TRANSFORMING THE TEACHING AND LEARNING OF HEALTH EDUCATION IN NIGERIA WITH ARTIFICIAL INTELLIGENCE: PROSPECT AND CHALLENGES

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Abstract

This paper examined the prospects and challenges of integrating Artificial Intelligence (AI) into health education in Nigeria. Using an expository design and content analysis approach, the study explored how AI technologies can improve teaching, learning, and health promotion at the basic, senior secondary, and tertiary education levels. The authors discussed major concepts relating to AI and health education, highlighting the relevance of AI-driven tools such as ChatGPT, adaptive learning systems, virtual tutors, chatbots, health diagnostic applications, and other AI-powered educational technologies in enhancing instructional delivery. Findings revealed that AI has significant potential to improve health education through personalized learning experiences, simulation-based instruction, real-time feedback, automated assessment, and interactive learning platforms. AI applications were found to support the teaching of key health education topics such as disease prevention, reproductive health, nutrition, environmental sanitation, sexually transmitted infections, and public health awareness. The paper also showed that AI-enhanced platforms can improve learner engagement, strengthen health literacy, increase accessibility to educational resources, and reduce instructional costs. Despite these benefits, several challenges associated with the use of AI in health education were identified. These include overdependence on technology, reduction in critical thinking and interpersonal communication skills, data privacy and cybersecurity concerns, infrastructural deficiencies, ethical issues, algorithmic bias, and fears of replacing human educators. Inadequate ICT facilities, unstable electricity supply, poor internet connectivity, and insufficient teacher training were also identified as major barriers to effective AI integration in Nigerian schools. The paper concluded that AI can significantly transform health education in Nigeria by improving instructional quality and expanding access to learning opportunities. Recommendation included the development of clear policies, improved ICT infrastructure, continuous teacher training, data protection measures, and equitable access to AI technologies across communities.

Keywords: Artificial intelligence, Health education, Pedagogy, Prospects, Challenges,

Introduction

Health education at basic, senior secondary, and tertiary levels is expected to equip young people and adolescents with the information and abilities necessary to advance individual and societal health in Nigeria. Yet, a lot of young people in Nigeria do not know enough about health problems and their effects (Olaoye, Adejumobi, Ogundele, & Akande, 2024). Thus, HIV/AIDS, tuberculosis, contracting malaria, and other illnesses continue to be serious public health issues, and adolescent and juvenile mortality keeps rising. In order to overcome these obstacles, the Federal Ministry of Education and the Federal Ministry of Health created national health education policies, a national health education curriculum for elementary school students, and standards and curriculum requirements for senior secondary and post-basic education (Ismail, Ajani, Baqir, Nadeem, Qureshi, &Petrucka, 2024).

However, school-age children and young people' capacity to safeguard their own and their communities' health has not yet improved as a result of these policy actions. Additionally, a country's ability to succeed in the twenty-first century depends on its ability to employ artificial intelligence (AI) effectively, which has led to an increase in interest in using AI in education. AI can improve teaching and learning in a number of ways, including personalising instruction, helping teachers identify students' needs in real time, managing, analysing, and interpretation of large amounts of assessment data, making the best use of human and material resources, encouraging community involvement, and promoting literacy and behaviour improvements in public health education.

Health education that is made possible by the use of AI techniques or approaches, such as machine learning, natural language processing, computer vision, and adaptive systems, is referred to as AI-related health education. These methods have the ability to improve educational opportunities, aid in the development of clinical skills, and foster the health literacy required for the prevention of health issues in both people and communities (Adebagbo, &Adewoye, 2024; Okanlawon et al, 2025). In Nigerian schools, AI-enabled health education may also be used as a tool for efficient and successful curriculum delivery. It can facilitate the assessment of a learner's mastery of health topics; provide immediate adaptive feedback as the learner progresses; support the provision of instructional and assessment materials; expedite formative assessment; and facilitate the preparation of simulated environments and settings in which practice and demonstration can occur.

AI has reached a remarkable level of rapid growth and extensive application, propelled by significant advancements in computer algorithms and the gathering of huge data over decades. More recently, it has been shown that classic AI study fields like computer vision, voice recognition, and robotics may also be creatively applied in various real-world situations including illness prevention, public health education, and the promotion of health and welfare. Specifically, the global public health catastrophe at the end of 2019 was caused by the coronavirus pandemic epidemic (Goralski & Tan, 2023). In the areas of monitoring, prevention, diagnosis, and health management, AI-based medical devices, algorithms, and

other emerging sectors have demonstrated tremendous promise and are crucial to the battle against global pandemic (Oluwadiya, et al., 2023).

