THE ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING PRACTICAL SKILL DEVELOPMENT IN HOME ECONOMICS EDUCATION

IFEBHOR, P. E. Ph.D.
Department of Vocational and Technical Education, Faculty of Education,
Ambrose Alli University, Ekpoma, Edo State
enivie67@gmail.com, 09013469450

Abstract
Artificial Intelligence (AI) has emerged as a transformative technology with significant potential to improve teaching, learning and practical skill development across Technical and Vocational Education and Training (TVET), including Home Economics Education. This paper examined the role of AI in enhancing practical skill development in Home Economics Education by conceptualizing AI, Home Economics Education and practical skill development and discussing the application of AI in promoting personalized learning, virtual practical laboratories, practical competency development, continuous assessment, critical thinking, creativity, problem-solving and independent learning. The paper further explored AI as a driver of innovation through improved teaching effectiveness, learner engagement, flexible learning, industry relevance, digital competency and sustainable skills development. It also identified major challenges to AI integration, including inadequate ICT infrastructure, poor electricity supply, limited funding, lack of teacher competence, high implementation costs and curriculum limitations, while highlighting strategies such as curriculum revision, teacher capacity building, improved funding, digital infrastructure development, AI policy implementation, provision of smart laboratories and AI literacy for students. The paper concluded that the successful integration of AI into Home Economics Education would strengthen practical skill acquisition, enhance graduates' employability, promote entrepreneurship and innovation and contribute to sustainable national development.

Keywords: *Artificial Intelligence, Digital Competency, Home Economics Education, Innovation, Practical Skill Development.*

Introduction

The rapid advancement of digital technologies has transformed virtually every sector of the society with education becoming one of the greatest beneficiaries of this transformation. Artificial Intelligence (AI) has become one of the most influential emerging technologies with the potential to improve educational access, quality, equity and lifelong learning through intelligent digital systems. Artificial Intelligence encompasses computer systems capable of performing tasks traditionally requiring human intelligence, including learning, reasoning, decision-making, language processing and problem-solving. Holmes et al. (2022) noted that the rapid evolution of machine learning, natural language processing, learning analytics and generative AI has accelerated the adoption of intelligent educational systems capable of supporting personalized instruction, automated assessment and adaptive learning experiences. These developments have positioned AI as one of the principal drivers of educational innovation in the twenty-first century.

Home Economics Education remains one of the most practical components of Technical and Vocational Education and Training (TVET), focusing on equipping learners with occupational competencies and life skills required for sustainable living and economic

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productivity. Vocational education is expected to develop practical competencies that enable learners to adapt to changing labour market demands and technological advancements. Laar et al. (2024) maintained that competency-based vocational education emphasizes experiential learning, problem-solving, creativity and innovation rather than mere acquisition of theoretical knowledge. In Home Economics Education, students acquire practical competencies in food and nutrition, clothing and textiles, home management, hospitality, family resource management and entrepreneurship through continuous demonstration, observation, experimentation and repeated practice. These practical experiences enable learners to develop competencies that enhance employability, self-reliance and lifelong learning.

Despite its practical orientation, effective skill acquisition in Home Economics Education continues to face numerous instructional challenges, particularly in resource-constrained educational environments. According to Aliyu (2023), many educational institutions encounter shortages of modern instructional facilities, digital infrastructure, qualified teachers and practical learning resources required for effective competency development. Holmes et al. (2022) observed that innovative digital technologies can complement conventional instructional approaches by providing learners with interactive simulations, virtual laboratories, intelligent tutoring systems and immediate feedback mechanisms. They further argued that these technologies create opportunities for repeated practice, individualized learning and authentic assessment, thereby strengthening practical skill acquisition even where physical instructional resources are limited.

