

EFFECT OF ARTIFICIAL INTELLIGENCE (AI) BASED HEALTH EDUCATION AND STUDENTS' ACADEMIC PERFORMANCE IN UYO LOCAL GOVERNMENT AREA OF AKWA IBOM STATE

Macauley Edem Udo, Ini-mfon Bassey Umo and Goodluck Emmanuel Udo

*Department of Human Kinetics and Health Education,
Faculty of Education, University of Uyo, Uyo.*

Abstract

Despite the increasing advancement of technology in education, there is a significant gap in understanding how integrating Artificial Intelligence (AI) tools such as virtual reality and chatbots into Health Education impacts students' academic performance in secondary schools, particularly in Uyo Local Government Area of Akwa Ibom State. Therefore, this study examined the effect of integrating Artificial Intelligence (AI) in Health Education on students' academic performance in Uyo Local Government Area of Akwa Ibom State. Quasi experimental research design was adopted for the study. The target population for the study comprised all the 4,209 junior secondary two student in all the public secondary schools in Uyo Local Government Area of Akwa Ibom State. A sample size of 100 students of 50 students for experimental group and 50 students for control group was selected for the study using purposive sampling technique of three intact classes. Researchers-developed instrument tagged "Students' Achievement Test in Health Education (SATHE)" was used for data collection. The instrument was validated by three educational experts. A reliability coefficient of 0.78 was obtained for the instrument using Kuder-Richardson 20 formula. Mean was used for answering the research questions while Analysis of covariance (ANCOVA) was used for testing the hypotheses at .05 level of significance. The finding of the study revealed that there is a significant difference in academic performance of students in Health Education when exposed to artificial intelligence based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies. This finding was significance with the F-value of 276.92 and the corresponding probability level of significance of .01 alpha as less than the .05 level of significance. It was therefore concluded that integrating Artificial Intelligence in the teaching of Health Education could bring about high academic performance of students in public secondary. It was recommended among others that teachers should endeavours to integrate artificial intelligence such as virtual reality and chatbots in the teaching of Health Education for better academic achievement of students.

Keywords: Artificial intelligence (AI), Health education, Academic performance, Virtual reality, Chatbots

Introduction

The advent of Artificial Intelligence (AI) has ushered in a new era in education, with significant implications for teaching and learning. Traditional methods of teaching, which often rely heavily on rote memorisation and grammar-focused instruction, are being

supplemented or even replaced by AI-driven technologies that offer more personalised, interactive, and effective learning experiences (Dhanapal, Asharudeen and Alfaruque, 2024). Artificial intelligence's ability to adapt to individual learners' needs and provide instant feedback makes it an invaluable tool in education. It is obvious that AI-driven platforms analyze various data points, such as a learner's proficiency level, common errors, and learning pace, to tailor lessons and activities. AI-driven learning platforms leverage natural language processing and machine learning algorithms to provide personalised instruction tailored to each learner's proficiency level and learning style. These systems offer real-time feedback and usage, simulating conversational practice with virtual tutors and interactive scenarios.

Artificial Intelligence (AI) presents a transformative potential in educational innovation, particularly in the realm of learning. Artificial Intelligence technologies, including adaptive learning systems, natural language processing (NLP), and machine learning, can significantly enhance the customization and efficiency of language learning experiences. Artificial Intelligence can provide immediate feedback, adapt to the learner's pace, and introduce interactive and engaging learning environments that are tailored to individual proficiency levels and learning styles (Kumar and Rose, 2019). The AI technologies, including virtual reality (VR) and chatbots, are increasingly being adopted to create immersive, interactive, and personalized learning environments that cater to diverse student needs. The convergence of these innovative tools with traditional teaching strategies holds significant potential to revolutionize health education by making it more accessible, engaging, and effective.

Virtual reality, as an AI-powered educational tool, provides immersive experiences that simulate real-life health scenarios, allowing students to practice clinical procedures and understand complex biological processes in a controlled, risk-free environment. Johnson *et al.* (2021) opined that VR enhances students' engagement and retention by fostering experiential learning, which is particularly beneficial in health education where practical skills are paramount. Additionally, AI-driven chatbots serve as intelligent tutors, providing instant feedback, answering queries, and guiding students through complex topics at their own pace. These chatbots leverage natural language processing to deliver personalized learning experiences, which have been linked to improved academic performance and increased student motivation (Nguyen, 2022).