AI technologies can provide students individualised learning experiences that adjust to their unique demands. These AI frameworks may be leveraged by artificial intelligence technologies, such as educational applications and chatbots, to create more engaging and personalised learning experiences for science, health, and related disciplines (Okunade, 2024). Therefore, this paperclarified some basic concepts considered germane to the study, discussed some theoretical foundations on AI applications in education,discussed the prospects of AI application in Health Education learning and pedagogy and highlighted some constraints in the use of AI for health education teaching and learning. Lastly, conclusion and recommendations were made.

Artificial Intelligence (AI)

Thisis a branch of computer science focused on building systems or machines that can perform tasks that normally require human intelligence. These tasks include things like:understanding language(natural language processing),recognizing images or speech, learning from experience(machine learning),making decisions**,** solving health diagnostic problems and planning or predicting outcomes **(**Oluwadiya, et al., 2023**).** The technology known as artificial intelligence (AI) allows computers and other devices to mimic human learning, understanding, problem-solving, decision-making, creativity, and autonomy. AI-enabled gadgets and applications are able to perceive and recognise items. They are able to comprehend and react to human words. They can pick up new knowledge and skills. They are able to provide consumers and specialists with comprehensive advice (Okunade, 2024). They are capable of acting on their own, negating the need for human knowledge or assistance (a self-driving automobile is a prime example).Recent developments in generative AI (gen AI), a system that can produce original writing, photos, videos, and other material, have drawn the attention of the majority of AI practitioners, academics, and media.

Throughout the lifespan and in various contexts, health education is a continuous, dynamic, complex, and planned teaching-learning process that is carried out through an equitable and negotiated client and health professional "partnership" to enable and empower the individual to promote/initiate lifestyle-related behavioural changes that promote positive health status outcomes. Within a positive health paradigm, health education considers the internal and environmental elements that affect an individual's or group's health status by possibly enhancing their knowledge, skills, attitudes, and beliefs around their health-related needs and behaviour(Emenike, Onukwugha, Sarki, & Smith, 2023).

A country's human resource productivity is influenced by both population health and capacity building. Ignorance of illness signs and symptoms, dietary habits, and access to healthcare is frequently the root cause of poor health in both the affluent and the poor. Gorzanell and Knijnik (2025) noted that health education gives individuals the knowledge they

need to make decisions and adopt behaviours that will improve, preserve, and advance their health. By providing students with the necessary health information to live a healthy life and disseminating that knowledge to strengthen their local community, health education in schools will eliminate ignorance and prevent illnesses (Ford & Knutson, 2025).

In Nigeria, health education is neither a stand-alone topic in any state's curriculum nor a mandated duty of any level of government. Instead, health education in Nigerian schools has developed naturally in response to recognised health issues, and for many years, partners have made many investments through distinct health-related programs. Verifiable quantitative and qualitative data, according to Balogun (2020), show that these programs have been underfunded, poorly executed, and poorly evaluated throughout time as a result of the absence of a specific health education curriculum.

The specific goals of the health education curriculum are to: enable students to learn the fundamentals of the body and the skills needed to maintain health; encourage students to develop and practise healthy habits in the community; enable students to appreciate the ecological relationship between man and his environment; enable students to observe and draw conclusions from real-world experiences that have implications for their health; and prepare students for professional training in health related careers (Ford & Knutson, 2025).

Hamilton-Ekeke, Egumu, and Inengite (2020) pointed that the prevalence of non-communicable illnesses across age, gender, occupation, and socioeconomic position is worrying, and the main health issues in Nigeria are communicable diseases brought on by changes in lifestyle patterns. The school must give students the chance to get health education, lead healthy lifestyles, and eventually improve the health of their communities because more women are employed and lots of parents have less time to spend for their kids. In Nigeria, physical and health education is taught at the nursery, primary, and junior secondary levels, while health education is offered at the senior secondary level in place of health sciences. The philosophy and focus of senior secondary school health education is to provide the students with the necessary skills and competence to: a) take appropriate actions in matters relating to their health and that of other people; b) appreciate the needs for a healthy environment.

Challenges of Artificial Intelligence Usage for Health Education

Despite its advantages, integrating AI into health education presents several challenges that need addressing to ensure its effectiveness and ethical application. Some of the constraints or potential concerns on the reliance of AI technology over traditional teaching methods are hereby discussed as follows:

Reliance on AI can lead to over-dependence on tech for learning

Students' ability to interact with peers and human teachers may be hampered if they grow unduly reliant on these AI tools (Adebagbo&Adewoye, 2024). Additionally, resources like health checkers and health diagnostic interpreter apps offer prompt responses and support,

increasing the accessibility of health-related learning procedures. But this over-reliance on AI may make it more difficult for students to learn on their own. For example, students run the risk of not fully internalising the subject when they rely on AI apps for health instruction, which is crucial for the acquisition of health education skills (Bali, Garba, Ahmadu, Takwate, &Malgwi, 2024).

