing all gender bias and stereotypes, especially parents, curriculum developers, school administrative staff, educators and trainers.
- Early exposure of girls to female role models who have excelled in their STEM careers and equally doing well as mothers and wives. Also, by counseling them on the prospects of STEM careers and improving access of girls to scientific and technological education. This can be done by organizing career fairs, job shadowing, career talks, enterprise education, workplace and science centre visits and making career publicity materials available to them.
- Scholarships and Awards for women in STEM will further reduce the gap that exists between the genders. Several international bodies are actively supporting women and giving females special consideration.
- Introduction of Competency-Based Learning activities into the teaching of STEM. By this, the courses are seen as tangible, instead of being abstract. This will also help the spatial skills of the girls and make the learning environment of STEM more attractive.
- Active mentoring and role modeling. Mentoring can significantly impact females in STEM by boosting confidence and challenging stereotypes. Studies indicate that mentoring programs improve students' academic performance and self-confidence. Secondary school girls interested in science could mentor younger primary school girls, while female scientists could mentor university-aged girls. This layered mentoring benefits both mentors and mentees, fostering leadership skills, advice, encouragement, and learning from shared experiences.

METHODOLOGY

This study adopted a descriptive research design. This approach was adopted because the researcher intends to identify the factors influencing the engagement of girl-child in STEM in public senior secondary schools in Rivers State. The population of this study consisted of all 247 public senior secondary schools in the 23 Local Government Areas of Rivers State. The sample of the study consisted of 74 teachers and students (teachers = 30 and students = 44) using a simple random sampling technique. The instrument for data collection was a researcher's self-developed questionnaire titled "Girl-Child Inclusion in STEM in Public Senior Secondary Schools in Rivers State Questionnaire" (GCSTEMPSSRSQ). The instrument was validated by three experts in Educational Psychology, Guidance and Counselling and one in Educational

Management departments of the Ignatius Ajuru University of Education, Port Harcourt. A reliability coefficient of 0.78 (78 percent reliability) was obtained using Cronbach Alpha through the test-retest method. The research questions were answered using mean and standard deviation while the null hypotheses were tested at 0.05 level of significance using the z-test statistics. Tables were constructed to the demands of the respective research questions, and hypotheses and a criterion mean of 2.50 was used.

RESULTS

Presentation and analysis of data to answer research questions and hypotheses

Research Question One: What is the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State?

Table 1: Mean and Standard deviation on the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State

S/N	Items	Teachers N = 30		Decision	Students N = 44		Decision	Mean set	Overall Decision
		\bar{X}_1	SD ₁		\bar{X}_2	SD ₂			
1	My family encourages me to pursue a career in STEM	2.51	0.11	Agree	2.56	0.13	Agree	2.54	Agree
2	I have family members who work in STEM fields	2.67	0.22	Agree	2.80	0.19	Agree	2.74	Agree
3	My family provides resources (books, internet, etc.) to help me learn about STEM.	2.89	0.07	Agree	2.77	0.12	Agree	2.83	Agree
4	My family believes that girls can succeed in STEM.	3.00	0.10	Agree	3.02	0.16	Agree	3.01	Agree
5	My family often discusses STEM-related topics at home.	2.90	0.09	Agree	2.78	0.11	Agree	2.84	Agree
6	My family supports my participation in STEM activities at school	2.67	0.24	Agree	2.60	0.18	Agree	2.64	Agree
7	My family's income level affects my ability to engage in STEM activities	2.51	0.33	Agree	2.54	0.24	Agree	2.53	Agree
8	My family's educational background influences my interest in STEM	2.56	0.22	Agree	2.51	0.19	Agree	2.54	Agree
9	My family's cultural beliefs impact my engagement in STEM	2.50	0.24	Agree	2.63	0.23	Agree	2.57	Agree
10	My family's expectations about gender roles affect my participation in STEM	2.50	0.12	Agree	2.54	0.10	Agree	2.52	Agree
Aggregate Mean and SD		2.71	0.20	Agree	2.87	0.18	Agree	2.79	Agree

Table 1 results showed that the average mean score of teachers was 2.71 with a standard deviation of 0.20 and the average mean score of students stood at 2.87 with a standard deviation of 0.18. Furthermore, the aggregate mean score of male and female students was 2.79. Judging by the results, table 1 revealed that all the items had mean above the criterion mean of 2.50. Thus, the respondents agreed on the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Research Question Two: What is the influence of effective pedagogical practices on the engagement of girl-child in STEM in public senior secondary schools in Rivers State?

