



REVAMPING VOCATIONAL HOME ECONOMICS USING ARTIFICIAL INTELLIGENCE (AI) FOR SUSTAINABLE DEVELOPMENT IN NIGERIA

Mabel Ekpedotse ULOKO, Florence Obiageli CHUKWUKA and Chidima Hope ABANOBI
Department of Home Economics Education, School of Secondary Education (Vocational)
Federal College of Education (Technical), Asaba, Delta State. Nigeria. ulokomabel@gmail.com

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Abstract

This paper explores the transformative potential of Artificial Intelligence (AI) in revamping vocational Home Economics education for sustainable development in Nigeria. It examines the current state of the discipline, identifies key challenges, and proposes a comprehensive framework for AI integration. Through the lens of technological determinism and experiential learning theories, the study underscores the need for curriculum reform, teacher capacity building, and digital infrastructure development. The paper concludes with policy recommendations aimed at leveraging AI to make Home Economics more relevant, inclusive, and impactful in achieving Nigeria's developmental goals.

Introduction

Vocational Home Economics in Nigeria has long served as a foundational subject aimed at equipping learners with practical life skills in areas such as food and nutrition, clothing and textiles, home management, and consumer education. This field plays a critical role in preparing individuals for self-reliance and contributing to national development. It is particularly relevant in a country like Nigeria, where youth unemployment and underemployment are pressing challenges (Okorie, 2000). Through its practical orientation, Home Economics fosters creativity, entrepreneurship, and a culture of self-sufficiency. Home Economics, in its vocational sense, refers to the systematic instruction of knowledge and skills required to manage and improve the home and family life, while also providing learners with employable and entrepreneurial skills. The scope of vocational Home Economics spans personal development, family living, food preparation, fashion and design, child care, and resource management (Eze, 2015). As both an academic and practical subject, it is embedded in Nigeria's Technical and Vocational Education and Training (TVET) system, contributing to individual and national socio-economic growth. Its importance in Nigeria's educational landscape cannot be overstated. Home Economics helps bridge the skills gap in domestic industries and encourages informal sector development. It fosters empowerment among women and youth, particularly in rural communities, by promoting skills such as tailoring, catering, and crafts. These skills can be harnessed to improve household income and economic resilience, especially in regions prone to economic instability (Adeosun, 2014). Moreover, the subject contributes to national goals related to health, family life, and sustainable livelihoods. However, vocational Home Economics in Nigeria faces significant challenges that hinder its full potential. One of the core issues is the outdated curriculum that fails to reflect contemporary technological realities or market needs. Many institutions continue to rely on traditional teaching methods and obsolete materials that do not prepare learners adequately for the modern economy (Obioma & Ajagun, 2013).