Relying too heavily on AI tools can limit students' critical thinking and problem-solving skills. Learning health education is not just about memorizing pathology of diseases and treatment patterns; it's about understanding context, culture, and nuances that machines often miss. When students depend on AI to provide instant responses of health related discourses, they may skip important steps in the learning process. This dependence may lead to a lack of essential social and communication skills that are crucial in real-life interactions.

Data Privacy Issues

Another ethical consideration is data privacy. Many AI learning applications collect personal information from users to improve their services and provide tailored learning experiences. However, this raises questions about how this data is used and protected. Apps and online programs use AI to personalize lessons, correct pronunciation, and provide instant feedback. However, the use of AI in learning health education raises significant concerns about data privacy (Bali, Garba, Ahmadu, Takwate, &Malgwi, 2024). Students frequently submit personal information and usage data when interacting with these platforms, which businesses can gather and examine. If not handled appropriately, this data could contain sensitive information like user preferences, habits, and even voice recordings. The storage and security of this data is therefore a significant concern. Many AI-learning applications lack strong privacy policies and security measures (Morah & Brown, 2024). This implies that private data may be exposed to security lapses that could result in misuse or illegal access. For instance, if a hacker manages to access the database of an AI app, they may reveal users' personal information and use it to defraud them.

AI tool Biases and Language Acquisition

Biases in these AI tools are a significant source of concern. They might unintentionally promote some dialects, cultural allusions, or speech patterns while ignoring others because they mainly rely on data from existing languages and communication patterns (Oluwadiya, et al., 2023). This may cause students, especially those from diverse backgrounds, to have an incomplete understanding of the subject.

Human Job Replacement Concerns

Concerns have also been raised about AI taking the place of human health educators. Even though AI can automate some aspects of instruction, human health educators' special interpersonal skills are still essential. Adebagbo and Adewoye (2024), remarked that this has

caused policymakers to wonder why AI might be viewed as a tool to enhance rather than replace human interaction, improving rather than detracting from the educational experience.

Prospects of AI Usage for Health Education

Artificial intelligence (AI) has been increasingly integrated into various fields, including education. In the field of Health Education and pedagogy, AI presents potential opportunities for enhancing learning experiences and outcomes, simulation of real-world interactive into a language learning platforms, improvement of health skills through interactive tools and also, it makes health promotion skills acquisition more accessible and less expensive. Some of these benefits are discussed as follows:

Enhancing Personalized Learning Experiences

AI technology makes it possible for the development of adaptive learning systems that meet the need of individual students. These systems can evaluate student interactions and adjust instructional materials based on machine learning algorithms. For instance, virtual tutors can modify the level of difficulty of medical subjects according to a student's development and comprehension. These individualised methods promote greater comprehension and retention, which is crucial for training future medical professionals (Bali, Garba, Ahmadu, Takwate, &Malgwi, 2024).Furthermore, by analyzing individual student data, AI systems can adapt to the unique learning needs and preferences of each student, offering customized content and feedback. This personalized approach has the potential to improve student engagement and motivation in learning health determinants, and health promotion strategies (Oluwadiya, et al., 2023).

One of the benefits of personalised learning is further demonstrated by looking at traditional health education programs, which frequently take a one-size-fits-all approach and might not be able to meet the needs of each individual student. Artificial intelligence (AI) tools can evaluate a student's performance, strengths, and shortcomings before customising lessons for them. This implies that while students who excel in reading comprehension can be challenged with increasingly complex texts, those who struggle with grammar can get additional practice in that area (Okunade, 2024). Better learning outcomes result from allowing each student to advance at their own pace through customisation.

Improving Accessibility for Diverse Learners

AI has enormous potential to democratise and expand access to education, particularly in vital domains like healthcare. AI-powered platforms can support multiple languages, giving students enrolled in health education and related programs access to course materials in the languages of their choice. AI can also offer captions, audio descriptions, and personalised interfaces for students with disabilities, removing conventional barriers to education and promoting an inclusive learning environment.

Providing Real-Time Feedback and Assessments

Given that AI can instantly analyse data, health educators can provide assessments and feedback in real time. AI-powered assessment tools, for example, can analyse clinical simulations or practice tests and offer prompt suggestions for enhancement. Students can quickly correct mistakes and reinforce their learning thanks to this immediacy, which is essential in classes where making complex decisions is essential.