In recent times, Artificial Intelligence has increasingly been recognized as a transformative technology capable of enhancing competency-based learning across educational systems. UNESCO (2024) emphasized that AI supports learner-centred education by enabling adaptive learning pathways that respond to individual learners' strengths, weaknesses, interests and learning pace. According to Alufa (2022), AI-powered educational technologies facilitate intelligent performance monitoring, personalized learning recommendations, predictive learning analytics and automated formative assessment that improve competency development. Luckin (2022) further explained that AI does not replace teachers but rather augments instructional processes by providing learners with timely feedback, personalized support and opportunities for continuous improvement. Consequent upon this, AI aligns closely with competency-based education because it emphasizes mastery of practical skills rather than completion of instructional time.

Within Home Economics Education, AI is believed to provide significant opportunities for enhancing practical instruction across various specialization areas. According to UNESCO (2024), AI technologies such as intelligent tutoring systems, virtual reality, augmented reality, computer vision and adaptive learning platforms have the capacity to transform practical teaching and learning by creating immersive, interactive and authentic learning environments. Igbadumhe (2025) opined that AI-powered simulations enable learners to practice vocational tasks repeatedly without the limitations associated with costly equipment or restricted laboratory access. Similarly, Luckin (2022) asserted that integrating AI into vocational education enhances students' creativity, critical thinking, entrepreneurial competence, digital literacy and problem-solving abilities, which are essential competencies for success in the Fourth Industrial Revolution. Against this backdrop, this paper examines the role of Artificial Intelligence in enhancing practical skill development in Home Economics Education.

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Conceptual Clarifications

1. ***Artificial Intelligence:*** Artificial Intelligence (AI) refers to the branch of computer science that develops intelligent systems capable of performing tasks requiring human cognitive abilities such as learning, reasoning, problem-solving, decision-making and language understanding. According to Mutlu Cukurova (2024), AI extends human intelligence by supporting learning, cognition and decision-making within educational environments. Similarly, Wang et al. (2024) explained that AI integrates computer science, educational psychology and data analytics to improve teaching and learning. Shi and Choi (2024) noted that AI applications in education include intelligent tutoring systems, adaptive learning platforms, generative AI, learning analytics, educational chatbots and automated assessment systems that personalize learning, monitor learners' progress and support teachers' instructional decisions. The evolution of AI in education has progressed from early rule-based tutoring systems to intelligent technologies driven by machine learning, natural language processing, deep learning and generative AI. According to Wang et al. (2024), contemporary AI facilitates personalized, adaptive and collaborative learning through continuous analysis of learner data. Li et al. (2025) explained that AI now promotes learner-centred education by enhancing creativity, critical thinking and self-directed learning, while Owoc et al. (2021) maintained that technologies such as virtual assistants, automated grading, learning analytics, virtual reality and generative AI have become integral to modern instructional delivery and educational innovation.
2. ***Home Economics Education:*** Home Economics Education is a multidisciplinary programme within Technical and Vocational Education and Training (TVET) that equips learners with practical knowledge, vocational competencies and life skills for productive living, entrepreneurship and sustainable development. According to International Federation for Home Economics (2024), the discipline empowers individuals and families through competencies in resource management, consumer education and healthy living. Shehu et al. (2024) explained that Home Economics Education prepares learners for self-reliance and employment through competency-based instruction while Ehioghiren and Uko-Aviomoh (2023) argued that it contributes to wealth creation, poverty reduction and national development. Its major objectives include developing practical skills, promoting family welfare, encouraging entrepreneurship and preparing learners for lifelong personal and professional development (Federal Republic of Nigeria (FRN), 2013). The discipline comprises major components including food and nutrition, clothing and textiles, home management, family living and entrepreneurship. According to Akhurst (2024), food and nutrition develops competencies in meal planning, food preparation and food safety while Shehu et al. (2024) explained that clothing and textiles and home management equip learners with garment construction, textile selection and household resource management skills. Deagon (2021) maintained that family living promotes interpersonal relationships and responsible decision-making, whereas Ehioghiren and Uko-Aviomoh (2023) asserted that entrepreneurship equips learners with business and enterprise development skills. Together, these components prepare learners with practical competencies required for employment, self-reliance and sustainable livelihoods.
3. ***Practical Skill Development:*** Practical skill development is the process through which learners acquire and demonstrate the technical, cognitive and psychomotor competencies

