

EDUCATION: ADVANCING HEALTH LITERACY AND BEHAVIOUR CHANGE IN NIGERIA

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Abstract

The paper is based on a critical review of existing literature on health literacy, digital health, and AI-enabled communication rather than original empirical research. It conceptualized health literacy as extending beyond basic understanding to the ability to critically interpret and apply health information. Nigeria continues to face persistently low health literacy, limiting informed decision-making on reproductive health, immunization, infectious diseases, and non-communicable diseases. These challenges are compounded by weak health communication systems, shortages of trained health educators, and cultural and religious beliefs that may conflict with biomedical explanations of illness. This position paper argued that Artificial Intelligence (AI), when appropriately adapted to the Nigerian context, offers a practical opportunity to improve personalized health education, strengthen health literacy, and promote sustained behaviour change. Unlike conventional health education approaches that rely on one-way information delivery, AI enables continuous engagement through personalized, interactive communication. Key AI applications include multilingual health messaging in Hausa, Yoruba, Igbo, and Pidgin English, literacy-appropriate content, treatment adherence support, risk prediction for chronic diseases, and tailored reminders for antenatal care, immunization, and long-term disease management. The paper identified integration opportunities within Nigeria's existing health systems, including primary healthcare services, Community Health Extension Workers, DHIS2, and the National Health Insurance Authority. Major implementation challenges include inadequate digital infrastructure, low digital literacy, privacy and security concerns, limited funding and technical expertise, and the absence of a comprehensive national AI policy. The paper recommended developing supportive policies, investing in digital infrastructure, strengthening digital literacy and local research capacity, and implementing robust ethical safeguards. With coordinated action, AI can significantly enhance health literacy and improve health outcomes across Nigeria.

Keywords: Artificial Intelligence; Personalized Health Education; Health Literacy; Behaviour Change

Introduction

Artificial Intelligence (AI) refers to computer systems able to perform tasks that ordinarily require human intelligence. These tasks include learning from data, recognizing patterns, making predictions, and adjusting responses to new information (Davenport & Kalakota, 2019). In health education, AI is increasingly used to design, deliver, and refine messages that help people understand health information and make informed decisions about their wellbeing. Personalized health education moves beyond generic pamphlets and mass campaigns toward content shaped by a person's literacy level, language, risk profile, prior knowledge, and cultural background. This matters because health literacy, the ability to obtain, process, and understand basic health information needed to make sound health decisions, remains a major determinant of health outcomes (Kickbusch et al., 2022; Nutbeam & Lloyd, 2021).

Nigeria's health literacy situation is a serious concern. Studies across different states have repeatedly documented low health literacy among caregivers, adolescents, and adults, particularly regarding reproductive health, immunization, non-communicable diseases, and infectious disease prevention (Iwelunmor et al., 2018). This gap is worsened by weak health communication infrastructure, a shortage of trained health educators relative to population size, and cultural or religious beliefs that sometimes compete with biomedical explanations of illness. The result is a population that often makes health decisions based on incomplete or inaccurate information, leading to late presentation to healthcare facilities, poor treatment adherence, and continued vulnerability to preventable diseases.

This paper takes the position that Artificial Intelligence, applied thoughtfully within the Nigerian context, can meaningfully strengthen personalized health education and, in turn, improve health literacy and support lasting behaviour change. This is not a claim that AI is a cure-all; it is an argument that AI represents a strategic and largely underused opportunity that health educators, researchers, and policymakers in Nigeria should take more seriously. The paper examined the case for AI-driven personalized health education, considers the practical obstacles in the Nigerian context, and proposes a realistic pathway for responsible adoption. The discussion focuses on technology relevant to health education rather than the wider field of AI in clinical diagnosis or hospital administration, though these areas are referenced where they connect with patient education and health communication.

Health Literacy and Behaviour Change

Health literacy is not a single skill but a layered capacity. It ranges from the functional ability to read and understand basic health instructions, to the interactive ability to draw meaning from health information met in everyday life, to the critical ability to judge and use that information to influence one's own health (Nutbeam & Lloyd, 2021). This layered view explains why health education that only passes on facts is often not enough. A person may be able to read a leaflet on hypertension without being able to turn that knowledge into changed eating habits or steady medication use. Kickbusch et al. (2022) argued that health literacy in a digital age should be understood as a dynamic, socially shaped capacity rather than a fixed trait, influenced by the information environment, the trust a person places in its sources, and the tools available to act on what is understood.

