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ACCESS TO STEAM EDUCATION AS CORRELATE TO JUNIOR SECONDARY SCHOOL STUDENTS' INTEREST AND PERFORMANCE IN MATHEMATICS IN GWAGWALADA AREA COUNCIL, FEDERAL CAPITAL TERRITORY, NIGERIA

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Abstract: This study is on access to Science, Technology, Engineering, Arts and Mathematics (STEAM) Education as correlate to junior secondary school students' interest and performance in mathematics in Gwagwalada Area Council, Federal Capital Territory (FCT), Nigeria. The research had three research questions and tested two hypotheses. The study adopted a correlational research design on a population of 8,206 public junior secondary school students in Gwagwalada Area Council, FCT. One hundred and eighty (180) students were selected from two schools using multistage sampling technique as the sample for the study. The instruments used for data collection were: Access to STEAM Education Questionnaire (ASEQ) and Mathematics Interest Inventory (MII). Students' Mathematics Achievement Performance Scores were also collected from the sampled schools. The reliability coefficients of ASEQ and MII were 0.83 and 0.81 respectively. The research questions were answered using descriptive statistics (Mean and Standard deviation) while the hypotheses were tested using the Spearman Rank Correlation at 0.05 level of significance. The findings revealed that students had access to STEAM education which boosted their interest for mathematics. However, there was a weak negative relationship between access to STEAM Education and Students' Academic Performance in Mathematics (SAPM). Moreover, a strong positive significant relationship ($r = 0.600$, $p = 0.000$; $p<0.05$) between access to STEAM education and students' interest in mathematics was obtained while the negative relationship between access to STEAM education and SAPM was not significant ($r = -0.071$, $p = 0.173$; $p>0.05$). This was due to the inability of teachers to cover the scheme of work, poor exam condition, small sample size taken in this study, and availability of STEAM facilities. The study concludes that access to STEAM education enhances students' interest in mathematics while academic performance in mathematics was negatively correlated. Based on the findings, it is recommended that Secondary school authorities should introduce specialized STEAM subjects, clubs or projects that will relate real world applications and interdisciplinary learning. In addition, teachers should design interdisciplinary projects in science and art that would explicitly demonstrate how STEAM approach is used to promote deeper interest for mathematics. Also, the government should ensure STEAM projects and lessons are closely aligned with mathematics curriculum standards to reinforce students' performance in mathematics.

Keywords: Access, STEAM Education, Interest, Performance in Mathematics.

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Introduction

In today's fast-paced, tech-driven world, incorporating Science, Technology, Engineering, Arts, and Mathematics (STEAM) education into junior secondary schools is crucial for preparing students for the future. STEAM education is an interdisciplinary approach to learning that integrates the subjects of Science, Technology, Engineering, Arts, and Mathematics. This approach aims to foster creativity, critical thinking, and problem-solving skills in students by combining these subjects in a holistic and interactive way (Guyotte et al., 2014). According to Hsiao and Su (2021), the STEAM approach to education encourages students to develop their unique perspectives, innovative thinking, and artistic expression, with innovation being a crucial element. By fostering critical thinking, creativity, and problem-solving skills,

students are well-prepared to succeed in Mathematics and other core science subjects. Research suggests that integrating art into Science, Technology, Engineering and Mathematics (STEM) learning can enhance students' innovative skills, while also improving cognitive abilities like problem-solving, decision-making, and critical thinking, as well as fostering self-expression, observation, collaboration, and communication skills (Taylor, 2016; Hsiao & Su, 2021).

STEAM education seamlessly merges art with STEM, creating a holistic learning approach that balances scientific and technological studies with creative expression, resulting in a more comprehensive and interdisciplinary educational model. Merging art and STEM education can promote holistic development, nurture students' creative potential, innovative thinking, and cultural appreciation. This learning approach brings fun back into the classroom, keeping students engaged and motivated, so they enjoy learning and retain information more effectively (Anaduaka, 2024). By so doing, students' interest in STEAM subjects particularly Mathematics increases as well as their performance in Mathematics. According to Sochacka et al. (2016), the fusion of art and STEM education encourages cross-disciplinary learning, enhances students' imagination, and provides a deeper understanding of the humanities. In so doing, the students grow more interest in core STEAM courses such as Mathematics (Anaduaka, 2024).

