IJERLAS
International Journal of Educational Review, Law And Social Sciences

EFFECT OF STEAM METHOD ON PUPILS' ACADEMICPERFORMANCE IN ILORIN SOUTH LOCAL GOVERNMENT AREA, KWARA STATE

Hafees Tosin Sulyman[1], Esther Damilola Emmanuel[2]
[1,2]Department of Early Childhood and Primary Education, Faculty of Education,
Kwara State University, Malete, Nigeria
E-mail: Sulyman.hafees@kwasu.edu.ng / htsulyman@gmail.com

Abstract

This study examined the effect of STEAM method on pupils' academic performance in Ilorin South Local Government, Kwara State. The study adopts a pre-test post-test control group quasi-experimental design due to the suitability in establishing possible effect relationship. The study was limited to four schools and factorial design of 2x2x2 was adopted to test the null hypotheses for this study. The research instrument used for data collection were STEAM instructional guide and Pupils Achievement Test which is specifically titled (PAT) with reliability index of r=0.91. Data were analyzed using descriptive statistic (frequency count, mean and percentage) for demographic data and inferential statistics (ANCOVA) was used to test the formulated hypotheses which were all tested at 0.05 level of significance. The findings revealed that there was significant main effect of STEAM method on pupils' academic performance ($F_{(1;\ 69)} = 23.934$, $P< 0.05$). There was no significant interaction effect of treatment and school type on pupils' academic performance ($F_{(1;\ 69)}=.240$; $P > 0.05$). and also There was no significant interaction effect of treatment and gender on pupils' academic performance ($F_{(1;\ 69)}=.683$; $P > 0.05$). Based on these findings the following conclusions were drawn from this study, it is evident that STEAM method has main effect on the academic performance. STEAM method can bring about improvement in the academic performance of pupils regardless of gender. It was highly recommended that Nigerian Teachers in general should adopt it in their classroom interaction. Teachers should not limit their knowledge to what they were taught while in training they should be current and updated with latest strategies. Through this, they will be equipped with more knowledge that will improve pupils' academic performance.

Keywords**: *Academic Performance, Method STEAM***

1. INTRODUCTION

Over the years, there have been a continuous effort to improve the academic performance of learners in various areas especially in early childhood and primary schools in order to build pupils cognitive, social, emotional, and physical development from the early stage. To achieve this, it is required for teachers to have an adequate method in enhancing pupils' ability. Though different researches have been put in place using different methods including problem-based teaching, hands-on activity, project-based method, lecture method and game strategy but of interest to the researcher is to examine the effect of STEAM (science, technology, engineering, art, and mathematics) on pupils' academic performance in Ilorin South local Government area of Kwara State. Innovation Academy (2021), described STEAM as the abbreviation for Science, Technology, Engineering, Art & Math. IA stated that it is an integrated approach to learning that encourages pupils to think more broadly about real-world problems. STEAM method is a holistic, interdisciplinary approach to learning that combines science, technology, engineering, arts and mathematics, it harnesses the natural symbiosis between these disciplines to foster creative problem-solving, collaboration and critical thinking (space foundation 2023). STEAM education, is a form of interdisciplinary education, a way to successfully implement competency-based teaching (Wang, Lim, Lavonen, & Clark-Wilson, 2019).

EFFECT OF STEAM METHOD ON PUPILS' ACADEMIC PERFORMANCE IN ILORIN SOUTH LOCAL GOVERNMENT AREA, KWARA STATE

Hafees Tosin Sulyman[1], Esther Damilola Emmanuel[2]

