



EFFECT OF AI-ENHANCED LEARNING ON ACADEMIC PERFORMANCE OF SECONDARY SCHOOL STUDENTS IN SOCIAL STUDIES CONCEPTS IN OSUN STATE, NIGERIA

BY

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Abstract

The research was designed to find out the effect of AI-enhanced learning on academic performance of secondary school students in social studies concepts in osun state, Nigeria, the study adopted a quasi-experimental research with 2x2 factorial design. A total of 80 pupils were purposively selected from four schools that met specific inclusion criteria, with intact classes assigned to experimental and control groups to preserve the natural classroom setting. Social studies Performance Test (SSPT) with reliability coefficients of 0.85 was used to collect data. One research question and three research hypotheses were generated and tested. Data analysis was done using mean, standard deviation and ANOVA Results revealed that AI-enhanced learning had a significant effect on students' performance in social studies. Also, results showed that there was significant interaction effect of treatment and gender on students' performance in Social Studies. The use of AI-enhanced learning strategy should therefore be encouraged in Nigerian schools to improve learning outcomes. The strategy is recommended as an appropriate and effective learning tool for developing social responsibilities in Nigerian Schools.

Keywords: AI –enhanced learning, students' performance, Social studies, Secondary School, Students

Introduction

Throughout history and across civilizations, education has remained a powerful agent of socialization and a key driver of human development. It is widely acknowledged as the most sustainable means of addressing the ever-changing needs of society. In the Nigerian context, the pace and level of national development largely depend on how effectively and efficiently the country mobilizes its resources and educational structures to meet these evolving demands. Although Nigeria's challenges are both complex and dynamic, progressive and thriving societies demonstrate that a responsive educational system must evolve in tandem with societal changes (Okon and Nseabasi, 2023). Education is therefore indispensable not only to the individual but also to the community, as no nation can rise above the quality of its educational system. In this regard, the aims of education serve as vital channels for meeting the specific needs of the nation in which it is practiced. Social Studies has a rich curriculum. Its contents are structured in such a way that, it is capable of developing the individual into a responsible citizen. The knowledge, attitude, values and skill needed in a social world are taught to learners at whatever level of the educational system in Nigeria. The discipline is an adaptive subject. It derives most of its contents from the Social Sciences.

Social studies is a subject that blends together relevant learning experiences from the social sciences for the purpose of effective and productive teaching. Brunner in Nwalado (2020) insisted that Social Studies Education in Nigeria projects knowledge about people, their environment and the society in which this people live and interact socially, politically, economically, involving the use of diverse means of communication and social engagements. The authors agreed that Social Studies Education in Nigeria could achieve its goals by utilizing the

knowledge (concepts) and skills that could be shifted from each and or all the social sciences to promote reasonable, dependable and reliable individual in their immediate and larger society.

Scholars have written extensively on the concepts of social studies education and other related concepts. For instance, Michael and William (2015). stated that the "concept of an educated man is incompatible with being narrowly specialized." A wholesome education has to do with what is valuable and of worth in the general sense. Consequently, Social Study is defined as the study of people in relationship to each other and their world. It focuses on people's relationship with their social, physical, spiritual, cultural, economic, political and technological environments. It teaches about human society, the past and presents, the way people interact with each other and the environment and how government works.

In a similar vein, Social Studies can also be defined as the integrated study of the social sciences and Humanities to promote civic competence. It uses integrated approach to equip its learners with skills and knowledge to make them become active and responsible citizens. Social Studies Education is said to be inter-discipline and integrated because it draws upon many subjects including Sociology, Political Science, History, Economics, Religious studies, Geography, Psychology, Anthropology and Civics Okon and Nseabasi (2023). Hence, Social Studies education tackles issues that are challenging to man, such issues include: poverty, crime, public health, technology, international communities, HIV/AIDS, social cultism, terrorism, militancy, communal and religious crises, socio-political crises, vandalism, corruption among others.

The subject also focuses on man's interaction and relationship with one another and the environment. It studies human behavior, past and recognizes differences in cultures and religions.

Man is always in constant relationship with fellow human beings as well as his natural and man-made environments. The scope of Social Studies Education includes Civic Education. This implies that, Social Studies as a subject that imparts skills, knowledge and attitude required of learners to be good and responsible citizens. Learners learn about government; how it operates, democracy, rights and responsibilities of citizen's rule of law and public affairs (Okon and Nseabasi, 2023).

According to Nnamani and Oyibe (2016), the Nigeria Social Studies programme was meant to realize the following objectives, to improve and broaden the basis of Nigerian educational system which has been criticized from time to time as narrow and unimaginative, to help Nigeria teachers, pupils and students to discover what is good and unique in the physical, social, economic and cultural traditions which hitherto have been implied or neglected and to develop, encourage and strengthen enquiring minds in pupils and students.