Automating Administrative Tasks

By automating processes like exam grading, course material organisation, and schedule management, artificial intelligence (AI) tools can greatly lessen the administrative load on health educators. Health education authorities can devote more time and effort to curriculum development and interactive student engagement, which have a greater impact in a learning environment, by simplifying these procedures (Eze & Onah, 2024).

Enhancing Curriculum Development

AI can also help teachers create current and relevant curricula. Morah and Brown (2024) observed that AI-driven platforms can recommend changes to current courses or suggest new ones by examining industry demands, learning outcomes, and current research trends. The integrity and effectiveness of the educational system are maintained by ensuring that students gain pertinent skills and knowledge through the alignment of academic content with real-world applications.

Creates Simulate Real-world Interactive Learning Platforms

AI technology can also be utilised to develop interactive learning environments that mimic actual communication situations. These platforms can give students the chance to practise and advance their health skills learning in a fun and stimulating setting. Additionally, health educators can customise their instruction to target particular areas of personal and community health improvement by using AI-powered assessment tools to provide prompt and accurate feedback on students' knowledge of disease prevention and wellbeing promotion proficiency (Okunade, 2024).

Improvement of Health Promotion Skills through Interactive Tools

Enhancing health promotion abilities through interactive tools is an additional advantage of incorporating AI into health education training. AI-powered tools, such as chatbots and health awareness-learning software, enable students to practise disease prevention techniques like routine breast self-examination to detect breast cancer early and blood pressure checks for hypertensive patients. With the use of machine learning, natural language processing, and speech recognition, they offer interactive learning experiences that assist users in developing

their health-related competencies (Oluwadiya, et al., 2023). Platforms such as Rosetta Stone and Duolingo, for example, employ algorithms that adjust to each user's progress to make sure that lessons are catered to their individual strengths and shortcomings. Learners can practise at their own pace with this interactive, customised approach, which improves retention and comprehension of the material.

AI makes Learning more Accessible and Less Expensive

By lowering the cost and increasing accessibility of education, artificial intelligence (AI) is revolutionising a number of industries, including health education. In the past, learning frequently required significant financial outlays, such as paying for pricey textbooks, attending language schools, or hiring private tutors. But the rise of AI technologies, like chatbots and apps for health education and learning, has drastically reduced these expenses. Students can learn at their own pace and convenience without breaking the bank thanks to these AI-driven platforms, which offer interactive lessons, practice problems, and immediate feedback (Okunade, 2024).

Conclusion

In conclusion, artificial intelligence (AI) has enormous potential to revolutionise health education, despite some obstacles. AI can greatly improve health education by fostering knowledge of disease prevention and control, wellbeing promotion, health determinants, and nutrition, among other topics, by offering personalised learning, supporting educators, and creating creative teaching methodologies. To fully realise its potential, it is still imperative to address ethical issues and guarantee technical accuracy. AI is prepared to spearhead the shift towards a more effective, inclusive, and progressive approach to health education as the field continues to change. Therefore, the following recommendations are made:

i. Policy Development and Regulation: It is essential that policymakers formulate clear and enforceable guidelines governing the ethical use of Artificial Intelligence within the field of health education. Such policies should emphasize data protection, confidentiality, and privacy, while establishing strict protocols for the collection, storage, and utilization of information. These regulatory measures will ensure accountability and safeguard both educators and learners from potential misuse of technological tools.

ii. Curriculum Integration: The health education curriculum should be systematically revised to incorporate Artificial Intelligence applications and resources in a manner that aligns with national educational standards and established learning objectives. Integrating AI into teaching and learning processes will enhance instructional quality, promote innovative pedagogical practices, and foster greater student engagement.

iii. Cultural Relevance: Health education programs must reflect and respect the cultural values, traditional beliefs, and health realities of Nigerian communities. Ensuring cultural sensitivity in curriculum design will make health education more relatable, contextually meaningful, and effective in addressing community-specific health challenges.

iv. Teacher Training and Professional Development: Comprehensive training and continuous professional development programs should be provided for educators to equip them with the necessary skills and competencies for effective integration of AI technologies in classroom instruction. Regular workshops, seminars, and capacity-building initiatives will help teachers adapt to evolving educational innovations and sustain effective teaching practices.

v. Enhancing Learning Environment: Educational institutions should establish dynamic and technology-supported learning environments that leverage AI tools to create interactive, personalized, and student-centered learning experiences. Such environments will not only improve academic outcomes but also encourage creativity, collaboration, and critical thinking among learners.

vi. Access and Equity—Equal Chances for Everyone: Everyone should have access to AI tools for health education, especially people living in rural or less privileged areas. To make this possible, design apps and platforms that support different languages and reflect Nigeria's cultural diversity. This ensures that no group is left out as technology becomes a bigger part of education.

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