STEAM refers to the process of providing opportunities to the learners to be able to solve problems, to be innovators, inventors, self-confident, logical thinkers, and technologically literate, as well as to acquire literacy skills (Morrison, 2006: stohlmann, Moore, & Roehrig, 2011). It may be designed to provide pupils with maximum possible practical exposure and hands-on experience in a particular field. With STEAM method, the teacher imparts knowledge in the pupils as it makes them develop key skills including; problem solving, creativity, and critical analysis that fuel success across a variety of tasks and disciplines (Yildirim, 2016). Taylor (2015), also defined STEAM as an interdisciplinary curricular approach that aims to create unique and powerful synergies between the art and STEM field in order to educate the whole person. Niroj (2022), Further defined STEAM method as an interdisciplinary approach to learning that encourages learners to incorporate creativity into their technical knowledge for solving curriculum issues in general and global crises in particular. STEAM education facilitates meaningful learning for students by promoting the interdisciplinary integration of knowledge and skills among the STEAM fields. (Wang, Kenneth, Lim & Lavonen 2022). One of the goals of STEAM education is to foster the STEAM skills of students, enhancing their employability, their ability to solve complex industry problems, and their capacity to better the lives of all beings on Earth (White House, 2018).

Equally, according to Lathan (2022), STEAM is an educational discipline that aims to spark an interest and lifelong love of the arts and sciences in children from an early age. Science, Technology, Engineering, the Arts and Math are similar fields of study in that they all involve creative processes and none uses just one method for inquiry and investigation. Lathan further posits that STEAM empowers teachers to employ project-based learning that crosses each of the five disciplines and fosters an inclusive learning environment in which all students are able to engage and contribute. As opposed to traditional models of teaching, educators using the STEAM framework bring the disciplines together, leveraging the synergy between the modeling process and math and science content. (Lathan, 2022). Furthermore, Lathan (2022), stated that when pupils engage in activities that combine different elements of STEAM, they experience guided inquiry in which they must ask thoughtful questions, discover answers, apply what they learn, and problem-solve creatively. Many STEAM projects involve teamwork and thoughtful dialogue in which students exchange ideas and discuss ways to problem-solve.

Through these activities, students learn how to divide up responsibilities, compromise, listen to and encourage each other. Some students might approach STEAM with excitement or curiosity, while others might be more timid or apprehensive. Strategically placing students together in groups can create powerful teams in which students learn how to help each other and figure out how to use their different strengths and skill sets. STEAM is important because it helps teachers incorporate multiple disciplines at the same time and promotes learning experiences that allow children to explore, question, research, discover, and exercise innovative building skills (Colker & Simon, 2014). Important aspect of the STEAM approach is that students aren't just taught the subject matter, they're taught how to ask questions, how to be innovative and how to create. This allows them to develop the ability to approach any situation with an open mind and mindset that's creatively wired. Megan (2021) also outlined the benefits of STEAM learning as the following: critical thinking, problem solving, confidence, collaboration, communication, and creativity & innovation to improve the academic performance of learners.Academic performance of learners has been the subject of intensive research over the past years. According to Jam (2009) academic performance is the ability to study and remember facts and being able to communicate their knowledge verbally or on paper. In other words, academic performance refers to how students deal with their studies and how they cope with or accomplish different tasks given to them by their teachers. Academic performance generally refers to how well a student is accomplishing his or her tasks or studies. There are quite a number of factors that determine the level and quality of students' academic performance. (Scottk, 2002).

The issue of low academic performance of learners may be due to the poor attitude of teachers to their work or poor methods of teaching. Another factor is motivation. A highly motivated learner puts in the maximum effort in his or her work. Several factors produce motivation and job satisfaction. Studies by Lockheed et al. (1991) in Kafui (2005) indicated that lack of motivation and professional commitment produce poor attendance and unprofessional attitudes towards learners which in turn affect the performance of learners academically. That is why Hall (1989) believes that there is a need to motivate pupils so as to arouse and sustain their interest in learning. "Motivation raises question on why people behave in the way they do it". An individual could therefore, from psychologists' point of view, be seen as politically, socially and academically motivated depending on the motive behind his or her activities. motivation can be in different forms like a fun and creative way to arouse learners desire to learn.