Students' interest in mathematics no doubt can be facilitated through STEAM approach due to its aestheticism and ease at problem solving skill. According to Sun and Saleh (2024), implementing STEAM education can be optimized by organizing students into small groups, allowing for more tailored instruction and equal access to learning opportunities, while taking cognisance of divergent learning speeds and styles. Stakeholder engagement is required to offer diverse and flexible opportunities for access in STEAM education.

Presently, digital access and the use of Information and Communication Technologies (ICTs) are growing in importance, as they are fundamental for participation in society, the economy, and democratic processes. Digital equity aims to bridge gaps in digital access, making technology more inclusive and overcoming systemic barriers that disadvantage certain individuals and communities (Iji, 2024).

In Nigeria, education reforms underscore the need for access to STEAM education as a driver of economic development and competitiveness. Studies suggest that project-based engaging STEAM approaches can significantly enhance students' interest and performance in mathematics. For example, Hsiao and Su (2021) revealed that students exposed to STEAM develop stronger critical thinking skills and perform better in mathematical problem-solving tasks. Despite efforts to integrate STEAM education in Nigeria, challenges remain, including limited resources, inadequate infrastructure, and a shortage of qualified teachers.Improving STEAM education is crucial for enhancing Nigeria's economic growth and global competitiveness (UNESCO, 2019; World Bank, 2018; Sadoh et al., 2021).

Given FCT's position as an educational hub (evidenced by presence of various institutions comprising government, private, international and centres of excellence), there is an opportunity to utilize STEAM in junior secondary schools to boost mathematical performance. However, students face numerous barriers, such as resource limitations, uneven curriculum implementation, and a lack of adequately trained educators.

Statement of the Problem

Despite initiatives by the Nigerian government to promote STEM and STEAM education, there is still a significant gap in access and effective implementation of STEAM Education across secondary schools in Nigeria. The importance of STEAM Education cannot be overemphasised hence international studies consistently highlight the potential benefits of STEAM Education in facilitating mathematical learning and cognitive skills (Hsiao & Su, 2021; Sadoh et al., 2021). However, a lot is yet to be done as regards collaborative learning, critical thinking and problem solving skills which STEAM Education offers. It is based on this background; the study examined the influence of access to STEAM Education on students' interest and performance in mathematics in Gwagwalada Area Council's secondary schools.

Purpose of the Study

This study aims to examine access to STEAM education as correlate to junior secondary school students' interest and performance in mathematics in Gwagwalada Area Council, (FCT) - Nigeria. The specific objectives are to;

- Determine the perception of students on access to STEAM education in junior secondary schools in Gwagwalada Area Council, FCT;
- Examine the relationship between access to STEAM education and students' interest in mathematics in junior secondary schools in Gwagwalada Area Council, FCT;
- Ascertain the relationship between access to STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

Research Questions

The following research questions guided the study:

- What is the perception of students on access to STEAM education in junior secondary schools in Gwagwalada Area Council, FCT?
- How do access to STEAM education and students' interest in mathematics relate in junior secondary schools in Gwagwalada Area Council, FCT?
- What is the relationship between STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

- H_{01}: There is no significant relationship between access to STEAM education and students' interest in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.
- H_{02}: There is no significant relationship between access to STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