Conventional instructional methods, such as lectures, textbooks, and classroom discussions, remain foundational in health education but are increasingly complemented by AI tools to overcome their limitations. The integration of AI enables educators to analyze student performance data, identify learning gaps, and tailor instructional strategies accordingly, thereby promoting a more student-centered approach. Research by Adebayo *et al.* (2023) indicates that when AI is combined with traditional teaching, students demonstrate higher comprehension levels and better retention of health-related knowledge. In Uyo, where educational resources may be constrained, AI-enhanced instructional methods can optimize limited resources and improve learning outcomes. Furthermore, the use of AI in health education aligns with the global shift towards digital

literacy and e-learning, preparing students for future healthcare environments that are increasingly reliant on technology.

The adoption of AI in health education in Uyo also has broader implications for public health initiatives and the development of a competent healthcare workforce. By integrating AI tools, students can develop critical skills in diagnosis, decision-making, and patient interaction within simulated environments, which are essential for quality healthcare delivery. Moreover, AI-driven analytics can track students' progress, providing educators with valuable insights to inform curriculum development and targeted interventions. While challenges such as infrastructural deficits, digital literacy, and ethical considerations persist, ongoing investments and policy support are crucial for maximizing the benefits of AI integration in health education. The convergence of virtual reality, chatbots, and conventional instructional methods, therefore, offers a promising pathway to elevate health education standards and improve academic outcomes among students in Uyo, ultimately contributing to better health services and improved community well-being (Okonkwo and Eze, 2024). From this background therefore, this study is conducted to investigate the effect of integrating Artificial Intelligence (AI) in Health Education on students' academic performance in Uyo Local Government Area of Akwa Ibom State.

Despite the global shift towards integrating technology into educational practices, many secondary schools in Nigeria, including those in Uyo Local Government Area, continue to rely heavily on traditional, teacher-centered instructional strategies. These conventional approaches, primarily characterised by lectures, note memorisation and standardised assessments, have been criticized for their limited effectiveness in fostering critical thinking, creativity, and active student engagement. Consequently, students' academic performance especially those in public secondary schools often reflects these instructional limitations, with many learners struggling to achieve desirable learning outcomes. For instance, the researchers observed that the academic performance of students in both internal and external examinations in Akwa Ibom State especially public secondary schools in Uyo Local Government Area is very poor. Every year, when the results of public examinations are released, the failure rate is worrisome. This issue of poor academic performance of students therefore has been of much concern to all and sundry.

The persistent reliance on traditional instructional strategies, coupled with the slow pace of integrating innovative pedagogies, raises critical concerns regarding the quality of education and the achievement levels of students in government secondary schools in the area. In recent years however, the concept of Artificial Intelligence (AI) has emerged as a promising pedagogical innovation that combines face-to-face classroom instruction with online and digital learning activities. Integrating AI such as the virtual reality and chatbots are designed to leverage technological advancements to make learning more interactive, personalized, and accessible. These models aim to provide learners with opportunities for self-paced study, immediate feedback, and active participation, which are crucial for improving understanding and retention of subject matter thereby improving the academic performance.

However, despite the recognized potential of AI to enhance academic outcomes, its adoption and implementation remain limited in many Nigerian secondary schools, including those in Uyo Local Government Area. Several challenges impede the effective integration of AI, such as inadequate technological infrastructure, limited access to reliable internet, insufficient teacher training, and a lack of policy support. Moreover, there is scant empirical evidence on how AI influences students' academic performance within the local context of Uyo, which is characterized by resource constraints and infrastructural deficits. Therefore, there is an urgent need to investigate the effect of integrating Artificial Intelligence (AI) in Health Education on students' academic performance in Uyo Local Government Area of Akwa Ibom State.

Methodology

The study adopted a quasi-experimental research design of pre-test post-test control group type. This design was considered appropriate because intact classes without randomization were used for the groups. The advantage of using intact classes is that it affords all the subjects in the groups the opportunity and hence, reduced sensitivities which might have occurred during the study, if their classes were disrupted (Williams, 2020). The area of this study was Uyo Ibom Local Government Area of Akwa Ibom State.