Results released by the National Examinations Council has revealed that 65.4 percent of pupils that sat for 2020 Common Entrance Examination into the federal government's unity schools failed, while only 34.6 percent of those that sat for the examination passed. Academic performance can be affected by various factors such as, Uncomfortable Learning Environment, the type of surroundings and people a child interacts with during the higher secondary school phase is partially responsible for the overall performance, including the academic score. If a child is bullied by his peers, does not have a particular liking towards his teachers, or has difficulty in making friends, it may affect the focus he must have during classes. The researcher intends to use the moderating variables of gender and school type. According to Collins dictionary (2022) gender is the state of being male or female in relation to the social and cultural roles. Issues of gender and students‟ academic achievements have remained a controversial one for a long-time world over. researchers have argued that males performed better than females in academics, while others have argued that the reverse was the case.

(Calsmith (2007) had explained that the influence of gender and differences in academic achievement was a complex task, (Lin, Heng 2022) revealed that while some studies have reported that boys demonstrate superior abilities in science, reasoning abilities, and abstract knowledge, girls have been found to outperform boys in speech and reading comprehension. Other studies have found that girls outperform boys in most subjects in K-12 education. AbduRaheem (2017) also conducted a study which revealed that male student performs better in mathematics and other science courses while female learners perform better in art courses exempt Yoruba. Sulyman, Olayinka, and Oladoye (2021) discussed that the school type on the other hand can affect the academic performance of pupils in relation to the teacher's preparation in the school environment. Sulyman, Olayinka, Oladoye (2021) added that Teacher preparation to be effective in this environment is comprised of helping with instruction planning. Olosunde and Olaleye, (2010) noted that private school vary widely and the level of participation differs from one private school to the other. Parents pay for the cost of educating their children in private schools and therefore tend to be more engaged in determining what the school offer than parents whose children are in public schools.

Also, Okon (2010) mentioned that children who attended private primary schools performed better than pupils in public schools. This leaves the problem of poor academic performance still unsolved. There is no significant interaction effect of preparatory homework and school type on the academic performance of pupils in mathematics (Sulyman, Dagunduro 2020). A 2012 study from lesley university reports that STEAM approaches can help pupils learn skills relevant to the 21st-century, including innovation and cultural sensitivity. The study also states that a well-rounded approach to education also better enables teachers to use differentiated instruction to meet the needs of diverse learners. And also Approaches grounded in visual art, drama, and creative writing give pupils hands-on training in delivering a message and doing so with confidence. When combined with science, mathematics and technology-based topics, students learn to tackle tough subjects with self-assurance. The focus on hands-on learning with real-world applications helps develop a variety of skill sets, including creativity and 21st-century skills. 21st-century skills

include media and technology literacy, productivity, social skills, communication, flexibility and initiative to improve learners' academic performance. Though from the foregoing, many researchers have tried to solve the problem of poor academic performance using different methods but the problem still persists that is why the researcher intends to investigate the effect of STEAM method on pupils' academic performance in specifically in Ilorin South Local Government Area of Kwara State. Nigeria.

2. IMPLEMENTATION METHOD

The study adopted a pre-test, post-test, control group quasi-experimental design due to the suitability in establishing possible effect relationships. It was a non-equivalent, control group design that required the non-random assignment of pupils into groups. The quasi- experimental research design was considered appropriate because the primary four intact classes will be used to avoid disruption of normal class lessons. The factorial design of 2x2x2 was adopted to test the null hypotheses for this study. The first two factorial levels are experimental and control groups, the second factorial design level is gender occurring in either male (M) or female (F), while the last factorial level is STEAM method which is the combination of Science, Technology, Engineering, Art and Mathematics to guide children learning. All the hypotheses were tested at a 0.5 level of significance.

3. RESULTS AND DISCUSSION

Research Hypothesis One

Ho1: There is no significant effect of STEAM method on pupils' academic performance in Ilorin South Local Government, Kwara State.