Literature Review

Prior to the STEM model of learning science was the Science, Technology and Society (STS). Thereafter the advent of STEM, followed by a paradigm shift which included 'arts' for the purpose of conscious use of creative imagination needed for the development of aesthetic objects along with design of solving problem (Dua, 2022). This integration of 'art' into STEM education birthed STEAM credited to Georgette Yakman who coined it in 2006. The goal of STEAM is to enhance the STEM framework by fostering creativity and innovation. Mountains (2017) asserted that there are primarily four skills needed for success in the 21st century namely: critical thinking and problem solving, communication, collaboration, and creativity and innovation. These skills are all embedded in STEAM education thereby making it unavoidable for any nation that has all round development in view. According to Kamolovna (2025), to prepare competitive human capital, there is a need to integrate and do a cross-sectoral (interdisciplinary) approach to education which is the basis of STEAM-education. Many countries are integrating STEAM education into their school curricula due to its perceived present and future importance (Hsiao & Su, 2021; Nannim et al., 2024; Sun & Saleh, 2024; Kamolovna, 2025). This is because STEAM Education balances the science and technology courses in STEM, and creates a more inclusive and integrated interdisciplinary education model (Hsiao & Su, 2021). An important factor which has been observed to predict students' STEAM ability is the psychological variable called 'interest'.

Interest is a powerful motivational process that energizes learning, guides academic and career trajectories, and is essential to academic success (Harackiewicz et al., 2016). With regard to education, Schiefele (2012) and Renninger (2024) identified three types of 'interest' applicable to learning namely; situational, individual, and well-developed individual interest. Situational interest is a short-lived or momentary attention to, or curiosity about, particular subject matter, which can be accompanied by either positive or negative feeling. The Individual interest is said to be a relatively enduring predisposition to experience enjoyment when working with particular subject matter. The well-developed individual interest represents a deep-seated and enduring interest in a specific area. This type of interest drives engagement, exploration, and a desire to learn more about a topic. A student with a well-developed individual interest for a subject has more stored knowledge and stored value for that subject compared to other subjects.

Whichever case a student is observed to exhibit, studies have shown that STEAM programmes can significantly increase such a student's interest in STEM subjects (Hong et al., 2019; Bedar & Al-Shboul, 2020; Huda et al., 2024). In addition, literature also shows a connection between STEAM, interest and performance in school based subjects and other extra-curricular activities. Students were seen to have improved in STEAM subjects, tasks and creativity evidenced by their interest and outcomes (Unterfrauner et al., 2024; Huda et al., 2024; Manalu & Chang, 2025). An area in STEAM that stakeholders in education are concerned about most often is mathematics which students worldwide are considered to avoid (Obina et al., 2022).

The importance of mathematics to the human race has since been established with concrete evidences (Timayi et al., 2024). With regard to STEAM, research has shown that interest for STEAM improves students' interest for mathematics (Manalu & Chang, 2025). Interest plays a crucial role in the learning of mathematics (Egara & Mosimege, 2024). Students with interest in mathematics perform better than their counterparts who see the subject as a ritual that must be performed to get to a life's destination they desired. Researches have indicated that schools with strong STEAM programmes have their students' performance in mathematics enhanced (Sullivan & Bers, 2018). The integration of technology and creative problem-solving skills fosters students' analytical abilities, essential for mastering mathematical concepts (Boaler, 2016).

A study by Hsiao and Su (2021) revealed that the combination of STEAM education, with virtual reality (VR)-aided experience courses, could help to improve the learning satisfaction and outcomes of students and to arouse their learning motivation. Huda et al. (2024) in their study established that STEAM education positively influences student interest and technology integration. Notably, student interest plays a mediating role in the relationship between STEAM education and STEM. Hsu et al. (2021) showed that STEAM is an effective approach to boost student activity and confidence, particularly among elementary and junior high school students who tend to experience mathematics anxiety.

In Nigeria, specifically in the FCT, data have shown a direct link on access to STEAM education with improved performance in mathematics (Ibrahim, 2022). The author further noted that anecdotal evidence makes a suggestion that STEAM access improves performance, structured studies and statistical analyses are lacking. Hence, this creates a gap in understanding the relationship between STEAM education access and mathematics performance in the geographical area.