Corresponding Author: Mabel Ekpedotse ULOKO

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This disconnect between instruction and industry expectations results in low employability and innovation among graduates. In addition, there is limited integration of digital tools and technologies in Home Economics instruction. In a world that is rapidly digitizing, the lack of access to modern learning infrastructure—such as virtual labs, digital simulations, and e-learning platforms—places Nigerian students at a disadvantage. Educators often lack training in the use of ICT tools, and most schools are not equipped with the necessary infrastructure to support digital transformation (Nwoke & Njoku, 2020). This technological gap restricts the delivery and assessment of Home Economics and prevents the subject from evolving in line with global best practices. Artificial Intelligence (AI) offers a transformative opportunity to revamp vocational Home Economics and address many of its persistent challenges. AI technologies can revolutionize teaching, learning, and entrepreneurship within the field by providing personalized learning experiences, virtual simulations, intelligent tutoring systems, and predictive analytics for curriculum improvement. Globally, AI is already being deployed in education to enhance learner engagement, support differentiated instruction, and automate administrative tasks (Luckin et al., 2016). These innovations, if adapted to the Nigerian context, could bring relevance, efficiency, and accessibility to vocational education. The rise of AI as a global educational force underscores the urgency for Nigeria to adopt emerging technologies in its educational strategies. Countries such as China, the United States, and Finland have already incorporated AI into their education systems to foster digital literacy and 21st-century skills (UNESCO, 2021). Nigeria cannot afford to lag in this digital evolution, especially in vocational subjects that are central to workforce development and youth empowerment. Furthermore, integrating AI into vocational Home Economics aligns strongly with the United Nations Sustainable Development Goals (SDGs). Specifically, it supports SDG 4 (Quality Education), SDG 5 (Gender Equality), and SDG 8 (Decent Work and Economic Growth). AI-driven vocational education can help ensure inclusive and equitable quality education, promote lifelong learning, empower women, and enhance youth employment—key development priorities for Nigeria (United Nations, 2015). By modernizing Home Economics through AI, the nation can foster innovation, improve productivity, and achieve sustainable economic transformation. Revamping vocational Home Economics through AI is not just a technological necessity but a strategic imperative for sustainable development. The integration of AI promises to renew interest in the subject, enrich curriculum delivery, and elevate the socio-economic relevance of vocational training in Nigeria. With the right policy support, infrastructure, and training, Nigeria can reposition Home Economics as a dynamic and future-ready discipline.

Matters Arising

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, particularly computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding (Russell & Norvig, 2016). AI technologies range from simple applications such as chatbots and virtual assistants to more complex systems like predictive analytics, robotics, and machine learning. In the context of education, AI is increasingly being used to enhance instructional delivery, personalize learning, and improve administrative efficiency. In vocational education and training (VET), AI applications are expanding rapidly. Intelligent tutoring systems provide customized support for learners, while AI-powered simulators offer safe environments to practice practical skills. In culinary arts, for example, AI can simulate cooking scenarios or manage inventory systems. In fashion and textiles, AI tools aid in design automation and trend prediction. These innovations are reshaping how vocational skills are taught and practiced, making learning more

Corresponding Author: Mabel Ekedotse ULOKO

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engaging and industry-relevant (Holmes et al., 2019). AI also plays a vital role in adaptive learning, where algorithms assess learners' strengths and weaknesses and adjust content accordingly. This personalized approach is particularly beneficial in vocational subjects like Home Economics, where skill acquisition and hands-on practice are key. By integrating AI into the curriculum, educators can track learner progress in real time, offer instant feedback, and provide targeted support to enhance understanding and retention (Luckin et al., 2016). Linking vocational Home Economics to sustainable development requires an understanding of the subject's potential to drive economic empowerment. Home Economics equips individuals, especially women and youth, with practical skills that promote self-reliance and entrepreneurship. With AI integration, these skills can be scaled, refined, and applied to new markets. For instance, AI tools can assist small-scale food processors with digital marketing, pricing strategies, and customer engagement, creating more resilient and competitive home-based businesses (Adeosun, 2014). Home Economics also contributes to food security, resource management, and environmental conservation. Subjects like nutrition, meal planning, and sustainable agriculture are key to reducing hunger and promoting well-being. AI systems can be used to design nutritionally balanced meals, manage household budgets, or monitor the environmental impact of domestic practices. These applications support Sustainable Development Goals (SDGs) such as Zero Hunger (SDG 2), Responsible Consumption (SDG 12), and Climate Action (SDG 13) (United Nations, 2015). From a theoretical standpoint, this framework draws on the Technological Determinism Theory, which posits that technological innovations shape and drive societal changes. In this view, integrating AI into Home Economics is not simply a pedagogical improvement but a transformative shift in how vocational education contributes to economic and social development (Smith & Marx, 1994). This theory explains how AI can serve as a catalyst for redefining traditional roles and unlocking new potentials within Home Economics. Another relevant theory is Experiential Learning Theory, developed by David Kolb (1984), which emphasizes learning through experience, reflection, and active experimentation. Vocational Home Economics relies heavily on hands-on practice and real-world application. AI enhances experiential learning by providing virtual simulations, interactive tools, and feedback systems that mirror real-life scenarios. This allows students to gain competence and confidence in a controlled, low-risk environment. The convergence of these theories underscores the necessity of aligning educational practice with technological evolution. Home Economics, traditionally grounded in manual and domestic skills, must evolve to reflect the realities of a digital economy. The introduction of AI helps bridge the gap between theory and practice, ensuring that students are not only learning but also innovating and applying their skills to solve real-world problems. Furthermore, AI supports inclusive and equitable education by accommodating different learning styles and abilities. With tools like speech recognition, language translation, and personalized dashboards, learners with diverse backgrounds and challenges can access vocational training in meaningful ways (UNESCO, 2021). This inclusivity strengthens the role of Home Economics as a subject for sustainable human development. In conclusion, the integration of AI into vocational Home Economics is not merely a trend but a necessary response to the demands of modern education and sustainable development. By leveraging AI, Home Economics can become a vehicle for economic empowerment, digital innovation, and social transformation in Nigeria. This conceptual framework establishes the foundation for exploring practical strategies and policy interventions needed to actualize this vision.