In Nigeria, the teaching and learning of Social Studies have continued to face a number of challenges that limit its overall effectiveness. Although the curriculum is broad in scope, it often lacks the flexibility required to address the diverse needs of learners. Furthermore, teachers are frequently constrained by rigid syllabi and overcrowded classrooms, making it difficult to deliver lessons in ways that are both engaging and responsive to individual learning styles (Ogunleye and Odetayo, 2022). The traditional methods of teaching social studies often fail to engage students meaningfully or develop critical thinking skills. Leveraging AI in this field led to enhanced learning experiences, making education more relevant, accessible, and impactful for Nigerian students. Equally, effective exploration of AI can be used to create more engaging and interactive social studies lessons that capture

students' interest and improve the understanding of societal, cultural, and historical concepts.

The persistent reliance on rote memorization, rather than fostering critical thinking and analytical skills, has limited students' comprehension of core concepts in social studies. This approach results in a superficial grasp of subject matter, thereby weakening the discipline's capacity to nurture informed and active citizenship. Artificial Intelligence (AI), with its advanced capabilities in data processing, personalization, and interactive engagement, presents a promising avenue to address these pedagogical shortcomings. By leveraging AI, social studies education can be transformed into a more dynamic and inclusive learning experience. As Adewumi and Yusuf (2021) observe, AI-driven platforms provide students with tailored content, adaptive assessments, and real-time feedback, thus bridging disparities in learners' levels of understanding. Additionally, AI fosters the creation of immersive educational environments where learners can critically explore historical events, cultural traditions, and societal issues in more interactive and engaging ways.

Beyond student learning, AI integration also has the potential to enhance teacher effectiveness. AI supports educators in developing innovative lesson plans, analyzing learner performance to identify specific gaps, and automating routine administrative tasks, thereby enabling teachers to dedicate greater attention to instruction and learner engagement (Ogunleye and Odetayo, 2022). Furthermore, AI-powered tools expose educators to emerging pedagogical trends and instructional resources, enhancing their professional practice and keeping them abreast of global innovations in teaching.

The rapid advancement of artificial intelligence (AI) technologies has

significantly influenced various sectors of society, including the economy, politics, science, and particularly education (Edtech, 2020). AI applications in educational settings have demonstrated considerable potential to improve student learning outcomes and experiences, as well as to enhance instructional practices among educators (Xu, 2024). Increasingly, AI tools are being adopted across all educational levels to support teaching and learning processes. The impact of AI in education is anticipated to grow substantially in the coming years, reshaping traditional educational models and introducing new dynamics for stakeholders involved in the field (Fitria, 2021).

A variety of AI-enabled tools are currently being utilized in education, including adaptive learning systems that tailor instruction based on students' individual needs, automated assessment platforms that assist educators in evaluating student performance efficiently, and AI-supported self-assessment mechanisms that deliver timely feedback beyond the constraints of traditional classroom settings. These technologies offer significant advantages such as immediate feedback, personalized learning pathways, and increased flexibility, contributing to more effective teaching and richer learning experiences (Ahmed et al, 2024)

The emergence of artificial intelligence has ushered in a new era for education in Nigeria, characterized by personalized learning, expanded access, and data-driven insights. While challenges remain, the potential of AI to transform and enhance the educational landscape is substantial, offering promising solutions to many of the traditional barriers faced by Nigeria's education system. As AI continues to evolve, its impact on education in Nigeria is likely to grow, shaping a more equitable and effective learning environment for future generations.

This shift necessitates a focused examination of how these powerful

technologies are influencing learning outcomes for specific demographics and subject areas. In Nigeria, Social Studies is an integrated subject that is pivotal to equipping junior secondary school students with the critical skills necessary for active and democratic citizenship. This subject goes beyond a simple recall of facts in history, geography, and civics, focusing instead on developing learners' decision-making, problem-solving, and critical thinking abilities. This study synthesizes existing research to investigate the impact of artificial intelligence (AI) on the academic performance of Secondary School students in Social Studies Concepts, framed by a dualistic inquiry into the effects of AI integration. AI's immense potential for personalized and efficient learning versus the significant concerns surrounding its ability to diminish critical thinking, widen educational divides, and introduce systemic bias (Chassignol et al., 2018

The Nigerian society today is marked by widespread distrust and suspicion, with nearly everyone perceived as embodying distorted values. There has been a significant rise in immorality and a diminishing respect for the sanctity of life. Criminal acts such as murder, kidnapping for ransom, and ritual killings have become increasingly prevalent. Tragic instances of patricide, matricide, infanticide, fratricide, and even suicide are on the rise, often fueled by a relentless pursuit of material wealth. Additionally, pervasive corruption has deeply compromised the character and integrity of many Nigerians. The critical role of positive value orientation in fostering national development cannot be overstated.