Integration of STEAM into the curriculum have led to improved student performance in mathematics (Honey & Hilton, 2011). Interdisciplinary programmes also help students to see the relevance of mathematics in everyday life, helping to develop their interest. In Nigeria, efforts have been on curricular reforms, yet challenges remain in implementation, particularly in underfunded schools (Suleiman, 2021). In Nigeria, ongoing professional development for teachers remains limited, affecting the overall quality of mathematics instruction available to students (Ojo, 2020). Furthermore, school administrators are overburdened with administrative works and personal engagement that they hardly have time to mentor their teachers on emerging issues relating to instructional innovations. In this regard, a study by Akuchie and Omoh (2021) revealed that there was no significant relationship between principals' managerial skills and implementation of STEAM education in senior secondary schools in FCT. This signifies that the teachers were not trained or mentored on the application of STEAM education.

The foregoing points out the critical role that access to STEAM education plays in shaping secondary school students' interest and performance in mathematics. Therefore, a comprehensive and more focused research is required to establish these claims and to fill the existing gaps.

The theoretical framework for this study was underpinned by the self-efficacy theory by Bandura (1977) and Social Constructivism theory by Lev Vygotsky (1978). Bandura's self-efficacy theory posits that individuals' confidence in their ability to complete a task significantly influences their motivation. This confidence is shaped by a complex interplay of personal behaviour, internal factors, and environmental influences. The expectation component of self-efficacy theory involves learners' belief in their

ability to succeed at a specific task, encompassing their mastery of skills, control over outcomes, and anticipated success. The STEAM model has been integrated into different technology platforms, such as Flash and Second Life, to develop interdisciplinary educational content. Students learn more effectively from 3D games than from 2D games, and the greater cognitive burden will affect the students' self-efficacy. By so doing, teaching and learning of STEAM subjects become more interesting and easy for assimilation. This is believed to foster students' interest in STEAM core subjects especially, Mathematics. The implication of this theory lies in the fact that STEAM approach would propel students' self-efficacy. Vygotsky's constructivism theory is also known as social constructivism because of the significance of culture and social context. The theory adds a social dimension to constructivism. STEAM education, particularly through group projects and teacher scaffolding, fits well within Vygotsky's framework. It offers structured opportunities for students to collaborate, receive support, and gradually take ownership of their learning. Access to well-resourced, interactive STEAM environments enables students to learn from more capable peers and instructors, enhancing both their interest and performance in mathematics. This concept is called the zone of proximal development (ZPD). The theory supports the idea that junior secondary students, who are in the formal operational stage, benefit from abstract reasoning and active engagement in mathematical tasks. STEAM education, by incorporating real-life challenges and hands-on activities, aligns well with this developmental stage, helping students construct deeper mathematical understanding.

Methodology

The study adopted a correlational research design. The population of the study comprised all the 8,206 students in the 18 public Junior Secondary Schools, Gwagwalada Area Council, FCT. A two-stage sampling technique was used to select the sample for the study. In the first stage, two schools were selected from the public junior secondary schools in Gwagwalada Area Council using purposive sampling technique (This was because the schools have readily available test scores) while in the second stage, 90 junior secondary two (JSS2) students were selected from each of the two schools using simple random sampling technique. Thus, a sample size of 180 students participated in the study. Two instruments were used for data collection namely: Access to STEAM Education Questionnaire (ASEQ) constructed by the researchers and Mathematics Interest Inventory (MII) adapted from Stevens and Olivarez (2005). MII originally had 27 items from which 13 items were selected in line with the objectives of the study. Also, Students Mathematics Performance Scores (FCT Unified Second Term Examination Result) were collected from the sampled schools. ASEQ and MII consisted of 13 items each and were structured on a 4-point modified Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The Students' Mathematics Performance scores in mathematics were transformed into a 4-point scale of Excellent (70 – 100) = E, Good (50 – 69) = G, Fair (40 – 49) = F and poor (0 – 39) = P; scored 4, 3, 2, 1 respectively. The ASEQ and MII were validated by experts in Mathematics Education and Tests and Measurement. To ascertain the reliability of the instruments, split-half method of reliability test was used.