Current State of Vocational Home Economics in Nigeria

Vocational Home Economics education in Nigeria is structured to provide students with practical skills in areas such as food and nutrition, clothing and textile, home management, and child development. The curriculum, as outlined by the Nigerian Educational Research and Development Council (NERDC), is competency-based, emphasizing hands-on experience and real-life applications (NERDC, 2013). However, the implementation of this curriculum varies significantly across institutions, with many schools still relying on outdated methods and lacking the equipment needed for practical sessions. This discrepancy has resulted in a gap between curriculum goals and actual learning outcomes. The methods of instruction in most vocational Home Economics programs remain largely traditional, with heavy reliance on chalk-and-board teaching and rote memorization. Practical activities, though intended to be the core of the subject, are often limited due to inadequate funding and poor infrastructure (Aduwa-Ogiegbaen & Iyamu, 2005). As a result, students are frequently taught theoretical concepts without the opportunity to apply them in real-life situations, undermining the goals of vocational education to produce job-ready graduates. Teacher training and capacity also present major challenges. Many Home Economics teachers in Nigeria have not received updated training in recent pedagogical techniques or digital literacy. A report by Okeke and Eze (2010) indicates that most teachers lack professional development opportunities that integrate emerging technologies into their teaching. This lack of continuous training limits teachers' ability to adapt to new trends and diminishes their effectiveness in delivering a dynamic, skill-based curriculum. Student engagement in Home Economics has also been negatively affected by the lack of modern tools, poor infrastructure, and societal perceptions that undervalue vocational education. While the subject holds potential for self-reliance and entrepreneurship, many students see it as outdated or irrelevant to current economic realities (Okoro, 2011). The absence of modern equipment and interactive learning tools also contributes to low enthusiasm and poor performance in both theoretical and practical assessments. Technology integration in Home Economics education in Nigeria remains minimal. In contrast to global practices where AI, digital simulations, and interactive learning platforms are being used to enhance vocational training, Nigerian schools often lack basic ICT infrastructure. A study by Agbo and Iwuchukwu (2018) shows that fewer than 30% of Home Economics departments in secondary and tertiary institutions have access to computers, let alone AI-driven educational tools. This technological gap puts Nigerian students at a disadvantage in a rapidly digitizing world. In sum, while the curriculum for vocational Home Economics in Nigeria is structured with good intentions, its delivery is hindered by outdated methods, underqualified teachers, and insufficient technological support. These challenges collectively affect student outcomes and undermine the relevance of Home Economics in contributing to sustainable development. Addressing these issues through AI integration, capacity building, and infrastructural development is crucial to revitalizing the subject and aligning it with 21st-century demands.

