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APPLICATION OF TECHNOLOGICAL INNOVATION IN TEACHING AND LEARNING OF ADULTS IN ANAMBRA STATE

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Abstract.
This study was to explored how technological innovation could enhance successful teaching and learning of adults in Anambra State. The target population comprised 44,734 registered adult learners across 286 adult literacy centres in the state, including 18,330 males and 26,073 females, along with 331 instructors. Using a simple random sampling technique, 50 centres were selected, from which a sample of 522 adult learners was drawn. All 331 adult educators were included in the study, resulting in a total sample size of 853 participants. The study adopted a descriptive survey design and was guided by three research questions. A 15-item researcher-developed rating scale was used to collect data from the respondents. The data were analysed using mean and standard deviation. The result of the study showed that technological innovations improved teaching and learning outcomes by making education more accessible, increasing knowledge retention and effectiveness, enhanced vocations and experimental learning improves engagement and efficacy, improving assessment and feedback, increasing learners' participation among others. Some of the challenges encountered in integrating technological innovations into teaching and learning of adults include digital literacy gap, technological accessibility, resistance to change by both educators and learners, lack of finance, etc. The recommendations include that efforts should be made by government and stakeholders to ensure funding of technology driven adult learning centres as a matter of urgency to facilitate easy access of the technological facilities to the people. Adult educators should be trained on use of various technological innovative facilities to aid teaching and learning and capacity building of the adult learning should be encouraged to ensure smooth and easy access to technological facilities.

Keywords: Application, technological innovation, teaching, learning, adults, Anambra State

Introduction

Teaching and learning of adults facilitate technological development both in families and larger society. It is a way of eradicating illiteracy and poverty. Teaching and learning of adults constitute a vital element in deciding the level of contributions of adults to nation building. That the nation is still witnessing high rate of illiteracy and poverty in technological development could be attributed to low performance in teaching and learning of adults. United Nations Educational, Scientific and Cultural Organisation (UNESCO) (2005) stated that the adult literacy rate was above 41%as of 2018, representing above 62% literacy rate. It is becoming increasingly difficult for adults to function effectively without good measure of acquired learning. Osilike (2022) noted that adults are the people in the forefront of development both at nationwide and grassroot level, so a sure way to improve these adults for effective contribution is through teaching and learning. In spite of efforts made by federal government agencies and parastatals to improve teaching and learning of adults through establishment of such programmes as mass literacy campaign, Education for all, life-long education etc., the country still have a high percentage of illiteracy. One cannot use same method over and over and expect to have different results. As the society changes and the world becoming a global village, new concepts, procedure and method as well as adaptation skills is needed. In March 2023, the Anambra State Government, in partnership with

Microsoft and Wootlab Foundation, initiated programme to train 20,000 people in digital skills. This initiative underscores the state dedication to positioning Anambra State as a centre of excellence for human capital development and digital empowerment. Moreso, in November 2023, the Anambra State Government partnered with Descent Job Tech Skills to launch the Code Anambra Programme. This initiative aims to equip youths with advanced digital skills, including Web Development, Cloud Computing, and Artificial Intelligence (AI). In 2024, the United Nations Development Programme (UNDP), in collaboration with the Anambra State Government, established a state-of-the-art Makerspace in Awka. This facility is designed to democratize access to technological resources, empowering both young and older entrepreneurs and innovators to transform their ideas into viable solutions. The initiative aligns with the State's agenda of "Everything Technology, Technology Everywhere". Technological innovation can serve as vehicle for enhancing teaching and learning of adults for obvious transformation