The relationship between health literacy and behaviour change is best seen as a pathway rather than a single event. Adequate health literacy improves a person's understanding of risk and consequence. This supports positive attitudes toward preventive or corrective action, which then, under the right conditions, becomes sustained practice such as treatment adherence, healthy lifestyle choices, or timely use of health services. Each link in this pathway can break down on its own. Understanding does not automatically produce motivation, and motivation does not automatically produce sustained practice without reinforcement, social support, or a health system that makes the desired behaviour easy to carry out. In Nigeria, this breakdown is well documented, particularly in medication adherence and preventive care uptake, where even people with reasonable awareness of a health risk often fail to sustain the matching protective behaviour over time (Iwelunmor et al., 2018).

This distinction between knowing and doing is central to the argument of this paper. Conventional health education in Nigeria has tended to focus its resources on the transmission stage, through pamphlets, radio jingles, and one-off community talks, while investing comparatively little in the reinforcement, feedback, and follow-up that sustained behaviour change requires. It is at this point of reinforcement and continuity, rather than at the point of first delivering information, that Artificial Intelligence offers its most distinctive contribution, a claim developed further in the sections that follow.

Artificial Intelligence and Personalized Health Education

Health education has traditionally relied on face-to-face counselling, printed materials, radio jingles, and community outreach. These methods remain valuable but are limited in how well they can adapt to the individual. AI changes this by enabling systems that learn from data about a person's behaviour, preferences, and knowledge gaps, then adjust the content, tone, and delivery channel of health messages accordingly (Topol, 2019). What sets AI-supported health education apart from earlier digital health communication is its capacity for continuous learning: the system does not simply deliver fixed content, it refines its recommendations as it receives more information about the user, moving health education closer to a genuinely individualized experience.

Several categories of AI technology are directly relevant to health education practice. Machine learning algorithms can analyze patterns in patient data to predict who is at higher risk of specific conditions and to prioritize them for targeted education. Natural language processing (NLP) allows systems to interpret questions asked in everyday language, including Pidgin English and, increasingly, Nigerian indigenous languages, and to respond with contextually appropriate health information. Conversational AI chatbots, delivered through mobile apps or messaging platforms such as WhatsApp, can answer health questions around the clock, send reminders for appointments and medication, and give simplified explanations of diagnoses. Recommender systems, similar to those used in e-commerce, can suggest relevant educational content based on a user's demographic profile, health history, and expressed concerns. Together, these technologies form the technical backbone of AI-driven personalized health education (Sallam, 2023).

The benefits of this approach are considerable. AI can extend health education to populations that are geographically distant from health facilities or trained educators, addressing Nigeria's persistent shortage of health workers relative to population size. It can also lower the cost of scaling health messaging, since a well-designed AI system can interact with thousands of users at once without a matching increase in staffing. Personalization also tends to improve engagement with and retention of health information, because messages that reflect a person's actual circumstances, rather than generic advice, are more likely to be understood and acted upon (Davenport & Kalakota, 2019). In short, AI is not a peripheral novelty but a substantive tool capable of reshaping how health education is delivered in Nigeria.

AI-Driven Strategies for Improving Health Literacy

One of the most persistent obstacles to health literacy in Nigeria is the difficulty many people face in accessing reliable health information when they need it. Rumours, misinformation, and unverified claims circulate widely, especially on social media, often filling the gap left by inadequate formal health communication. AI-powered platforms, including chatbots and search-based health assistants, can give instant, evidence-based answers to health questions, reducing dependence on unverified sources and helping to correct misinformation before it spreads (Olu et al., 2019).

Nigeria's linguistic diversity, with over five hundred languages spoken across the country, has long posed a challenge for standardized health messaging. AI systems equipped with natural language processing can be trained to communicate in Hausa, Yoruba, Igbo, Pidgin English, and other widely spoken languages, and can reflect locally relevant cultural references and examples. This kind of linguistic and cultural adaptation is difficult to achieve at scale through conventional health education methods but is well within reach of properly developed AI systems.

Personalization also allows AI systems to adjust the complexity of health information to match a person's literacy level, avoiding both oversimplification, which can feel patronizing, and excessive technicality, which can confuse. When a person understands why a particular health

behaviour matters, explained in terms that fit their own life, they are more likely to internalize that information and use it to guide decisions about seeking care, adhering to treatment, or adopting preventive measures (Kickbusch et al., 2022).