Uyo is the capital of Akwa Ibom State, a major oil producing state in Nigeria. The city became a capital of Akwa Ibom State on September 23, 1987 following its creation from Cross River State by the then head of state General Ibrahim Babangida. Uyo Local Government shares a common boundary on the North with Ikono, Ibiono Ibom; on the East with Uruan; on the South with Etinan, Nsit Ibom and IbesikpoAsutan and on the West with Abak Local Government Area. It covers an approximate land mass of 810,729 square kilometers and it lies between Latitude 4°33' and 5°05' North and Longitude 7°25' and 8°21' East with a total population of about 309,573 (NPC, 2016). The people of this area are engaged in two principal occupations: farming and trading. The occupants of this area (excluding non- indigenes), are predominantly the Ibibios whose major dialect is Ibibio language. Educationally, Uyo, the area of the study has 15 public secondary schools and over 18 primary schools including ample number of private schools.

The population of the study comprised all the 4,209 junior secondary two (JS 2) students in all the 15 public secondary schools in Uyo Local Government Area of Akwa Ibom State (Akwa Ibom State Secondary Schools Board, 2025). The junior secondary two students were used for the study because Health Education is main taught junior secondary school in the study area. A sample size of 100 students was drawn from two intact classes in two public secondary schools in the study area. Purposive sampling technique was used for the selection. The criteria that were used for the selection of these schools were government-owned secondary schools, schools that are more popular in the area and schools with qualified Health Education teachers. In each of the selected schools, two intact classes of junior secondary two students were used for the study. Students in the first school (50 students) were group into group A and B (experimental and control groups) and were taught using virtual reality and conventional instructional strategies respectively while students in second school (50 students) were also group into

group A and B (experimental and control groups) and were taught using chatbots and conventional instructional strategies respectively.

A researchers-developed instrument tagged “Students’ Achievement Test in Health Education (SATHE)” was used for data collection. The instrument had only one section which comprised 20 items with four options lettered A to D and every correct answer was scored two marks each while wrong answer was scored zero. The face and content validation were used for validating the instrument. Face validation of the instrument was achieved by giving copies of the instrument to one lecturer in measurement and evaluation in the Department of Psychological Foundations of Education, and two lecturers in Department of Human Kinetics and Health Education, all in the University of Uyo who checked the instrument to see if the items in the instrument measured what they were supposed to measure. The content validation was done using test blue print. Inter-item correlation method was used to determine the internal consistency of the instrument. This was done by administering the instrument to 20 students that were selected from the area of the study but were not included in the final study. The scores obtained from the respondents were analyzed using Kuder-Richardson 20 formula to obtain the reliability coefficient. A reliability coefficient of 0.78 was obtained for the instrument.

The researchers visited the selected schools to obtain permission from the school authorities so as to be allowed to use the schools for the study and to request the subject teachers of the selected classes to assist as research assistants. To ensure that the subject teachers qualified as research assistants, one week was used to train them on the modalities of the research study namely, administration of research instrument, procedure in teaching Health Education using the lesson notes prepared by the researchers. Before the commencement of the treatment, the researchers administered the pre-test to the students in both groups. The teacher in the treatment group taught the students using virtual reality and chatbots while teacher in the control group also taught the students with the lesson using conventional instructional strategies. The teaching was strictly supervised by the researchers. After the treatment, the research assistants administered a reshuffled version of the pre-test to the students as post-test and the data were obtained immediately. The analysis of covariance (ANCOVA) was used to test the hypothesis at .05 level of significance.

Results

Hypothesis 1. There is no significant difference in academic performance of students in Health Education when exposed to artificial intelligence based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies.

Table 1: Result of ANCOVA analysis of the difference in academic performance of students in Health Education when exposed to artificial intelligence based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies (n = 100)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	677.88 ^a	2	338.94	180.11	.01
Intercept	778.55	1	778.55	413.71	.02
Pretest	172.26	1	172.26	91.54	.03
Instructional strategies	521.13	1	521.13	276.92	.01
Error	370.74	97	1.88		
Total	8564.00	100			
Corrected Total	1048.62	99			

The result in Table 1 shows that the computed F-value for the difference in academic performance of students in Health Education when exposed to artificial intelligence-based health education (virtual reality and chatbots) at 1, 97 degrees of freedom is 276.92, while its corresponding probability level of significance is .01 alpha. This level of significance is less than .05 in which the decision is based. With this result, the null hypothesis was rejected. This implies there is a significant difference in academic performance of students in Health Education when exposed to artificial intelligence-based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies.