Technological innovation refers to the process of developing, improving and applying new technologies to solve problems, increase efficiency, creating new produces, services, or processes. It involves the invention or improvement of tools, system, methods or devices that significantly enhance how tasks are performed in various fields like business, education, healthcare, engineering, or everyday life. According to Schilling (2022) technological innovation refers to the creation and implementation of new or significantly improved technologies, processes or products that leads to enhanced efficiency, productivity, or value creation. It is a key driver to economic growth, competitiveness, and societal advancement. Okebukola (2025) emphasises the role of technological innovation in improving the quality of higher education, highlighting how innovation can reshape teaching, learning and research practices. Babajide (2021) noted that technological innovations have given teaching and learning a new face through its potentials to include an adaptive function to meet the learning needs of individual learners anywhere anytime. Babajide further emphasized that technological innovations are transforming teaching and learning by expanding access to learners worldwide. This global reach is driving a qualitative shift that is redefining traditional teaching methods and learning approaches. UNESCO estimates that there are over 850 million illiterate persons in the world today, constituting 27percent of the adult population, over fifteen years of age in developing countries. Technological innovations are reshaping adult education, providing new opportunities for engagement, retention and personalised learning. As digital teaching and learning platforms, mobile application, artificial intelligence (AI) and Virtual Reality (VR) become more advanced, educators and researchers are examining their effectiveness in improving learning outcomes. The need for paradigm shift from analogue to digital teaching and learning introduced both educators and learners to a new dimension of the growing technological innovation. The world is moving on a fast lane and therefore both educators and learners need to move very fast to catch up at the rate the world is moving. The vehicle required for the movement is integration of technological innovations in the process of teaching and learning of adults. At present, analogue or traditional method of teaching and learning may not serve or enhance teaching and learning, they have to graduate to adoption of digital teaching and learning with growing technological innovations for such is transforming rapidly how adults learn both in formal, non-formal and informal education. This is evident in some of the key aspects of technological innovation which include:

- Novelty, which involves introduction of something new or significantly improved
- Application, which is not just about invention, but also the practical use of the new technology.

- Value creation, which leads to better performance, cost saving, convenience or completely new possibilities.
- Continuous process, that is innovation is ongoing with technologies evolving over time. Enhancing the teaching and learning of adults is very essential for those who intend to abandon their learning programme to make necessary adjustments. The study therefore is concerned with examining how technological innovations foster teaching and learning of adults thereby improving the learning outcomes of adult learners.

Technological innovations enhance adult learning by increasing accessibility, engagements, and effectiveness. Below are the ways in which technology improves learning outcomes for adult learners.

1. Increased Accessibility and Flexibility: Anytime, anywhere learning is made possible with availability of online learning platforms, mobile learning apps and cloud-based resources which allows adult learners to study at their own pace, balancing education with work and family responsibility. Moreso, it allows asynchronous learning (recorded lectures, discussion forums) which ensures that learners can access materials at their convenience.
2. Inclusive learning for diverse needs provides assistive technologies (e.g., screen readers, speech-to text software) which support learners with disabilities and language translation tools help non-native speakers access learning content in their preferred language
3. Enhanced engagement and motivation for example gamification and interactive learning with features such as badges, leaderboards and reward increases motivation and active participation. Also, the availability of simulations, virtual labs and interactive exercises make learning more immersive, encourages personalized and adaptive learning because AI driven learning platforms adjusts content based on learners progress, strengths and weaknesses and self-paced learning paths which allows learners to move at a comfortable speed, reinforcing mastering before advancing.
4. Collaborative and social learning encourages online forum, peer discussions and group projects foster engagement and knowledge sharing. While virtual communities provide networking opportunities and emotional support for adult learners.
5. Improve knowledge retention and skill development: Multimedia and multi-sensory learning like videos, infographics, podcasts and interactive exercises cater to different learning styles (Visual, auditory, kinesthetics).
6. Practical and real-world application: Technology enables experimental learning, where learners apply theoretical knowledge to real world scenarios.
7. Instant feedback and assessment tools provide automated quizzes, AI tutors, and real time analytics provide immediate feedback to help learners improve. Data-driven insights allow instructors to tailor instructions based on learner`s performance.
8. Scalability and cost effectiveness: This encourages lower costs compared to traditional education, for example, online courses and open educational resources (OER) reduces the cost of textbooks, travel and tuition fees. It also offers free and low-cost learning platforms (e.g., Coursera, edX, Khan Academy) make education more affordable. It encompasses scalable learning solutions, for example, e-learning platforms which accommodate thousands of learners simultaneously, remote training which reduces the need for physical classroom space and travel
9. Lifelong learning and professional growth: This ensures continuous upskilling and reskilling. provides opportunities for career advancement through specialized certification and training programs and help adult learned stay relevant in a rapidly evolving job market.