The instruments were administered on 30 JS2 students outside the population of the study. The scores from the responses were correlated using Pearson Product Moment Correlation (PPMC) statistic. Spearman Brown Prophecy formula was used to obtain reliability co-efficient of the full length of the test, and values of 0.83 and 0.81 were obtained for ASEQ and MII respectively. The coefficients were considered high enough for reliability. The questionnaires were administered by the researchers to ensure a maximum return of the completed copies while the scores of the students was collected from the schools and transformed. Data collected from administration of the instruments were analysed using descriptive and inferential statistics. Mean and standard deviation were used to answer the research questions, while Spearman Rank Correlation was used to test the hypotheses at 0.05 level of significance. Using the scores from the 4-point modified Likert scale on the instrument, a bench mark was computed by taking the average of the sum of scores (10 ÷ 4= 2.5). This gave the bench mark score as 2.5. Hence, the decision rule is: any item having a score greater than or equal to 2.5 (≥ 2.5) is taken as 'agreed' and any item with mean score less than 2.5 (< 2.5) is taken as 'disagreed'.

Results

A total 180 questionnaires were administered to the subjects out of which 179 were retrieved. This represents 99.4% retrieval rate.

Research Question One: What is the perception of students on access to STEAM education in junior secondary schools in Gwagwalada Area Council, FCT?

Table 1: Perception of students on access to STEAM education in junior secondary schools in Gwagwalada Area Council, FCT

(N = 179)

S/N	ITEMS	SA	A	D	SD	$\bar{x}$	ST.D	Decision
1.	My school provides adequate textbooks for the teaching of STEAM subjects such as: Basic Science, Basic Technology, English Studies and Mathematics	89	79	6	5	3.41	0.69	Agree
2.	There is Basic Science / Technology laboratory in my school	71	58	26	24	2.98	1.04	Agree
3.	The content taught in Basic Science is relevant to real-life	120	51	8	0	3.63	0.57	Agree
4.	The content taught in Basic Technology relates to real-life	108	62	7	2	3.54	0.62	Agree
5.	The teaching and learning of mathematics in my school is done with relevant instructional materials	97	57	15	10	3.35	0.85	Agree
6.	My mathematics teacher relates the teaching of mathematics to	55	69	35	20	2.89	0.97	Agree

	other science and arts subjects							
7.	I receive counselling on the importance and benefits of Science / Basic Technology	108	55	10	6	3.48	0.75	Agree
8.	My school organizes some of the following events: Science Fairs, Art and Technology exhibitions	59	60	40	20	2.88	0.99	Agree
9.	I am encouraged to solve real-world problems using knowledge from Basic Science and Basic Technology	87	70	17	5	3.34	0.76	Agree
10.	I am encouraged to solve real-world problems using knowledge from Mathematics	118	55	3	3	3.61	0.61	Agree
11.	I participate in co-curricular activities such as: JETS club, robotics, mathematics club, coding, arts in my school	96	50	15	18	3.25	0.98	Agree
12.	My school provides adequate materials for teaching and learning of English Studies	82	73	17	7	3.28	0.79	Agree
13.	My school has well-equipped and up-to-date library for students' use	70	35	32	42	2.74	1.20	Agree
	Overall Mean/Standard Deviation					**3.26**	**0.83**	**Agree**

$\bar{x}$ = Weighted Mean, **ST.D = Standard deviation**

Table 1 presents the perception of students on access to STEAM education in public junior secondary schools in Gwagwalada Area Council, FCT. The overall mean score of 3.26 indicates a positive perception of students on access to STEAM education. The result further revealed that all the items on the table were agreed upon by the respondents.