Rural communities, persons with disabilities, out-of-school adolescents, and low-income households often fall outside the reach of conventional health education programmes. Mobile-based AI tools, which need only a basic smartphone and, increasingly, work with limited internet connectivity through offline-capable applications, can extend personalized health education to these groups in ways that physical outreach programmes, constrained by funding and staff, often cannot sustain over time.

AI Applications for Sustainable Behaviour Change

Beyond passing on information, sustained behaviour change requires ongoing reinforcement, and this is an area where AI systems have a clear advantage over one-off educational encounters. Mobile applications that track physical activity, dietary patterns, or sleep, and respond with tailored feedback and encouragement, have been shown to support gradual, sustained lifestyle improvement more effectively than static advice given once and never revisited (Topol, 2019).

AI-driven risk prediction models can identify individuals or communities at higher risk of conditions such as hypertension, diabetes, or vaccine-preventable diseases, allowing health education efforts to be directed where they will have the greatest impact. This targeted approach is a more efficient use of limited public health resources than broad, undifferentiated campaigns.

Poor adherence to prescribed treatment remains a significant contributor to preventable illness in Nigeria, particularly for chronic conditions such as hypertension, diabetes, and HIV. AI-enabled reminder systems, often delivered through SMS or messaging applications, can prompt patients to take medication at the correct time, explain the consequences of missed doses in accessible language, and flag patterns of non-adherence to healthcare providers for follow-up (Iwelunmor et al., 2018).

For people living with chronic conditions, AI-supported education tools can provide ongoing guidance on diet, symptom monitoring, and warning signs that require urgent medical attention. This continuous engagement helps patients build the confidence and skill to manage their condition between clinical visits, which is particularly valuable in a health system where specialist follow-up appointments are often hard to schedule promptly.

Finally, AI-driven personalized reminders and educational nudges can encourage uptake of preventive practices such as antenatal care attendance, childhood immunization, cancer screening, and family planning. Because these reminders can be timed to an individual's specific circumstances, such as a child's immunization schedule or a woman's antenatal visit calendar, they are more likely to prompt timely action than generic public awareness messaging.

Opportunities for AI Integration in Nigeria's Health System

Nigeria's health system is organized around a three-tier structure of primary, secondary, and tertiary care, with primary healthcare centres (PHCs) meant to serve as the first point of contact for most of the population. This tiered structure offers several concrete entry points for AI-driven personalized health education. At the primary care level, community health extension workers who already conduct home visits and community outreach could be equipped with AI-supported mobile applications that generate tailored counselling scripts for antenatal care, immunization, and family planning, extending the reach of a workforce that remains thin relative to population need.

Nigeria's existing digital health infrastructure, including the District Health Information System (DHIS2) used for routine health data reporting, presents an opportunity for AI tools to be layered onto data that health facilities already collect, rather than requiring entirely new data

collection systems. Linking AI-driven education modules to immunization and antenatal registers could allow automated, personalized reminders to be generated directly from existing facility records. The National Health Insurance Authority's expanding enrolment base similarly offers a channel through which AI-supported health education could reach insured members as part of routine engagement, embedding personalized education within a system Nigerians already interact with rather than introducing a wholly separate platform.

The World Health Organization's Global Strategy on Digital Health 2020-2025 (WHO, 2021) provides a broader international framework within which Nigeria's efforts could be positioned, emphasizing country-led digital health investment, interoperability, and people-centred design. Aligning national efforts with this framework would allow Nigeria to draw on established global guidance while adapting implementation to local realities. Nigeria's growing private health-technology sector, which has produced a range of mobile health and telemedicine ventures in recent years, further represents a source of technical capacity and innovation that public health authorities could engage through structured partnerships rather than developing AI health education systems solely within the public sector. Taken together, these entry points suggest that the opportunity for AI integration in Nigeria lies less in building entirely new infrastructure and more in extending, connecting, and personalizing systems and workforce structures that already exist.

Implementation Challenges

The case for AI-driven health education in Nigeria must engage honestly with the obstacles standing in its way. Five challenges stand out as the most significant.