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required for effective performance in occupational and everyday tasks. It emphasizes experiential learning through repeated practice, observation and real-life application rather than theoretical instruction alone. According to the ILO (2022), skills development equips individuals with competencies that improve employability, productivity and lifelong learning. Similarly, Mindanao et al. (2025) explained that practical skill development enables learners to translate classroom knowledge into workplace competence, while Odebiyi et al. (2022) presented that it bridges the gap between theory and industry expectations through competency-based instruction, continuous assessment, creativity and problem-solving. In Home Economics Education, practical skill development is fundamental to preparing learners for productive living and entrepreneurship. According to Taar and Palojoki (2022), home economics promotes twenty-first-century competencies through authentic practical engagement, collaboration and critical thinking. Mindanao et al. (2025) maintained that learners are expected to acquire competencies in food preparation, clothing construction, home management, interior decoration, consumer education, childcare and hospitality, alongside entrepreneurial and digital skills. Odebiyi et al. (2022) explained that practical competence also involves communication, teamwork, adaptability, ethical responsibility and the effective use of digital technologies. Consequently, practical skill development equips Home Economics graduates with the competencies needed for employment, innovation and sustainable socio-economic development.

Theoretical Framework

The study is hinged on Kolb Experiential Learning Theory of 1984. The theory is founded on the premise that meaningful learning occurs through direct experience, followed by reflection, conceptualization and active experimentation. According to Kolb (1984), learning is a continuous process whereby knowledge is created through the transformation of experience rather than through passive reception of information. Kolb explained that effective learning follows a four-stage cyclical process comprising concrete experience, where learners actively engage in practical activities; reflective observation, where they critically reflect on those experiences; abstract conceptualization, where they develop theories or concepts from their reflections; and active experimentation, where they apply newly acquired knowledge to solve problems or perform similar tasks in new situations. The theory has gained renewed relevance through the integration of Artificial Intelligence (AI), which provides learners with authentic and interactive learning experiences via intelligent tutoring systems, virtual laboratories, augmented reality (AR), virtual reality (VR), simulation-based learning environments and AI-powered feedback systems.

The Experiential Learning Theory was considered relevant to the study because it emphasizes that practical skills are most effectively acquired through active participation, continuous practice, reflection and application of knowledge in authentic contexts. Therefore, Home Economics Education is inherently practical, requiring learners to develop competencies in food and nutrition, clothing and textiles, home management, family living and entrepreneurship through hands-on activities rather than theoretical instruction alone. The integration of Artificial Intelligence into Home Economics Education aligns with the assumptions of Kolb's theory by providing AI-supported simulations, virtual practical laboratories, intelligent tutoring systems, adaptive learning platforms and real-time feedback mechanisms that enable learners to engage in repeated practical experiences and reflective

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learning. These AI technologies create safe, flexible and resource-efficient environments where students can practice vocational skills, identify errors, receive immediate corrective feedback and refine their competencies before undertaking real-world practical tasks. Therefore, the Experiential Learning Theory appropriately explains how Artificial Intelligence can enhance practical skill development in Home Economics Education by promoting experiential, learner-centred, competency-based and reflective learning experiences that improve students' occupational competence, creativity, problem-solving abilities and readiness for the modern workplace.

Artificial Intelligence in Enhancing Practical Skill Development in Home Economics Education

The roles of artificial intelligence in enhancing practical skill development in home economics education are discussed as follows:

1. ***Personalized Practical Learning:*** Artificial Intelligence enhances practical skill development in Home Economics Education by providing personalized learning experiences that accommodate learners' diverse abilities, interests and learning pace. AI-powered adaptive learning systems analyze students' performance and recommend individualized learning activities, practical exercises and instructional resources based on identified learning needs. According to Wang et al. (2024), AI-driven adaptive learning technologies employ learning analytics and predictive algorithms to personalize instruction, thereby improving learners' engagement and competency acquisition. Liu and Zhong (2024) explained that AI-supported personalized learning encourages experiential learning by allowing students to progress at their own pace while receiving individualized support throughout the learning process. In Home Economics Education, personalized AI platforms can recommend different practical activities in food preparation, clothing construction, home management and entrepreneurship according to students' competency levels, thereby promoting mastery learning and improving practical performance.
2. ***Intelligent Demonstration of Practical Skills:*** AI facilitates the demonstration of practical skills by providing interactive visualizations, intelligent instructional videos, virtual demonstrations and conversational tutoring systems that simplify complex practical procedures. According to García-Méndez et al. (2024), AI-powered virtual tutors provide learners with step-by-step guidance and contextual explanations that enhance understanding of practical procedures. Elnaffar et al. (2025) argued that AI tutoring systems improve learners' practical performance by providing immediate instructional support, personalized hints and corrective guidance during skill acquisition. In Home Economics Education, AI-enhanced demonstrations enable students to repeatedly observe practical activities such as cake decoration, garment construction, food preservation and household management procedures before undertaking physical practice, thereby improving confidence and procedural accuracy.
3. ***AI-Supported Virtual Practical Laboratories:*** AI-supported virtual laboratories and simulations provide authentic learning environments where students can practice practical competencies without the limitations associated with physical laboratories, equipment shortages, or safety risks. According to Almasri (2024), AI-powered simulation environments create immersive learning experiences that improve students' practical competence, conceptual understanding and learner engagement. Ogunleye et al. (2024) explained that generative AI applications can facilitate virtual experimentation,

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practical demonstrations and interactive simulations that strengthen competency-based education. In Home Economics Education, virtual kitchens, digital sewing simulations, interior design applications and household management simulations enable students to practice repeatedly, make mistakes without serious consequences and refine their practical competencies before engaging in real-life practical activities.

4. ***Enhancing Food and Nutrition Skills:*** Artificial Intelligence contributes significantly to developing competencies in food and nutrition by supporting meal planning, nutritional analysis, food safety education, recipe customization and dietary decision-making. According to Bali et al. (2024), AI technologies are increasingly supporting vocational education by improving instructional efficiency and exposing learners to emerging digital workplace technologies. Adewale et al. (2024) maintained that AI-powered learning environments improve learners' understanding through personalized recommendations, intelligent content delivery and continuous performance monitoring. Based on this, Home Economics students can utilize AI applications to analyze nutritional values, develop balanced diets, evaluate food safety practices and improve food preparation techniques while strengthening both practical competence and digital literacy.
5. ***Improving Clothing and Textile Skills:*** AI is transforming clothing and textile education through intelligent fashion design software, digital pattern drafting, virtual garment fitting, textile visualization and computer-aided design applications. According to Wang et al. (2024), AI technologies enable learners to integrate creativity with digital innovation through intelligent design tools and adaptive instructional systems**.** Celik et al. (2024) explained that AI-based educational tools promote creativity, collaboration and practical competence by allowing learners to experiment with innovative solutions in authentic learning environments. Home Economics students therefore acquire practical competencies in fashion illustration, clothing construction, textile selection and apparel entrepreneurship using AI-supported applications that mirror technologies increasingly adopted within the fashion industry.
6. ***Enhancing Interior Decoration and Home Management Skills:*** Artificial Intelligence improves instruction in home management and interior decoration by providing intelligent planning tools, virtual design software, smart home simulations and digital resource management applications. According to Oparaduru and Uchendu (2024), AI enhances teaching effectiveness by personalizing instructional content and creating interactive learning environments that improve learner engagement. Wang et al. (2024) observed that AI facilitates data-driven decision-making and adaptive learning that strengthen competency development across vocational disciplines. Through AI-supported interior design software and household resource management applications, Home Economics students can develop competencies in space planning, colour coordination, budgeting, energy management and sustainable household management while gaining familiarity with contemporary digital technologies.
7. ***Improving Entrepreneurial Skills:*** Entrepreneurship education within Home Economics benefits considerably from AI through business planning tools, market analysis applications, customer relationship systems, digital marketing platforms and financial forecasting technologies. According to Celik et al. (2024), AI-based educational tools support the development of creativity, communication, innovation and entrepreneurial competencies required in the twenty-first-century economy. Bali et al. (2024) argued that AI prepares learners for emerging labour market demands by strengthening digital

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competencies and technology-driven innovation. Home Economics students can therefore utilize AI technologies to generate business ideas, analyze consumer behaviour, develop marketing strategies and manage small enterprises more effectively, thereby promoting self-employment and economic sustainability.