Research Question Two: How do access to STEAM education and students' interest in mathematics relate in junior secondary schools in Gwagwalada Area Council, FCT?

Table 2: Students' Interest in Mathematics in Junior Secondary Schools

S/N	ITEMS	SA	A	D	SD	$\bar{x}$	ST.D	Decision
	As a result of my exposure to STEAM Education:							
1.	I like mathematics	120	50	1	8	3.58	0.72	Agree
2.	I like to answer questions in mathematics class	111	57	5	6	3.53	0.71	Agree
3.	I am always not happy in the absence of mathematics teacher during mathematics period	93	50	25	11	3.26	0.91	Agree
4.	I feel excited when a new mathematics topic is introduced	114	55	8	2	3.57	0.63	Agree
5.	I think about how I can use mathematics in future career	106	62	5	6	3.50	0.71	Agree
6.	I like to solve mathematics problems	103	61	10	5	3.46	0.72	Agree
7.	I like to find out new ways to solve mathematics problems	110	58	5	6	3.52	0.71	Agree
8.	I do my mathematics before working on any other home work	90	60	24	5	3.31	0.80	Agree
9.	Mathematics is so engaging that I feel bad when I am stopped from solving mathematics problems	94	59	17	9	3.33	0.84	Agree
10.	Time goes out quickly when I am working on mathematics	104	55	15	5	3.44	0.76	Agree
11.	I always pay attention when learning mathematics	110	53	6	2	3.60	0.61	Agree
12.	I do not give up easily when solving mathematics problems	104	63	9	3	3.50	0.67	Agree
13.	I feel solving mathematics problems is not a waste of time	115	47	13	4	3.53	0.72	Agree
	Overall Mean					**3.47**	**0.73**	**Agree**

$\bar{x}$ = Weighted Mean, **ST.D = Standard deviation**

Table 2 shows the overall mean score of 3.47 indicates that there is positive impact of STEAM education on students' interest in mathematics. The results revealed that all the items were affirmed by the respondents.

Research Question Three: What is the relationship between STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT?

Table 3: Students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT

(N = 179)

S/N	Grading	Rank	Frequency	$\bar{x}$	Std.Dev.	Decision
1	70 – 100	4	12			
2	50 – 69	3	79	2.42	0.82	Low Performance
3	40 – 49	2	61			
4	0 – 39	1	27			

Table 4: Relationship between access to STEAM Education and Students' Performance in mathematics

Variables	r
Access to STEAM education	
	-0.071
Students' Performance	

Table 3 present the students' performance in mathematics, which had a mean score of 2.42 indicating a slightly low performance in mathematics. The mean score of students' performance in mathematics (2.42) was used with the mean of Access to STEAM education to compute the relationship between them. From Table 4, the relationship between STEAM education and students' performance in mathematics was computed to be -0.071. This indicates weak negative relationship.

Test of Hypotheses

The following hypotheses were tested at 0.05 level of significant

H_{01}: There is no significant relationship between access to STEAM education and students' interest in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

Table 5: Spearman's Test of Relationship between Access to STEAM Education and Students' Interest in Mathematics

Variables	N	$\bar{x}$	Std.Dev.	r	Sig.(2-tailed	Decision
Access to STEAM education	179	3.26	0.83		0.000	
				0.600		Rejected
Students' Interest in Mathematics	179	3.47	0.73			

Table 5 presents the result of the relationship between access to STEAM education and students' interest in Mathematics. It shows that a strong relationship ($r = 0.600$; $p = 0.000$; $p<0.05$) exist between access to STEAM education and students' interest in mathematics. Hence, the hypothesis was rejected, indicating that there is a significant relationship between access to STEAM education and students' interest in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

H_{02}: There is no significant relationship between access to STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

Table 6: Spearman's Test of Relationship between access to STEAM Education and Students' Performance in Mathematics

Variables	N	$\bar{x}$	Std.Dev.	r	Sig.(2-tailed)	Decision
Access to STEAM education	179	3.26	0.83			
				-0.071	0.173	Accepted
Students' Performance in Mathematics	179	2.42	0.82			

Table 6 presents the result of the relationship between access to STEAM education and students' academic performance in mathematics. It shows a correlation coefficient of -0.701, the implication of which is there is a negative relationship between access to STEAM education and students' academic performance in mathematics ($r = -0.071$; $p=0.173$; $p>0.05$). Hence, the hypothesis was accepted. Conclusively, there is no significant relationship between access to STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT.