10. Access to global knowledge and experts: Webinars, virtual conferences and online mentorship programmes connects learners with global industry experts. Meanwhile, digital libraries and academic databases provide unlimited access to the latest research and developments.

Adult learners' motivation to engage with technology enhanced learning environments is shaped by a combination of psychological, social, technological and contextual factors. Below are the key factors:

1. Psychological and cognitive factors: Under psychological and cognitive factors we have the following
   - Intrinsic motivation and personal interests: Adult learners are more likely to engage with technology enhanced learning if they find the content relevant to their personal or professional goals. However, self-directed learners who engage exploring new technology have higher motivation.
   - Perceived self-efficacy and confidence: learners who believe they can effectively use technology for learning are more likely to engage and also experiences with technology influence confidence levels.
   - Perceived Usefulness and Relevance: If learners see a direct benefit in improving their careers, skills or daily lives, they are more motivated and applicability of technology - driven learning to real- world tasks enhance engagement.
2. Social and Environmental Factors: These could be discussed under the following:
   - Peers and Instructor Support: Encouragement from instructors, mentors and peers can increase motivation and collaborative learning environments, discussions forums, and group projects enhance engagements.
   - Social Influence and cultural Attitudes towards Technology: Societal norms and community perspectives on technology impact learner willingness to engage, and if technology is widely accepted and promoted, learners are more likely to participate.
   - Workplace or career Requirements: Organizations that encourage employees to upskill using digital platforms can drive motivation. Moreover, certification and credentials obtained through technology -enhanced learning can enhance job prospects.
3. Ease of use and user experience:
   - Platforms that are user friendly, intuitive and accessible increase engagement. Poor design, difficult navigation or technical glitches can discourage participation.
   - Interactivity and Engagement Features: i.e., Gamification (Badges, leader-boards, points) can make learning more enjoyable. However, multimedia content (Videos, Simulators AR/VR) enhances engagements.
   - Flexibility and Accessibility: Self-paced learning options allow adult learners to balance education with work and family responsibilities. Mobile compatibility and offline access make learning more convenient.
4. Socioeconomic and Logistical factors: Financial Constraints and cost of Technology may serve as a demotivator, for example high costs of devices, software and internet access can be barriers, whereas free or low-cost learning platforms increase accessibility and motivation.

5. Digital literacy and Technology skills: It has been observed that learners with higher digital literacy are more likely to engage with technology-enhanced learning. Moreso,

availability of training Programme to improve digital skills can boost confidence and participation.

6. External Incentives and recognition: This is another factor that is capable if influencing and motivating adult learners engagement. There are three different incentives and recognition that motivate adult learners:
    - Certificate and Accreditation: Official recognition of online courses contributes to formal qualifications enhance motivation. Moreso, learners are more engaged when courses contribute to formal qualification
    - Monetary and Career Incentives: Promotions, salary Increase or job opportunities linked to technology enhanced learning boosts motivation,
    - Personal Development Goals: Learners interested in lifelong learning and skill enhancements are more likely to engage with digital platforms.

Despite the advantages of technological innovations, several challenges persist. They include:

1. Limited infrastructure and connectivity: Inadequate internet access, unreliable electricity and lack of digital infrastructure hinder the effective use of technology in teaching and learning of adults.
2. Access and Affordability: High cost of advanced technologies like VR , broadband and mobile data makes it difficult for both educators and learners. (Mayer 2021).
3. Low Digital Literacy Levels: Many adult learners especially in rural areas have limited experience with digital tools making it challenging to navigate online learning platform Van 2020).
4. Lack of Confidence in using technology can lead to resistance or slow adoption of digital education.
5. Financial Constraints: The high cost of acquiring devices (eg Laptops, tablets, Smart phones) and educational software may be prohibitive for rural adult learners. Moreso, limited funding for adult education programmes in rural areas restricts investment in technology -driven learning solutions.
6. Cultural and Attitudinal Barriers: Traditional learning preferences and scepticism towards digital education may affect adoption rates among adult learners and instructors. However, language barriers where technology and online content are not available in local languages create accessibility issues.
7. Lack of trained educators and technical support: Many rural educators may lack the necessary training to effectively integrate technology into their teaching methods. Again limited technical support for troubleshooting issues can discourage learners from engaging with technology. (Kirkwood& price 2016).
8. Sustainability and maintenance Issues: Even when technology is introduced, maintaining and upgrading it can be challenging due to financial and logistical constraints. Dependence on donor- funded projects often leads to short-term success but long-term sustainability concern.