Challenges and Opportunities for AI Integration in Vocational Home Economics in Nigeria

1. Infrastructure Deficit and Digital Divide

A major challenge to AI integration in Home Economics education is the widespread lack of digital infrastructure across Nigerian schools. Many institutions, especially in rural areas, lack electricity, internet access, and modern ICT tools—foundational requirements for deploying AI technologies. This



digital divide limits equitable access to AI-based learning, thus reinforcing existing educational disparities (UNESCO, 2022).

2. Lack of AI Literacy Among Educators

Many Home Economics teachers lack sufficient exposure to digital tools, let alone AI applications. Without proper professional development programs, teachers may find it difficult to incorporate AI-based instructional methods into their teaching. This skill gap presents a barrier to effective implementation unless proactive measures are taken to build educators' digital capacity (Ayanwale et al., 2020).

3. Policy and Curriculum Limitations

The Nigerian Home Economics curriculum does not yet explicitly accommodate AI applications or digital innovation. Curriculum reforms that emphasize AI integration are necessary to ensure relevance in a technology-driven world. Additionally, national education policies must support the incorporation of emerging technologies in vocational education for effective transformation (NERDC, 2013; FRN, 2020).

4. Opportunities in Personalized Learning

Despite these challenges, AI holds significant promise for transforming Home Economics through personalized learning paths. AI can adapt to individual learning styles, provide instant feedback, and assess practical skills using simulations and virtual environments. This can help overcome the current limitations in classroom management and student engagement (Holmes et al., 2019).

5. Empowering Entrepreneurship and Innovation

Integrating AI into Home Economics education can stimulate entrepreneurial thinking by introducing students to tech-based business models in areas like food technology, fashion design, and home management. AI tools can help students design, plan, and manage small businesses, contributing to economic empowerment and national development (Nwachukwu, 2021).

6. Enhancing Sustainable Development Goals (SDGs)

AI integration aligns well with Nigeria's commitment to achieving the United Nations Sustainable Development Goals. Specifically, it supports SDG 4 (quality education), SDG 8 (decent work and economic growth), and SDG 9 (industry, innovation, and infrastructure). By embedding AI into vocational education, Nigeria can foster sustainability, resilience, and adaptability in the labor market (UN, 2020).

Proposed Framework for AI Integration into Vocational Home Economics in Nigeria

1. Curriculum Redesign for AI Integration

To effectively embed AI into vocational Home Economics, the curriculum must be redesigned to include AI-related content and digital competencies. This could involve modules on smart kitchen technologies, AI-powered budgeting tools, fashion design software, and virtual simulations for home management practices. The integration should be aligned with competency-based approaches to reflect real-world applications (NERDC, 2013; Adedoyin, 2021).

2. Teacher Training and Professional Development

Teachers are central to the success of AI implementation. Regular and intensive training programs must be developed to enhance teachers' understanding of AI and its applications in vocational education. Workshops, certifications, and collaborations with tech institutions can help build teacher capacity for delivering AI-enhanced lessons (Ayanwale et al., 2020).

3. Infrastructure Development and Resource Allocation

Corresponding Author: Mabel Ekpedotse ULOKO

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Investment in infrastructure is essential for sustainable implementation. Schools need access to stable electricity, internet connectivity, computers, and smart devices. Government and private-sector partnerships can support funding for the provision and maintenance of AI tools and technologies in classrooms (UNESCO, 2022).

4. Development of AI-Enhanced Learning Materials

Interactive e-learning platforms and AI-driven applications should be developed specifically for Home Economics content. These materials could include virtual labs, gamified lessons, real-time feedback tools, and voice-assisted learning apps tailored to topics like nutrition, garment construction, and family resource management (Holmes et al., 2019).