Discussion

The findings revealed that the respondents have positive perception on access to STEAM education. This proved that the students are exposed to STEAM education using the various approaches in teaching and learning of STEAM subjects especially mathematics. The exposure of the students to STEAM education no doubt further contributed to students' interest in mathematics. As the findings revealed, students developed interest in mathematics due to implementation of STEAM education in their schools. This finding is in line with Huda et al. (2024) who found

out that STEAM education positively influences student interest and technology integration, which invariably enhances mathematics interest as core subject in STEAM education. More so, Hsu et al. (2021) established that STEAM education effectively boosts students' engagement and confidence, especially for elementary and junior high school students who often struggle with mathematics anxiety, thus, endearing them to develop interest in mathematics.

Further, the findings revealed that there was negative relationship between access to STEAM education and students' academic performance in mathematics. This might not be unconnected with mathematics achievement test scores of students treated holistically rather than individually. In addition, the study observed that the negative relationship was not significant. This corroborates with Obina et al. (2022) who noted that students avoid mathematics and hence perform poorly at it. However, other researchers such as Hsu et al. (2021), Hsiao and Su (2021), Unterfrauner et al. (2024), Huda et al. (2024) Manalu and Chang (2025) claimed that STEAM education improves students' mathematics performance since it is activity based. Some of the reasons that can be advanced for the negative relationship between access to STEAM education and students' academic performance in mathematics includes inability of teachers to cover the scheme of work, poor exam condition, small sample size taken in this study, and availability of STEAM facilities.

Conclusion

The study concludes that access to STEAM education in junior secondary schools can lead to enhancement of students' interest in mathematics evidenced by the result obtained. STEAM education is a 21st century approach to learning that inculcates arts into STEM thereby activating the latent potential for creativity and innovation among students. In addition, STEAM education provides a platform for improving the academic performance of students when exposed to it. However, within the framework of this study, a negative relationship between access to STEAM education and students' performance in mathematics in junior secondary schools in Gwagwalada Area Council, FCT was observed. Further, the relationship between access to STEAM education and students' performance in mathematics was found not to be significant.

This was rather strange, since a predictor of mathematics performance which is 'interest' should lead to a better outcome. Bandura's self-efficacy theory (1977) posits that an individual's confidence in their ability to complete a task significantly influences their motivation. Added to this, the Social Constructivism theory by Vygotsky (1978) provides for structured opportunities for students to collaborate, receive support, and gradually take ownership of their learning as observed within the STEAM education framework would improve the performance of students in mathematics. It is worth noting that access to well-resourced and interactive STEAM environment enables students to learn from more capable peers and instructors; enhancing both their interest and performance in mathematics. This is explained within the zone of proximal development propounded by Vygotsky (1978).

Recommendations

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

1. Secondary school authorities should introduce specialized STEAM subjects, clubs or projects (such as robotics, coding, digital arts). This will build on existing enthusiasm and allow students explore real world applications and interdisciplinary learning.
2. Teachers should design interdisciplinary projects (such as building models, coding apps, data analysis) in science and art that would explicitly demonstrate how STEAM approach is used in mathematics, thereby reinforcing its value in promoting deeper interest.
3. Teachers should ensure STEAM projects and lessons are closely aligned with mathematics curriculum standards and learning objectives, to reinforce students' essential mathematics skills while engaging in interdisciplinary tasks.

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