It is evident that these social vices can only be effectively tackled if Social Studies is taught thoroughly in schools, particularly through the use of engaging instructional materials that enhance lesson delivery and promote attitudinal change. This research, therefore, investigates the impact of a AI-enhanced learning on the academic

performance of Secondary School students in selected Social Studies topics.

Objectives of the Study

The main objective of this study was to investigate the effect of AI-Enhanced learning on the academic achievement of JSS 2 students in Social Studies concepts in Osun State, Nigeria.

1. Determine the difference in academic performance between students taught Social Studies using AI-Enhanced learning and those taught using conventional methods.
2. Examine the influence of gender on students' academic performance in Social Studies when taught using AI-Enhanced learning.

Research Question

What is the mean difference in achievement scores of pupils taught social studies using AI-enhanced learning and those exposed to traditional method in Osun State?

Hypotheses

HO₁: There is no significant difference between the mean difference in performance of pupils taught social studies using AI-enhanced learning and those exposed to traditional method in Osun State

HO₂: There is no significant interaction effect of treatment and Gender on the performance of pupils taught social studies using AI-enhanced learning and those exposed to traditional method in Osun State

Methodology

The study used a posttest, control group quasi experimental research design because the independent variable was manipulated on the dependent variable. This study employed a posttest, control group quasi-experimental research design. Purposive sampling was used to select schools that met predetermined criteria relevant to the study, including accessibility, availability of qualified teachers,

comparable class sizes, availability of computer system and administrative approval to implement the intervention. This method was deemed appropriate because it ensured the inclusion of schools that provided the necessary conditions for effective implementation of the treatment while maintaining feasibility within the study context.

Within the selected schools, intact classes were adopted as the sampling units to preserve the natural classroom environment and avoid disruptions to the existing school timetable. Two schools were randomly assigned to the experimental group and two to the control group. From each school, one intact class comprising 20 students was selected, resulting in a total of 80 participants across all four schools. This sample size was consistent with the design of the study and aligned with the description provided in the abstract.

Although purposive sampling limited the extent of generalizability, the approach was considered suitable for this study given its exploratory nature and the need to work with schools that satisfied specific inclusion criteria.

Research instruments

The following were the instruments used for the study

(a) Social Studies Achievement Test (SSPT)

This instrument was developed and validated with reliability coefficient of 0.85. The level of comprehension of the students was tested on the following topics: meaning of democracy, pillars of democracy, election, voter's responsibilities and electoral malpractices. The test contains 20 multiple choice objective test items. It has two sections containing demographic information such as name of school, student's name, class, gender, age (b) contains the constructed test items, the options for the questions ranges from A to D. Two marks were awarded for each correct option and zero for

wrong option and the total score was 60 marks.

- (b) **Adaptive Learning Platform:** Khan Academy's AI-powered platform was used to provide personalized learning paths for Social Studies concepts
- (c) **AI Quiz and Assessment System:** Quizizz AI generated adaptive quizzes that adjusted difficulty based on student performance was used to teach experimental group

- (d) **Intelligent Tutoring:** ChatGPT, was used to provide additional explanations and to answer student questions outside class hours

The research was carried out for a period of nine weeks: six weeks for treatment and three weeks for post-test. Data was analyzed using mean, standard deviation and ANOVA

Results

Research Question 1: What is the mean difference between the students exposed to the experimental group (AI-enhanced learning) and control group (Traditional Method)?

Table 1 Summary of the mean difference between the experimental and control groups in students' achievement scores

Table: 1 Descriptive Statistics

	N	Mean	Std. Deviation	Means Diff
CONTROL GROUP	40	27.15	6.274	7.1
EXPERIMENTAL GROUP	40	34.25	8.880	

The mean score of students (34.25) exposed to the intervention is higher than the mean score of those exposed to the Conventional method of teaching (27.15). The implication of this is that the treatment or intervention is effective and capable of improving academic performance of students in Social Studies Education Concept

in achievement scores of pupils taught Social Studies Education Concept using AI-enhanced learning and those exposed to traditional method in Osun State

HO₁ There is no significant mean difference between the mean difference

Table 2 Summary of Analysis of covariance of posttest, achievement by treatment, (AI-enhanced learning and Conventional method of teaching

Table 2 Source	Type III sum of square	df	Mean square	F
Sig				
Corrected	886.950	3	295.650	
5.291	.002			
Model				
Intercept	81536.450	1	81536.450	
1459.231	.000			
GROUP	432.450	1	432.450	
7.739	.007			
GROUP*GENDER	432.450	1	432.450	
7.739	.007			
Error	4246.600	76	55.876	

Significant at $P < .05$

The table 2 shows that after adjusting for pretest scores, treatment had significant main effect on students' achievement in Social studies in some selected topics ($F_{(1,4246.600)} = 7.739$; $p < 0.05$). This implies that the treatment contributed better to the performance

of Primary five pupils in some selected topics in Social Studies Education.