Table 1. Summary of Analysis of Covariance (ANCOVA) showing the Main Effect of Treatment on Pupils Academic performance

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	432.999[a]	8	54.125	9.990	.000
Intercept	426.409	1	426.409	78.705	.000
Pre_Test	22.039	1	22.039	4.068	.148
Treatment	129.672	1	129.672	23.934	.000
School_Type	35.289	1	35.289	6.514	.013
Gender	.979	1	.979	.181	.672
Treatment * School_type	1.301	1	1.301	.240	.626
Treatment * Gender	3.702	1	3.702	.683	.412
Gender * School_Type	2.633	1	2.633	.486	.488
Treatment * School_type * Gender	7.573	1	7.573	1.398	.242
Error	330.486	61	5.418		
Total	17550.000	70			
Corrected Total	763.486	69			

a. R Squared = .567 (Adjusted R Squared = .510)

Table 1 data shows the effect of STEAM method on pupils' academic performance in Ilorin South Local Government, Kwara state. The finding revealed that there was a significant main effect of treatment on pupils' academic performance in Ilorin South Local Government, Kwara state ($F_{(1; 69)} = 23.934$, $P< 0.05$). The hypothesis is therefore rejected in light of the result since the significant value (.000) is less than 0.05. This implies that STEAM method has significant effect on pupils' academic performance in Ilorin South Local Government, Kwara State.

Table 2. Summary of Bonferroni's Poc Hoc Pairwise Comparison of the scores within the two groups

Treatment	Mean Difference	Experimental	Control Group
STEAM Method	17.098[a]	*	
Conventional Method	14.018[a]		*

Table 2 revealed that the significant main effect exposed by table 3 is as a result the significant difference between STEAM Method and conventional method. STEAM Method refers to the experimental group, while conventional method is known as the control group. This implies that those exposed to STEAM method (17.098) performed significantly higher than those exposed to conventional method (14.018).

Research Hypothesis Two

There is no significant effect of STEAM method and gender on pupils' academic performance in Ilorin South Local Government, Kwara State. Data in table 1 revealed the effect of STEAM method and gender on pupils' academic performance in Ilorin South Local Government, Kwara state. The finding shows that there was no significant effect of STEAM method and gender on pupils' academic performance in Ilorin South Local Government ($F_{(1; 69)}$=.683; P > 0.05). The hypothesis is therefore not rejected in light of the result since the significant value (.412) is greater than 0.05. This implies that STEAM method and gender had no significant effect on pupils' academic performance in Ilorin South Local Government, Kwara state.

Research Hypothesis Three

There is no significant effect of STEAM method and school type on pupils' academic performance in Ilorin South Local Government, Kwara State. **Data in table 1** revealed the effect of STEAM method and school type on pupils' academic performance in Ilorin South Local Government, Kwara state. The finding shows that there was no significant effect of STEAM method and school type on pupils' academic performance in Ilorin South Local Government ($F_{(1; 69)}$=.240; P > 0.05). The hypothesis is therefore not rejected in light of the result since the significant value (.626) is greater than 0.05. This implies that STEAM method and school type had no significant effect on pupils' academic performance in Ilorin South Local Government, Kwara state.

Research Hypothesis Four

There is no significant effect of STEAM method gender, and school type on pupils' academic performance in Ilorin South Local Government, Kwara State. **Data in table 1** revealed the effect of STEAM method, gender and school type on pupils' academic performance in Ilorin South Local Government, Kwara state. The finding shows that there was no significant effect of STEAM method, gender, and school type on pupils' academic performance in Ilorin South Local Government ($F_{(1; 69)}$=1.398; P > 0.05). The hypothesis is therefore not rejected in light of the result since the significant value (.242) is greater than 0.05. This implies that STEAM method, gender and school type had no significant effect on pupils' academic performance in Ilorin South Local Government, Kwara state.