Table 2: Mean and Standard deviation on the influence of effective pedagogical practices on the engagement of girl-child in STEM in public senior secondary schools in Rivers State

S/N	Items	Teachers N = 30		Decision	Students N = 42		Decision	Mean set	Overall Decision
		\bar{X}_1	SD ₁		\bar{X}_2	SD ₂			
11	My teachers use a variety of teaching methods in STEM subjects.	2.78	0.35	Agree	2.80	0.29	Agree	2.79	Agree
12	My teachers provide practical examples that relate to real-world situations in STEM lessons	2.89	0.28	Agree	2.58	0.31	Agree	2.74	Agree
13	My teachers encourage active participation in STEM classes	2.67	0.13	Agree	2.53	0.17	Agree	2.60	Agree
14	My teachers provide timely and constructive feedback on my STEM assignments	2.51	0.41	Agree	2.50	0.37	Agree	2.50	Agree
15	My teachers make STEM subjects interesting and engaging.	2.90	0.14	Agree	2.78	0.18	Agree	2.84	Agree
16	My teachers use technology effectively in teaching STEM subjects.	2.51	0.11	Agree	2.62	0.10	Agree	2.57	Agree
17	My teachers provide extra help when I struggle with STEM subjects.	2.52	0.18	Agree	2.49	0.22	Disagree	2.51	Agree
Aggregate Mean and SD		2.68	0.23	Agree	2.61	0.23	Agree	2.65	Agree

Table 2 results showed that the average mean score of teachers was 2.68 with a standard deviation of 0.23 while that of the students was 2.61 and a standard deviation of 0.23. The aggregate mean of both respondents was 2.65. By these results, table 2 revealed that all the items had a mean score above the criterion mean of 2.5. Thus, respondents agreed on the influence of effective pedagogical practices on the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Research Question Three: What is the extent of girl-child STEM literacy in public senior secondary schools in Rivers State?

Table 3: Mean and Standard deviation on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State

S/N	Items	Teachers N = 30		Decision	Students N = 42		Decision	Mean set	Overall Decision
		\bar{X}_1	SD ₁		\bar{X}_2	SD ₂			
18	I understand the basic concepts in Science	2.51	0.33	HE	2.50	0.30	HE	2.51	HE
19	I can apply mathematical concepts to solve problems.	2.67	0.26	HE	2.64	0.23	HE	2.66	HE
20	I can explain the principles of Technology and its applications.	2.89	0.13	HE	2.90	0.11	HE	2.90	HE

21	I understand the fundamentals of Engineering and its relevance to everyday life.	3.00	0.11	HE	3.03	0.17	HE	3.02	HE
22	I can use scientific methods to investigate questions and solve problems.	2.90	0.14	HE	2.79	0.12	HE	2.85	HE
23	I can interpret data and conclude STEM subjects	2.67	0.44	HE	2.54	0.37	HE	2.61	HE
24	I can communicate my understanding of STEM concepts effectively	2.51	0.41	HE	2.54	0.43	HE	2.53	HE
25	I can apply STEM knowledge to real-world situations.	2.56	0.13	HE	2.67	0.11	HE	2.62	HE
26	I feel confident in my ability to succeed in STEM subjects.	2.50	0.28	HE	2.53	0.25	HE	2.52	HE
Aggregate Mean and SD		2.66	0.26	HE	2.67	0.24	HE	2.67	HE

Table 3 results showed that teachers had an average mean of 2.66 (SD = 0.26) and students had an average mean score of 2.67 standard deviation of 0.24. Judging by the results, table 3 revealed that all the items had a mean above the criterion mean of 2.50. Thus, respondents agreed on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State.

Hypothesis One: There is no significant difference between the mean rating of teachers and students on the influence of family background in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Table 4: Summary of z-test on mean responses of teachers and students on the influence of family background in the engagement of girl-child in STEM in public senior secondary schools in Rivers State

Categories	N	X	SD	Df	P	z-cal	z-crit	Decision
Teachers	30	2.71	0.20	72	0.05	3.54	1.96	Ho ₁ Rejected
Students	44	2.87	0.18					

Table 4 above shows that the z-calculated value of 3.54 is less than the z-critical value of 1.96 at 0.05 level of significance with a degree of freedom of 72. The null hypothesis was rejected. This means that there is a significant difference between the mean responses of teachers and students on the influence of family background in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Hypothesis Two: There is no significant difference between the mean rating of teachers and students on the influence of effective pedagogical practices in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Table 5: Summary of z-test on mean responses of teachers and students on the influence of effective pedagogical practices in the engagement of girl-child in STEM in public senior secondary schools in Rivers State

Categories	N	X	SD	Df	P	z-cal	z-crit	Decision
Teachers	30	2.68	0.23	72	0.05	1.25	1.96	Ho ₂ Rejected
Students	44	2.61	0.23					

Table 5 above shows that the z-calculated value of 1.25 is less than the z-critical value of 1.96 at 0.05 level of significance with a degree of freedom of 72. The null hypothesis was rejected. This means that there is a significant difference between the mean responses of teachers and students on the influence of effective pedagogical practices in the engagement of girl-child in STEM in public senior secondary schools in Rivers State.