5. Pilot Programs and Research-Based Implementation

Pilot projects should be initiated across selected urban and rural schools to test AI applications in Home Economics education. These pilots would provide data on effectiveness, scalability, and adaptability, offering a knowledge base for national roll-out strategies. This data-driven approach will ensure that integration is evidence-based and contextually relevant (Nwachukwu, 2021).

6. Industry and Community Collaboration

Collaboration with industries such as agritech, fashion-tech, and home automation companies can provide students with exposure to real-world applications of AI. Community-based projects can also link Home Economics students to sustainable development initiatives, reinforcing the social and environmental relevance of their training (Ogunyemi, 2020).

Impact and Policy Recommendations

1. Strengthening National Education Policy on AI Integration

Integrating AI into vocational Home Economics calls for a revision of Nigeria's education policies. Policymakers should develop a national strategy that promotes AI literacy across all levels of education, especially in technical and vocational training (FRN, 2020). Policy frameworks should support infrastructure development, teacher training, and curriculum reforms that reflect 21st-century competencies.

2. Boosting Employment and Entrepreneurship

AI integration has the potential to revolutionize Home Economics education by equipping students with digital and entrepreneurial skills relevant to Nigeria's labor market. Through exposure to AI applications—like inventory management systems, food processing automation, and fashion design software—students can start businesses or improve their employability (Nwachukwu, 2021).

3. Improving Learning Outcomes and Student Engagement

AI-enabled personalized learning platforms can cater to students' individual strengths and weaknesses, increasing motivation and learning efficiency. These tools support continuous assessment and feedback, which are crucial for skill acquisition in Home Economics. This adaptive learning model is especially useful for practical subjects that require hands-on mastery (Holmes et al., 2019).

4. Promoting Gender Inclusion and Equity

Vocational Home Economics, traditionally associated with female students, can benefit from AI by making the field more dynamic, attractive, and gender-inclusive. AI's appeal across disciplines can help reframe Home Economics as a viable field for all genders, especially as it connects with areas like sustainable food systems, digital design, and smart home technologies (UNESCO, 2022).

5. Encouraging Multisectoral Partnerships

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Government, educational institutions, the private sector, and development partners must collaborate to fund and implement AI-driven initiatives in vocational education. Such partnerships can support innovation hubs, mentorship programs, and real-world exposure for students—bridging the gap between education and industry (Ogunyemi, 2020).

6. Recommendations for Curriculum Planners and Educators

Curriculum developers should prioritize competency-based and AI-enhanced content, including modules on digital financial literacy, smart technologies for resource management, and environmental sustainability practices. Educators should adopt blended learning strategies and engage students in project-based tasks that simulate real-life challenges (Adedoyin, 2021).

7. Enhancing Monitoring and Evaluation Systems

To ensure the success of AI integration, there must be strong monitoring and evaluation frameworks to track implementation outcomes. Data collected should inform continuous improvement and policy refinement, ensuring that Home Economics education remains responsive to technological advancements and national needs (FRN, 2020).

Conclusion

Revamping vocational Home Economics in Nigeria through the integration of Artificial Intelligence (AI) is not only timely but essential for aligning the country's education system with global trends and sustainable development goals. With the increasing demand for skills that reflect the realities of a digitized world, the application of AI in Home Economics holds the potential to transform how students learn, how teachers teach, and how communities benefit from vocational knowledge. By modernizing the curriculum, enhancing teacher capacity, and leveraging smart technologies, Nigeria can reposition Home Economics as a powerful tool for economic empowerment, food security, environmental management, and gender inclusion. AI integration can enable students to access personalized learning, virtual simulations, and digital platforms that support creativity, entrepreneurship, and lifelong learning. However, this transformation requires a deliberate and collaborative effort involving policy makers, educators, technologists, and the private sector. It also necessitates adequate funding, infrastructure, and continuous monitoring to ensure equitable and effective implementation. The alignment of vocational Home Economics with technological innovation is not just a pedagogical shift—it is a strategic imperative for building a resilient, inclusive, and sustainable Nigeria.

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