8. ***Promoting Critical Thinking and Creativity:*** Artificial Intelligence promotes critical thinking and creativity by engaging learners in inquiry-based learning, collaborative problem-solving, design thinking and authentic decision-making tasks. According to Celik et al. (2024), AI-supported learning environments enhance higher-order thinking skills by encouraging learners to analyze information, generate creative solutions and evaluate alternative perspectives. Almasri (2024) further explained that AI creates opportunities for learners to engage actively with complex learning tasks that promote innovation and reflective thinking. Within Home Economics Education, AI encourages students to design innovative clothing styles, develop nutritious meal plans, solve household management problems and create entrepreneurial products capable of meeting contemporary consumer needs.
9. ***Improving Problem-Solving Skills:*** Problem-solving is a fundamental competency in Home Economics Education and AI significantly enhances its development by exposing learners to authentic scenarios requiring critical analysis and informed decision-making. According to Wang et al. (2024), AI systems support learners in solving practical problems by providing intelligent recommendations, predictive analytics and adaptive instructional guidance. Adewale et al. (2024) maintained that AI-powered learning environments strengthen students' analytical abilities through continuous interaction, personalized guidance and data-driven learning experiences. In line with this, Home Economics students develop stronger competencies in addressing practical challenges relating to nutrition, clothing production, household budgeting, family welfare and entrepreneurship using AI-supported decision-making tools.
10. ***Enhancing Independent Learning:*** Artificial Intelligence promotes independent learning by providing learners with unrestricted access to intelligent tutors, personalized learning pathways, digital resources and real-time academic support beyond the classroom. According to García-Méndez et al. (2024), AI-powered virtual tutors encourage self-directed learning by allowing students to learn independently while Elnaffar et al. (2025) observed that receiving immediate explanations and feedback whenever needed. AI tutoring systems strengthen learner autonomy by guiding students through practical tasks without completely replacing the role of teachers. In Home Economics Education, independent learning enables students to practice food preparation, garment construction, home decoration, budgeting and entrepreneurial planning beyond scheduled classroom sessions, thereby strengthening competency acquisition, lifelong learning habits and digital confidence.
11. ***Enhancing Home Economics Graduates' Industry Relevance:*** Artificial Intelligence (AI) enhances the industry relevance of Home Economics graduates by equipping them with digital, technical and entrepreneurial competencies required in modern workplaces. As industries increasingly adopt intelligent technologies, graduates must possess both vocational expertise and digital proficiency. According to Dirk et al. (2020), AI-driven learning develops workplace-relevant competencies such as digital problem-solving and technology-enhanced decision-making. Similarly, Tlili et al. (2023) explained that AI promotes innovation, creativity, collaboration and digital competence,

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while Aoun (2024) argued that AI prepares graduates for the Fourth Industrial Revolution. Consequently, AI makes Home Economics graduates more employable, adaptable and responsive to contemporary industry needs.

12. ***Sustainable Skills Development:*** Artificial Intelligence (AI) promotes sustainable skills development in Home Economics Education by equipping learners with future-oriented competencies such as digital literacy, creativity, innovation, critical thinking and lifelong learning. These competencies enable graduates to adapt to technological changes and evolving labour market demands. According to Ng et al. (2023), AI supports the development of twenty-first-century skills needed for continuous learning and workplace adaptability. Kamalov et al. (2023) also explained that AI enhances personalized learning and competency development that support long-term educational and workforce transformation. Consequently, AI prepares Home Economics graduates with sustainable practical and entrepreneurial skills necessary for employability, innovation and national development