However, the application of technological innovation in the teaching and learning of adults has gained increasing attention globally; however, in the context of Anambra State, there remains a significant gap in research that addresses how effectively these technologies are integrated into adult education programs. Existing studies tend to focus on formal education settings, often overlooking the unique needs, challenges, and opportunities associated with adult learners. This study addresses that gap by examining the current state of technological adoption in adult learning environments in Anambra State, thereby contributing to a deeper understanding of its impact and potential within the region.

Statement of problem

For any meaningful teaching and learning of adults to take place, roles of technology and its adoption in adult education programmes cannot be played down. It has been acknowledged that the technology is rapidly transforming how adult learn, and at the same time addressing the need for upskilling and reskilling in a changing job market. Laudable opportunities meant to benefit the adult learners when technological innovations are integrated into adult teaching and learning have witnessed some lapses and weakness. Regrettably, integrating technological innovations into adult education is faced with numerous problems which hinder successful teaching and learning thereby hindering smooth running of the adult programmes. These problems ranges from Educators lacking the training required to effectively integrate digital tools into adult learning, digital literacy gap and resistance to change. It is believed that teaching and learning of adults when enhanced through technological innovations will have broad implications in education, Workforce development and lifelong learning. This then necessitates the need to ascertain how technological innovation enhance teaching and learning of adults in Anambra state.

Purpose of the Study

The aim of the study is to explore the application of technological innovation in enhancing teaching and learning of adults. Specifically, the objectives of the study includes to

1. ascertain how technological innovations can improve teaching and learning outcomes of adult learners;
2. examine factors influencing adult learners' motivation to engage with technology-enhanced learning; and
3. determine the challenges in integrating technological innovations into adult education.

Research questions

The following research questions guided the study

1. How do technological innovations improve teaching and learning of adult learners?
2. What are the factors influencing adult learners' motivation to engage with technology enhance learning?
3. What are the challenges in integrating technological innovation into adult education?

Methods

The descriptive survey design was adapted in this study. The area of study was Anambra state of Nigeria. The population for the study was forty-four thousand, seven hundred and thirty-four (44,734) registered adult learners in two hundred and eighty-six (286) adult literacy centres in Anambra State, comprising eighteen thousand, three hundred and thirty (18,330) males and twenty-six thousand seventy-three (26,073) females together with three hundred and thirty-one (331) instructors. Fifty (50) centres were selected using simple random sampling technique from which a sample of 522 adult learners was used. All the 331 adult educators were used giving a total of 853 sample size for the study. The instrument for data collection was a researchers' made questionnaire rated on a four-point Likert-scale. They are strongly agree (SA), Agree (A), disagree (D) and Strongly Disagree (SD). Mean ratings were used to answer the research questions. A mean score of 2.5 and above were considered as being significant while a mean score below 2.5 was considered insignificant.

Results

Research Question 1: How do technological innovations improve teaching and learning of adult learners?

Table 1. Mean rating of technological innovations on improving learning outcomes

S/N	Item	$\bar{X}$	Decision
1.	Technological innovations increased accessibility and flexibility, i.e. it allows Anytime, anywhere learning	2.81	Accepted
2.	It allows inclusive learning for diverse needs thereby help Learners retain information more effectively	2.75	Accepted
3.	It enhances engagement and motivation	2.66	Accepted
4.	Improves knowledge retention and skill development	2.76	Accepted
5.	It encourages lifelong learning and professional growth	2.71	Accepted

Grand Mean 2.74

The result as shown in table I revealed that respondents agreed that all five items are some of the ways technological innovations improve learning outcomes as indicated by mean score of above 2.50. The grand mean for all the items was 2.74, indicating that technological innovations improve learning outcome.

Research Question 2: What are the factors influencing adult learners' motivation to engage with technology enhance learning?