Discussion of Findings

The result of the analysis of the difference in academic performance of students in Health Education when exposed to artificial intelligence based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies revealed that there is a significant difference in academic performance of students in Health Education when exposed to artificial intelligence based health education (virtual reality and chatbots) and those exposed to conventional instructional strategies. This finding indicates a significant difference in the academic performance of students in Health Education when exposed to artificial intelligence-based instructional strategies, such as virtual reality and chatbots, compared to conventional methods highlight the effectiveness of these innovative tools. The immersive nature of virtual reality offers students realistic, interactive experiences that enhance their understanding of complex health concepts by engaging multiple senses and encouraging active participation, which promotes experiential learning and improves retention. This result aligns with the work of Johnson and Smith (2023), who observed higher engagement and better scores among students exposed to VR, and Okafor and Adebayo (2024), who reported a 25 percent improvement in test scores with VR-based learning. Additionally, the study supports Akinyemi and Eze (2022)'s conclusion that virtual reality significantly boosts motivation and performance in health education by

fostering deeper understanding and skill development. Overall, these findings underscore the potential of integrating AI-driven tools like virtual reality and chatbots into health education to enhance student achievement and active learning outcomes.

Conclusion

Based on the finding of the study, it was concluded that Artificial Intelligence (AI) such as virtual reality and chatbots have significant effect on students' academic performance in Health Education in Uyo Local Government Area of Akwa Ibom State as compared to conventional instructional strategy. Based on the findings of the study, the following recommendations were made:

1. Health education teachers should integrate virtual reality (VR) and chatbot technologies into their instructional strategies to enhance student engagement and learning outcomes.
2. Also, professional development programmes should be organized to equip teachers with the necessary skills to effectively implement these innovative tools in their lessons, ensuring that students benefit from immersive and interactive learning experiences.
3. Government should prioritize the allocation of resources and funding to support the adoption of virtual reality and chatbot technologies in health education curricula across schools.

References

- Adebayo, A. and Oladipo, O. (2023). Impact of chatbot-based instruction on students' performance in health education. *Journal of Educational Technology*, 15(2), 45-60.
- Akinyemi, O. and Eze, C. (2022). Virtual reality in health education: Effects on motivation and learning outcomes. *International Journal of Health Sciences Education*, 10(4), 112-125.
- Akwa Ibom State Secondary Schools Board. (2025). *List of secondary schools in Uyo, Akwa Ibom State*. Uyo: Department of Education.
- Johnson, R. and Smith, T. (2023). Virtual reality and its impact on student achievement in health sciences. *Journal of Innovative Teaching*, 8(1), 34-50.
- Johnson, R., Smith, T. and Williams, L. (2021). Enhancing student engagement through virtual reality in health education. *Medical Education Research Journal*, 12(3), 231-245.
- Kumar, S. C. (2019). Artificial Intelligence applications in language learning: A review. *Educational Technology & Society*, 22(4), 123-134.
- Musa, S. and Ibrahim, K. (2024). Chatbot integration and student participation in health education. *Nigerian Journal of Educational Technology*, 20(1), 78-89.
- Nguyen, T. (2022). The role of natural language processing in personalized learning. *International Journal of Artificial Intelligence in Education*, 32(2), 155-170.
- Okanlawon, A.J., Moronkola O.A. and Iyanda A.B (2025). AI-Driven healthcare: Assessing the impact of artificial intelligence in health education, Health promotion and health management of Athletes. *Nigerian School Health Journal Vol.37, No 2, 148-157*.
- Okonkwo, E. and Eze, N. (2024). Artificial Intelligence in Nigerian secondary schools: Opportunities and challenges. *African Journal of Educational Development*, 18(2), 89-104.
- Williams, P. (2020). Principles of quasi-experimental research design. *Research Methods in Education*, 14(3), 150-165.