Challenges of Integrating Artificial Intelligence into Home Economics Education

The challenges influencing the integration of Artificial Intelligence into Home Economics Education are discussed as follows:

1. ***Inadequate ICT Infrastructure:*** The successful integration of Artificial Intelligence (AI) into Home Economics Education depends largely on the availability of robust Information and Communication Technology (ICT) infrastructure. However, inadequate digital infrastructure remains one of the most significant barriers to AI adoption, particularly in many developing countries where internet connectivity, computer laboratories, broadband access, cloud computing facilities and digital devices are either insufficient or obsolete. AI-powered instructional tools such as intelligent tutoring systems, virtual laboratories, learning analytics platforms and generative AI applications require reliable internet services, high-performance computing devices and secure digital platforms for effective operation. According to Boateng (2024), many African educational institutions continue to face inadequate access to computers, internet connectivity and digital learning resources, thereby limiting the effective deployment of AI-supported teaching and learning. Similarly, Alli (2025) explained that inadequate ICT infrastructure significantly constrains AI integration in higher education by limiting access to intelligent learning platforms, digital resources and advanced computing technologies required for AI-enhanced instruction. Inadequate ICT facilities restrict students' opportunities to engage with virtual food laboratories, computer-aided fashion design software, smart home simulations and AI-driven entrepreneurial applications, thereby reducing the effectiveness of competency-based learning.
2. ***Poor Electricity Supply:*** Reliable electricity supply is an essential prerequisite for the effective utilization of AI technologies in education because AI-powered devices, cloud-based platforms, internet services and digital laboratories depend on uninterrupted electrical power. In many developing countries, particularly across sub-Saharan Africa, unstable electricity supply continues to undermine the implementation of digital learning initiatives and AI-supported instructional practices. According to Boateng (2024), persistent electricity shortages across many African educational institutions limit access to AI technologies and reduce opportunities for technology-enhanced teaching and learning. The study further observed that inconsistent power supply disrupts internet

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connectivity, damages ICT equipment and discourages sustained use of AI-powered educational applications. Similarly, Vahrenhold et al. (2025) argued that AI integration requires dependable digital infrastructure, including stable electricity and network services, to ensure uninterrupted access to intelligent educational systems. Poor electricity supply affects the use of virtual practical laboratories, smart kitchen technologies, digital sewing machines and AI-supported instructional software, thereby limiting students' exposure to innovative learning experiences.

3. ***Limited Funding:*** Limited financial resources constitute a major obstacle to the adoption and sustainability of AI technologies in Home Economics Education. The acquisition of AI-enabled hardware, licensed software, cloud computing services, high-speed internet infrastructure, smart classrooms and continuous teacher professional development requires substantial financial investment, which many educational institutions cannot adequately provide. According to Sentance et al. (2022), inadequate funding remains one of the primary factors limiting investment in ICT infrastructure, curriculum implementation and teacher professional development across many African educational systems. Similarly, Sambo-Magaji et al. (2025) explained that insufficient funding hinders the procurement of AI technologies, maintenance of digital infrastructure and implementation of sustainable AI initiatives in Nigerian educational institutions.
4. ***Lack of Teacher Competence****:* Teachers play a central role in the successful integration of Artificial Intelligence into teaching and learning; however, inadequate AI literacy and digital pedagogical competence among educators remain major challenges. Many Home Economics teachers have limited knowledge of AI applications, instructional technologies, prompt engineering, learning analytics and ethical AI use, thereby reducing their confidence and effectiveness in integrating AI into classroom instruction. According to Samuel et al (2025), inadequate teacher competence, low digital literacy and insufficient professional development significantly constrain the effective adoption of AI within Nigeria's education system. In the same vein, Eke (2024) reported that although many Nigerian teacher educators demonstrate positive attitudes toward AI adoption, gaps remain in practical AI knowledge, pedagogical integration skills and continuous professional training. Eke further stressed that inadequate teacher competence limits the effective utilization of AI-powered recipe applications, virtual sewing simulations, smart home management software and intelligent tutoring systems that could otherwise enrich practical instruction.
5. ***High Cost of AI Technologies****:* The high cost associated with acquiring, implementing and maintaining AI technologies poses another significant challenge to their integration into Home Economics Education. Effective AI deployment requires investment in sophisticated computer systems, cloud computing infrastructure, licensed software, data storage facilities, cybersecurity systems and regular technological upgrades. In addition, institutions must invest in technical support personnel, software maintenance and continuous user training to ensure sustainable implementation. According to Alli (2025), the financial cost of establishing AI-ready educational environments remains beyond the capacity of many higher education institutions in Nigeria, particularly where competing educational priorities exist. Boateng (2024) explained that the affordability of AI technologies remains a major concern across Africa, where many educational institutions struggle to procure essential digital infrastructure and computing resources required for AI-enhanced teaching and learning. Alli also stated that the high cost of AI-supported