Hypothesis Three: There is no significant difference between the mean rating of teachers and students on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State.

Table 6: Summary of z test on mean responses of teachers and students on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State

Categories	N	X	SD	Df	P	z-cal	z-crit	Decision
Teachers	30	2.67	0.26	72	0.05	0.00	1.96	Ho ₃ accepted
Students	44	2.67	0.24					

Table 6 above shows that the z-calculated value of 0.00 is less than the z-critical value of 1.96 at 0.05 level of significance with a degree of freedom of 72. The hypothesis was accepted. This means that there is no significant difference between the mean responses of teachers and students on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State.

DISCUSSION OF FINDINGS

Research question one presented the descriptive statistics for the respondents' agreement on the influence of family background on the engagement of girl-child in STEM in public senior secondary schools in Rivers State. The average mean score for teachers was 2.71 (SD = 0.20), while students had a slightly higher average mean score of 2.87 (SD = 0.18). The combined average mean score for all respondents was 2.79. Notably, all item means were above the criterion mean of 2.50, indicating that the respondents generally agreed on the significant influence of family background on girls' engagement in STEM education (Onu, 2018). These findings align with previous research suggesting that family background plays a crucial role in shaping children's educational aspirations and choices, particularly in STEM fields (Archer et al., 2017; Hill et al., 2010). Parental support, encouragement, and access to resources can significantly influence girls' interest and participation in STEM subjects (Carlone & Johnson, 2008). Therefore, it is essential to consider family background when designing and implementing interventions aimed at promoting girls' engagement in STEM education.

Research question two presented the respondents' agreement on the influence of effective pedagogical practices on the engagement of girl-child in STEM education in public senior

secondary schools in Rivers State. The average mean score for teachers was 2.68 (SD = 0.23), and students had a comparable mean score of 2.61 (SD = 0.23). The overall average mean score for both respondents was 2.65. Notably, all item means exceeded the criterion mean of 2.50, suggesting a consensus among respondents that effective pedagogical practices significantly impact girls' engagement in STEM education (Ezeudu, 2018). These findings resonated with existing research highlighting the importance of teacher quality and classroom practices in fostering girls' interest and participation in STEM subjects (Carlone & Johnson, 2008; Hill et al., 2010).

Effective pedagogical practices, such as inquiry-based learning, project-based learning, and collaborative learning, can provide girls with opportunities to develop critical thinking skills, problem-solving skills, and confidence in their abilities in STEM fields (Malin & Byram, 2011). Additionally, incorporating diverse perspectives and addressing gender stereotypes in STEM education can further encourage girls' engagement and break down traditional barriers (Murphy & Taylor, 2017). Therefore, considering these findings, educators and policymakers must prioritize the development and implementation of effective pedagogical practices in STEM education specifically aimed at addressing the needs and interests of girls. This can involve teacher training programs focused on gender-responsive pedagogy, incorporating innovative teaching methods, and promoting inclusive and supportive classroom environments.

Research question three presented the respondents' agreement on the extent of girl-child STEM literacy in public senior secondary schools in Rivers State. While the average mean score for teachers was slightly lower at 2.66 (SD = 0.26) compared to students at 2.67 (SD = 0.24), both means remained above the criterion mean of 2.50. This indicates that respondents generally agreed that some level of STEM literacy exists among girls in these schools. Interestingly, the proximity of the mean scores between respondents suggested a relatively similar perceived level of STEM literacy for both boys and girls. This finding could point towards positive progress in closing the gender gap in STEM education within the region. However, it is important to acknowledge the limitations of self-reported data and consider possible influences of social desirability bias. Despite the close mean scores, it's crucial to remember that standard deviations provide information about the spread of data points. The slightly higher standard deviation for students suggests a greater variance in their perceived level of STEM literacy compared to teachers.

CONCLUSION

This study presented valuable insights into the challenges and opportunities that exist in fostering girls' engagement and achievement in STEM education. While the findings offer reasons for optimism, they also highlight areas where targeted interventions and systemic changes are necessary to create a truly inclusive STEM learning environment for girls.

Recommendations

Based on the findings and conclusion of this study, the following recommendations are made:

- Government at all levels should implement and expand teacher training programs focused on gender-responsive pedagogy in STEM education.

- Government and other education stakeholders should invest in resources and infrastructure for STEM education with a focus on inclusivity.
- Schools should partner with families and communities to create a supportive environment for girls in STEM.

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