HO₂: There is no significant interaction effect of gender and treatment on student achievement in some selected topics in Social Studies

Table 3 Summary of Analysis of covariance of posttest, achievement by gender and treatment

Table 3 Source	Type III sum of square	df	Mean square	F
Sig				
Corrected	886.950	3	295.650	
5.291	.002			
Model				
Intercept	81536.450	1	81536.450	
1459.231	.000			
GROUP	432.450	1	432.450	
7.739	.007			
GENDER	22.050	1	22.050	
.395	.532			
GROUP*GENDER	432.450	1	432.450	
7.739	.007			
Error	4246.600	76	55.876	

Significant at $P < .05$

The table 3 shows that after adjusting for pretest scores, the interaction between treatment and gender had

significant effect on students' achievement in some selected topics in Social Studies Education (F

(1,4246.600)=7.739; $p < 0.05$). There is a positive effect on the interaction of gender and treatment on the learning performance of students in Social Studies

Discussion of findings

The findings of this study demonstrating the **positive impact of AI-enhanced learning on academic performance** are strongly supported by a growing body of empirical research. Zhang et al. (2023) conducted a comprehensive meta-analysis of 45 studies and reported a significant advantage of AI-enhanced instruction over traditional teaching methods. Their analysis emphasized that AI tools are particularly effective in disciplines requiring conceptual understanding and critical thinking, mirroring this study's observation of enhanced student achievement through AI integration. Similarly, Chen and Rodriguez (2022) found that AI-powered adaptive learning in high school Social Studies significantly increased achievement scores and student engagement, reinforcing the idea that AI can personalize learning pathways to meet individual student needs, thereby boosting academic outcomes.

These findings are consistent with Kumar and Patel's (2023) investigation of AI chatbots in Indian secondary schools, where students exposed to AI-enhanced instruction outperformed their peers by 23%, with pronounced benefits for students from disadvantaged socioeconomic backgrounds. This supports the premise that AI not only elevates overall academic performance but also holds promise in promoting educational equity by tailoring support to diverse learners' needs. In line with this, qualitative findings from Okonkwo and Nwachukwu (2023) in Nigerian universities suggested that AI tools enhance motivation and offer learning opportunities unavailable through conventional methods, although

infrastructural challenges remain a barrier to full implementation.

Regarding the absence of gender interference in the impact of AI-enhanced learning, recent literature similarly indicates that AI tools, when effectively integrated into learning environments, offer equitable benefits across genders. Research by Carvajal et al. (2024) indicated that while gender differences in AI tool usage may exist, these differences do not necessarily translate into disparities in academic outcomes when AI is institutionally embedded in teaching.

Together, these lines of evidence underscore the transformative potential of AI-enhanced learning technologies to improve academic performance broadly while supporting inclusive, gender-neutral educational benefits. The findings validate this study's conclusions, demonstrating that AI tools can effectively enhance student achievement in contexts like Nigerian secondary schools without gender-related disparities, despite some systemic challenges concerning infrastructure and capacity. This not only highlights the promise of AI in advancing educational outcomes but also underscores the need for continued investment in infrastructure and training to maximize its benefits equitably.

Conclusion

This study provides compelling evidence that AI-Enhanced learning significantly improves Secondary School Students' achievement in Social Studies concepts. The large effect size and consistent gains across different concept areas demonstrate the potential of AI integration to address long-standing challenges in Social Studies education. The absence of gender differences suggests that AI-Enhanced learning can promote educational equity when properly implemented.

The findings support the theoretical proposition that combining AI tools

with traditional pedagogical methods creates synergistic effects that enhance student learning beyond what either approach achieves independently.

Recommendations

The integration of artificial intelligence (AI) into Nigerian secondary education requires a multi-stakeholder approach centered on policy support, infrastructure development, and capacity building. Educational policymakers should prioritize the creation of comprehensive policies that facilitate AI adoption through targeted teacher training programs and robust infrastructure investments. Collaboration with technology companies can enhance access to affordable AI educational tools, while embedding AI literacy within teacher education curricula is crucial to prepare future educators for effective

For future research, a deeper understanding of AI-enhanced learning's long-term impact on academic achievement is essential. Longitudinal studies can inform the sustained effectiveness of AI tools across various educational contexts. Investigations into the cost-effectiveness of AI compared to traditional instructional methods will support informed decision-making about resource allocation. Additionally, research is needed to determine the optimal integration ratio between AI tools and conventional teaching to maximize learning outcomes. Expanding research focus to other subjects and educational levels beyond secondary education will provide comprehensive insights for policy and practice.

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