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fashion design software, smart kitchen equipment, virtual laboratories and intelligent learning platforms limits students' access to innovative instructional experiences.

Implications for Home Economics Education

The integration of Artificial Intelligence (AI) into Home Economics Education has far-reaching implications for improving the quality, relevance and sustainability of vocational education. AI transforms Home Economics from a predominantly traditional practical discipline into a technology-driven programme that prepares learners for the realities of the digital economy. Through intelligent tutoring systems, virtual practical laboratories, adaptive learning platforms, generative AI and learning analytics, educators are able to provide personalized instruction, strengthen practical skill acquisition and promote competency-based learning that aligns with twenty-first-century workforce expectations. AI has the potential to improve educational quality by supporting personalized learning, enhancing teachers' instructional practices and equipping learners with the competencies needed to thrive in rapidly changing labour markets. Similarly, Ng et al. (2023) explained that AI integration promotes digital literacy, creativity, critical thinking, collaboration and lifelong learning, all of which are essential competencies for future-ready graduates. In line with this, Home Economics graduates equipped with AI-related competencies become more innovative, adaptable, entrepreneurial and capable of utilizing intelligent technologies in food and nutrition, fashion and textiles, home management, hospitality and family resource management, thereby increasing their employability and professional relevance in an increasingly technology-driven society.

Beyond its educational benefits, AI-driven Home Economics Education has significant implications for national development by contributing to human capital development, economic growth, employment generation, technological innovation and sustainable development. A workforce equipped with AI-supported vocational competencies is better positioned to establish technology-enabled enterprises, improve productivity and respond effectively to emerging industrial and societal challenges. According to World Economic Forum (2025), advances in AI are reshaping labour markets by increasing demand for workers with digital, analytical, creative and technological competencies while making continuous reskilling and upskilling indispensable for sustainable economic development. Likewise, the International Labour Organization (2024) emphasized that strengthening digital and vocational skills is fundamental to promoting decent work, improving productivity and fostering inclusive economic growth in the era of digital transformation. In Nigeria, integrating AI into Home Economics Education offers opportunities to strengthen entrepreneurship, reduce graduate unemployment, improve food security, modernize the fashion and hospitality industries, promote innovation among small and medium-sized enterprises and accelerate progress toward sustainable national development. Therefore, sustained investment in AI-enabled vocational education will not only improve educational outcomes but also strengthen national competitiveness, economic resilience.

Conclusion

Artificial Intelligence has emerged as a transformative force with immense potential to redefine Home Economics Education by enhancing practical skill development, improving teaching effectiveness, increasing learner engagement, promoting flexible and lifelong learning and equipping graduates with industry-relevant and digital competencies. As discussed in this paper, AI-powered technologies such as intelligent tutoring systems, adaptive learning platforms, virtual practical laboratories, generative AI and learning analytics provide innovative approaches

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to competency-based teaching and learning that align with the evolving demands of the twenty-first-century workplace. Despite challenges such as inadequate ICT infrastructure, poor electricity supply, limited funding, insufficient teacher competence, high implementation costs and curriculum limitations, these barriers can be overcome through strategic curriculum reforms, sustained teacher capacity building, increased government investment, improved digital infrastructure, effective AI policy implementation, the provision of smart laboratories and the promotion of AI literacy among learners. The successful integration of AI into Home Economics Education will not only strengthen the practical competencies, creativity, entrepreneurial capacity and employability of graduates but also contribute significantly to human capital development, technological innovation, economic growth and sustainable national development.