- 1. Weak digital infrastructure:** Unreliable electricity supply, inconsistent internet connectivity, and limited smartphone ownership in rural areas remain fundamental constraints. AI tools depend on stable digital infrastructure to work reliably. Without meaningful investment in this area, AI-driven health education will stay concentrated in urban centres, which could widen rather than narrow existing health disparities (Olu et al., 2019).
- 2. Low digital literacy among users:** There is an evident irony in proposing AI as a solution to health literacy gaps when a large share of the population also lacks the basic digital literacy needed to use AI-powered tools confidently. Older adults, people with little formal education, and residents of remote communities may struggle to interact with digital interfaces, no matter how well the underlying health content is personalized.
- 3. Data privacy and security concerns:** The use of AI in health education involves collecting and processing personal health data, which raises legitimate concerns about consent, data security, and possible misuse of sensitive information. Nigeria's data protection framework, though it has developed considerably in recent years, is still maturing in its enforcement capacity, which raises real questions about how well individual privacy can be protected in practice (Sallam, 2023).
- 4. Limited funding and technical expertise:** Developing, deploying, and maintaining AI systems requires sustained financial investment that competes with other pressing health priorities in a resource-constrained system. Without dedicated funding, many promising AI health education pilots risk being discontinued once initial donor or research funding ends. This is worsened by a shortage of professionals with combined expertise in health, data science, and AI development, many of whom are drawn toward opportunities outside the health sector or outside the country altogether.
- 5. Absence of clear national policy and public trust:** There is currently no comprehensive national policy specifically governing the use of AI in health education or health service delivery in Nigeria. This absence creates uncertainty for developers, healthcare institutions,

and investors, and leaves questions of accountability, quality assurance, and liability inadequately addressed. Trust in technology-mediated health advice also cannot be assumed, as many Nigerians place greater trust in a known healthcare worker, religious leader, or community figure than in messages generated by a machine, however accurate.

Conclusion

Artificial Intelligence gives Nigeria a practical way to strengthen health education, raise health literacy, and support lasting behaviour change. AI tools can reach people that conventional health education struggles to reach, including rural communities and out-of-school adolescents. They can deliver health messages in the languages people actually speak; at a level everyone can understand. They can also provide the ongoing reminders and follow-up that real behaviour changes needs, well beyond a single pamphlet or a one-off talk.

Nigeria faces real barriers to this progress. Electricity and internet access remain unreliable in many areas. Many people lack the digital skills to use AI tools with confidence. Data privacy protections are still developing. Funding and trained local experts are limited. There is no national policy yet to guide the safe use of AI in health education. These barriers are genuine, and they will not disappear on their own.

These barriers can be overcome with deliberate action. Government, academic institutions, and technology partners must work together. Nigeria needs a clear national policy on AI in health education. It needs steady investment in digital infrastructure, especially electricity and internet access in rural areas. It needs digital literacy training for the people who will use these tools. It needs local research and local solutions, built by Nigerians for Nigerian communities, rather than foreign models adopted without adaptation. It needs ethical safeguards that protect patient data, ensure informed consent, and build public trust.

Nigeria has a real opportunity to use Artificial Intelligence to improve health literacy and health outcomes for millions of citizens. This opportunity is achievable, not theoretical. What is needed now is clear policy, steady investment, and sustained commitment from every stakeholder involved. The tools exist. The infrastructure to connect them to Nigeria's health system exists. What remains is the collective will to act.

Suggestions

Addressing the challenges above requires deliberate, coordinated action. Five suggestions follow directly from the obstacles identified:

- 1. Develop a clear national policy framework:** The Federal Ministry of Health, working with the National Information Technology Development Agency and relevant professional bodies, should develop a clear policy framework specifically addressing the use of AI in health education and service delivery. This framework should include standards for data governance, algorithmic accountability, and quality assurance.
- 2. Invest in digital infrastructure:** Sustained investment in reliable electricity, broadband access, and affordable data is a prerequisite for any meaningful expansion of AI-driven health education, particularly in rural and underserved areas. Public-private partnerships could accelerate this investment beyond what government funding alone is likely to achieve.
- 3. Pair AI tools with digital literacy training:** Efforts to introduce AI-based health tools should be paired with basic digital literacy training, delivered through community health workers, schools, and civil society organizations, so that intended beneficiaries are equipped to use these tools effectively.
- 4. Build local capacity through education and research:** Nursing, medical, and health education curricula in Nigerian tertiary institutions should incorporate foundational

training on AI applications in health communication. Nigerian universities, technology companies, and government health agencies should also collaborate more deliberately on designing and testing AI health education tools grounded in local research evidence, rather than adapting foreign models after the fact. Dedicated research funding, incubation support, and academic recognition should be extended to Nigerian researchers working in this area.

5. Uphold ethical safeguards: Any deployment of AI in health education should be guided by clear principles of informed consent, data protection, transparency about how algorithms generate recommendations, and mechanisms for redress when errors occur.

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