Discussion of findings

The findings of the study revealed that the STEAM method had a significant effect on pupils' academic performance in Ilorin South Local Government, Kwara State. Students who were exposed to the STEAM method performed significantly better than those who were exposed to the conventional method. This could be as a result of the active participation of learners during the

teaching and learning process. This finding supports that of sukro, afrizal, inayati (2021), who revealed that there is a significant difference in the performance of pupils taught chemistry molecular models' topic using STEAM method learning than those thought using conventional methods. Secondly, the finding of this study revealed that STEAM method and gender had no interaction effect on pupils' academic performance. This implies that, both male and female performance were improved. Although there was no little differences in the performance of male and female, but it did not affect one gender significantly affect the other gender. This finding is in tandem with Fagbemi, (2008) who reported that, there was no significant difference in the performance of boys and girls on conversation tasks. The finding is also in line With Kiminyo (2005) who found out that girls tended to perform better than boy in the conversation of weight.

Also the finding revealed that there was no significant interaction effect of treatment and gender on pupils' academic performance. This study is in tandem with Depaz and Moni (2008). who conducted a study on STEAM method and pupils* academic performance in organic chemistry; it was revealed that there was no significant difference in the performance of male and female pupils who participated in the peer led team learning group. Another finding revealed that there was no significant interaction effect of treatment and school type on pupils' academic performance in Ilorin South local government area, Kwara State. This finding implies that the use of STEAM method teaching improved pupils' performance on both public and private schools. This finding negates Okon (2010) who noted that children who attended private primary schools performed better than pupils in public schools.

Both school types improved, neither did public perform better than private schools nor did private school perform better than public schools. Lastly, finding of this study also revealed that there was no significant interaction effect of STEAM method, gender and school type on pupils' academic performance in Ilorin South local government area, Kwara State. This implies that male and female pupils performed well irrespective of school types. Both male and female in public and private schools performance improved. This is in line with Sulyman 2021 study which showed that there is no significant interaction effect of gender and school type on children reading ability. The treatment was effective but there was no interactive effect based on gender and school type.

Overall, these findings suggest that the STEAM method is a promising approach to improving academic performance. However, it's important to note that gender and school type do not seem to have a significant effect on academic performance, so other factors may need to be considered when trying to improve students' performance.

4. CONCLUSION

Based on the findings of the study, it is evident that STEAM mrthod has effect on the academic performance of pupils. STEAM method can bring about improvement in the academic performance of pupils regardless of gender. Those exposed to Hands-on Activities in Private schools had no significant effect compared to those exposed to STEAM method in public schools. Interaction of gender and school type had no significant effect on pupils' academic performance.

AUTHORS'S NOTE

The author declares that there is no conflict of interest regarding the publication of this article. The author confirm that the paper was free of plagiarism.

REFERENCES

Academic Innovation (2021) WHAT IS STEAM? And Why is it so important? True Education for Creativity & Gateway to Future https://www.myinnoacademy.com/steam/whysteam

Dada, O.C., & Sulyman, H.T., (2021). Teachers' knowledge of pupil with learning disability in ilorin south local government area, kwara state: IFE PsychologIA: An International Journal 29 (2), 79-88

Gidado, I.H & Sulyman, H.T. (2022). The Influence Of Child Initiated Play On Resilience Skill Of Children In Medinna/Gaaosibi Community. *Journal of Early Childhood Association of Nigeria (JECAN)* 11 (1), 220.

Hafees Tosin Sulyman (2021) Effect of letters and sounds as a phonics method on preschool children's reading abilities in ilorin metropolis of kwara state https://www.researchgate.net/publication/362602520_EFFECT_OF_LETTERS_AND_SOUNDS_AS_A_PHONICS_METHOD_ON_PRESCHOOL_CHILDREN'S_READING_ABILITIES_IN_ILORIN_METROPOLIS_OF_KWARA_STATE

Joseph Lathan Why STEAM is so Important to 21st Century Education https://onlinedegrees.sandiego.edu/steam-education-in-schools/