Strategies for Effective Integration of Artificial Intelligence into Home Economics Education

1. ***Curriculum Revision****:* Curriculum revision is fundamental to the effective integration of Artificial Intelligence (AI) into Home Economics Education because existing curricula in many institutions do not adequately reflect the digital competencies and AI-related skills required in contemporary vocational practice. A revised curriculum should incorporate AI concepts, digital literacy, data-driven decision-making, ethical AI use, intelligent instructional technologies and industry-oriented practical experiences across core Home Economics components such as food and nutrition, clothing and textiles, home management and entrepreneurship. According to Ayanwale et al. (2024), AI literacy should be embedded within teacher education curricula to equip future educators and learners with the competencies needed to utilize AI effectively and responsibly.
2. ***Teacher Capacity Building****:* Effective AI integration in Home Economics Education depends largely on teachers who possess adequate AI literacy, digital pedagogical competence and the ability to integrate intelligent technologies into practical instruction. Continuous professional development through workshops, certifications, mentoring and hands-on training enables teachers to confidently use AI-powered instructional tools such as intelligent tutoring systems, virtual simulations, adaptive learning platforms and automated assessment applications. According to Eke (2024), although Nigerian teacher educators demonstrate positive attitudes toward AI adoption, sustained professional training is necessary to strengthen their practical competence in AI-supported teaching.
3. ***Improved Government Funding****:* Adequate government funding is indispensable for the successful implementation of AI in Home Economics Education because AI integration requires substantial investment in digital infrastructure, software, smart instructional technologies, teacher training, maintenance and internet connectivity. Sustainable funding enables institutions to procure AI-enabled equipment, establish technology-rich learning environments and support continuous innovation in vocational education. According to FRN (2024), recent education reforms prioritize teacher development, digital transformation and skill acquisition to improve educational quality and prepare learners for emerging technologies.
4. ***Digital Infrastructure Development****:* Developing robust digital infrastructure is essential for integrating AI into Home Economics Education because AI-powered learning depends on reliable internet connectivity, adequate computing facilities, cloud-based platforms, digital devices and secure information systems. Without these foundational resources, institutions cannot effectively deploy intelligent tutoring systems, virtual

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laboratories, learning analytics, or AI-supported simulations. According to Omole (2026), the readiness of Nigerian universities for AI-driven education depends significantly on improvements in ICT infrastructure, network capacity, computing resources, software availability and stable electricity supply.

5. ***Provision of Smart Laboratories****:* The establishment of smart laboratories is critical to enhancing practical skill development in Home Economics Education because they provide technology-rich environments where learners can interact with AI-powered equipment, virtual simulations, intelligent instructional software and digital practical applications. Smart laboratories support experiential and competency-based learning by allowing students to practice vocational skills repeatedly while receiving immediate feedback through AI-enabled systems.
6. ***AI Literacy for Students***: Developing AI literacy among students is essential for ensuring that they can use AI technologies effectively, ethically and responsibly in academic, professional and everyday contexts. AI literacy extends beyond learning how to use AI tools; it includes understanding AI concepts, recognizing their capabilities and limitations, evaluating AI-generated information critically, addressing ethical issues and applying AI creatively to solve real-world problems. Tadimalla and Maher (2024) opined that AI literacy programmes should equip learners with technical understanding, responsible AI use, ethical awareness and interdisciplinary problem-solving competencies rather than focusing solely on programming skills. Integrating AI literacy into Home Economics Education will therefore prepare students to utilize intelligent technologies in food and nutrition, fashion design, home management and entrepreneurship while enhancing their digital competence, employability and lifelong learning skills.

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