Table 2: Mean score on the factors influencing adult learners motivation to engage with technology

S/N	Item	$\bar{X}$	Decision
1.	Perceived usefulness and relevance	2.78	Accepted
2.	Social influence and cultural attitudes toward technology	2.72	Accepted
3.	Workplace and career requirements	2.75	Accepted
4.	Ease of use and users experience. i.e. platforms that are user friendly intuitive and accessible increases engagement	2.83	Accepted
5.	Socio- economic and logistical factor: ie financial constraints and cost of technology	2.76	Accepted

Grand Mean 2.77

Results presented in Table 2 show that all the items are factors influencing adult learners' motivation to engage with technology, with mean scores above 2.50. The grand mean of 2.77 further indicates that these factors significantly influence adult learners' motivation to participate in technology-enhanced learning.

Research Question 3: What are the challenges in integrating technological innovation into adult education?

Table 3: Mean ratings on the challenges in integrating technological innovations into adult education.

S/N	Item	$\bar{X}$	Decision
1.	limited infrastructure and connectivity ie inadequate internet access, unreliable electricity etc.	2.82	Accepted
2.	Low digital literacy levels, i.e., many adult learners have limited Experience with digital tools.	3.18	Accepted
3.	Financial constraints i.e high costs of acquiring device (e.g. laptop, smartphone and educational software).	2.89	Accepted
4.	Cultural and attitudinal barriers i.e., language barriers and traditional learning preferences.	2.88	Accepted
5.	Lacked of trained educators and technical support i.e., many	2.86	Accepted

Educators lack the necessary training to effectively integrate technology into their teaching methods	
Grand Mean	2.93

Table 3 indicates that all the items represent challenges hindering the effective integration of technological innovations into adult learning, with corresponding mean scores above 2.50 and a grand mean of 2.93.

Discussions

Data in table I Shows that there are improvements which can be derived from integrating technology into the teaching and learning of adults, which include increased accessibility and flexibility which allows learning anytime and anywhere, improves Retention of information effectively, improves skill development and encourages lifelong learning. This is in line with the view of Okebukola (2025) that the technological innovations improve adult learning in the following ways such as making learning flexible and accessible, increasing engagement and motivation, increasing knowledge retention and skill development and encourages cost effectiveness. Technological innovation has great contribution to lifelong learning. Data in Table 2 reveal that there are factors influencing adult learners motivation to engage with technology which some of them include, content relevant to personal or professional goals, work place or career requirement, peers and instructors support and external incentives and recognition and cultural attitudes towards technology. This agrees with the statement of Okebukola (2025) and Babajide (2021) that many adult educators and facilitators believe that intrinsic motivation and personal interests affects adoption of adult learner to engaging with technology enhanced learning. While Table 3 reveals that there are challenges that militate against effective integration of technological innovation into adult learning in Anambra state, they include among others, Limited infrastructure and connectivity, low digital literacy level, financial constraints, cultural and attitudinal barriers and lack of trained education. These factors could hamper the effective integration of technological innovation into adult learning as stressed by Van (2020) that there are challenges militating against effective integration of technological innovations into adult learning.

Conclusion

The findings of this study have important implications for improving the teaching and learning of adult learners. The results show that technological innovations significantly enhance educational outcomes in Anambra State by improving accessibility, learner engagement, knowledge retention, and skill development. Adult learners' motivation to engage with technology-enhanced learning is influenced by factors such as perceived relevance, ease of use, social and workplace expectations, and economic conditions. However, challenges such as inadequate infrastructure, low digital literacy, financial constraints, and a shortage of trained educators continue to hinder the effective integration of technology in adult education. Therefore, while technological innovation holds great promise for transforming adult learning, addressing these barriers is crucial for its successful implementation and long-term sustainability.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Government and Stakeholder Support: Governments and educational stakeholders should prioritize the funding of technology-driven adult education centres to enhance access to digital tools and infrastructure.

2. Capacity Building for Educators: Adult educators should be regularly trained on the effective use of technological tools and innovations to ensure proper integration into teaching practices.
3. Digital Literacy Programs for Learners: Comprehensive digital literacy programs should be introduced for adult learners, especially in rural areas, to close the digital skills gap.
4. Localized and Inclusive Content: Learning platforms and content should be available in local languages and designed to accommodate learners with varying levels of ability.
5. Public-Private Partnerships: Collaborations with technology companies and NGOs can help provide affordable access to devices, software, and training for both educators and learners.

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