Kieranna Chen, Chenin Chen (2021) Effects of STEM Inquiry Method on Learning Attitude and Creativity https://www.researchgate.net/publication/355118014_Effects_of_STEM_Inquiry_Method_on_Learning_Attitude_and_Creativity

Space foundation (2023) What Is STEAM Education and Why Is It Important? https://cie.spacefoundation.org/what-is-steam-education-and-why-is-it-important/

Sulyman, H. T. & Babalola, A. T. (2023). Effect Of Classroom Wall Design on Pupil's Literacy In Ilorin East Local Government Area Of Kwara State. Jurnal Pendidikan Ilmu Sosial. 32(1). 105-114

Sulyman, H. T. & Lawal, K. Y. (2023). Effect of Rhymes on Social Skill Acquisition of Children with Special Needs. *ASEAN Journal of Community and Special Needs Education.* 2(2) 69-80.

Sulyman, H.T. (2021). Influence of Homework on Pupils' Academic Performance in Ilorin East Local Government Area, Kwara State: Gender and Behaviour 19 (3), 18375-18382

Sulyman, H.T. (2022). Assessment Of Pre-Primary School Children Developmental Level And Material Provision Towards The Attainment Of The Objectives Of Policy Documents In Early Childhood Education In North Central, Nigeria. *International Journal of Academic and Applied Research (IJAAR).* 6 (7), 135-148

Sulyman, H.T., & Daguduro, O.M. (2020). Closing pupils' achievement gap in mathematics through the use of preparatory homework in Ilorin metropolis, Kwara state Nigeria: Journal of early childhood and primary education 9 (2354-3930), 130-144

Sulyman, H.T., & Oladoye, E.O. (2022). Covid 19 pandemic era: a shift in pedagogical approach as a means of improving children learning in today's classroom: KWASU International Journal of Education (KIJE) 4 (1), 231-243

Sulyman, H.T., (2017). An Exploration into the Demographic Characteristics of Child Labourers in Ilorin Metropolis, Kwara State, Nigeria: Journal of early childhood association of nigeria (jecan) 6

Sulyman, H.T., (2023). Influence of Teacher-Parent Communication on Pupils' Academic Performance in Ilorin East Local Government Area, Kwara State: IFE PsychologIA: An International Journal 31 (1), 146–153

Sulyman, H.T., Abubakar, A.O., & Oladoye, E.O. (2022). Effect of Hands-on Activities on Pupils Academic Performance in Basic Science in Ilorin East local Government Area of Kwara State: *Journal of the department Early Childhood and Educational Foundation, niversity of Ibadan*. (4) 89-109

Sulyman, H.T., Ajayi, O.A., & Usman, T. A. (2022). The use of Performance based Assessment in *Early Childhood Centers: Pre-school Teachers Perception. International Journal of Academic Multidisciplinary Research*. 6(8), 61-65

Sulyman, Olayinka and oladoye (2021). effect of hands-on activities on pupils' academic performance in basic science in ilorin east

Sulyman, Saadu, Olosunde, July (2022) Effect of letters and sounds as a phonics method on preschool children's reading abilities in ilorin metropolis of kwara state https://www.researchgate.net/publication/362620363_THE_EFFECT_OF_GAME_STRATEGY_ON_THE_ACADEMIC_PERFORMANCE_OF_PUPILS_IN_LITERACY_IN_ILORIN_METROPOLIS_OF_KWARA_STATE

Summit.https://trumpwhitehouse.archives.gov/wp-content/uploads/2018/06/Summary-of-the-2018-White-House-State-Federal-STEM-Education-Summit.pdf

The Benefits of Teaching STEAM Lessons

Wang. T. H., Lim, K. Y. T., Lavonen, J. & Clark-Wilson, A. (2019). Maker-Centred Science and Mathematics Education: Lenses, Scales and Contexts. International Journal of Science and Mathematics Education. 17 (suppl 1), 1-11.

While house (2018). Summary of the 2018 White House State-Federal ShEw Laddies