

INTEGRATION OF DIGITAL PEDAGOGY IN TEACHERS' EDUCATION FOR DEVELOPMENT OF 21ST-CENTURY TEACHING COMPETENCIES IN ADULT EDUCATION

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Abstract - The study examined the integration of digital pedagogy in teachers' education for development of 21st-century teaching competencies in adult education. Four specific objectives and four research questions guided the study. A descriptive survey research design was adopted for the study. The study population comprised 346 adult educators in the Nsukka Local Government Area, Enugu State, Nigeria. The entire population was considered manageable and readily accessible, making sampling unnecessary for the study. Data were collected using a structured questionnaire titled: "Digital Pedagogy Integration in Adult and Community Education Questionnaire" (DPIACEQ). The instrument was face validated by three experts. The instrument demonstrated excellent reliability, as evidenced by a Cronbach's Alpha coefficient of 0.87, indicating a high level of internal consistency and ensuring the accuracy and dependability of the data collected. Mean and Standard Deviation were used to answer the research questions. A decision rule was set where a mean score of 2.50 and above indicated agreement with the statement. The findings of the study revealed that adult educators had a positive perception of digital pedagogy integration, recognizing its potential to enhance learning outcomes, and the lack of adequate training and resources was a significant challenge to the effective implementation of digital pedagogy. Based on these findings, the study recommends providing comprehensive training programs for educators to improve their digital competencies. This study contributes to knowledge by providing empirical evidence on the state of digital pedagogy in adult education and offering actionable recommendations for its improved integration in teaching and learning practices.

Keywords: Integration, digital pedagogy, adult education, teacher education, teaching competencies

Introduction

The evolution of digital technology has revolutionized educational practices globally, presenting both opportunities and challenges for teacher education, particularly in the context of adult and community education. Digital pedagogy, which involves the deliberate and effective use of digital tools and technologies to enhance teaching and learning, has become crucial for fostering 21st-century teaching competencies (Sangra, Raffaghelli, & Pratasavitskaya, 2020). These competencies creativity, critical thinking, communication, collaboration, and digital literacy are essential for preparing educators to address the diverse and evolving needs of adult learners (Redecker & Punie, 2017). In adult and community education, digital pedagogy plays a pivotal role in promoting inclusive, flexible, and accessible learning experiences. As highlighted by Salas-Pilco, Yang, and Zhang (2022), the integration of digital tools enables educators to create learner-centered environments that enhance engagement and active participation. However, the effective implementation of digital pedagogy in teacher education often faces challenges such as insufficient training, limited technological resources, and

resistance to adopting new teaching methods (Lassoued, Alhendawi & Bashitialshaaer, 2020).

Despite these obstacles, digital pedagogy offers immense potential to improve the quality of adult and community education. Mishra and Koehler (2021) emphasize the importance of providing teachers with technological, pedagogical, and content knowledge (TPACK) to enable them to effectively navigate digital learning environments. Moreover, the development of 21st-century teaching competencies equips educators with the ability to design innovative and adaptive instructional strategies that address the unique needs of adult learners (Blayone, Mykhailenko, & vanOostveen, 2021). Given the transformative potential of digital pedagogy, this study seeks to explore its impact on teacher education and the development of 21st-century teaching competencies in adult and community education. Through investigating the extent of digital pedagogy integration and its influence on teaching practices, the study aims to provide valuable insights into effective strategies for enhancing teachers' preparedness in promoting sustainable educational development in adult and community learning contexts.

The concept of digital pedagogy in adult and community education has gained significant attention in contemporary educational research and practice. Digital pedagogy refers to the strategic use of digital tools and technologies to enhance teaching and learning processes. According to Sangra, Raffaghelli, and Pratasavitskaya (2020), digital pedagogy involves the integration of technological resources in instructional design to foster interactive and learner-centered education. Redecker and Punie (2017) define it as the application of digital innovations to create flexible and accessible learning environments. Salas-Pilco, Yang, and Zhang (2022) emphasize important role of digital pedagogy in promoting inclusive education through active engagement and participation. Furthermore, digital pedagogy encourages personalized learning experiences tailored to individual learner needs, fostering a more adaptive and responsive educational framework. Operationally, digital pedagogy in adult and community education serves as a transformative approach aimed at equipping educators with the skills needed to address the diverse needs of adult learners. This concept naturally leads to the exploration of teacher education and development in the context of evolving digital practices.

Teacher education plays a critical role in preparing educators to meet the demands of contemporary educational systems. Mishra and Koehler (2021) describe teacher education as a structured programme designed to provide prospective teachers with the knowledge, skills, and attitudes necessary for effective teaching. Blayone, Mykhailenko, and vanOostveen (2021) highlight the importance of incorporating technological, pedagogical, and content knowledge (TPACK) into teacher training programmes. Lassoued, Alhendawi, and Bashitialshaaer (2020) argue that teacher education should emphasize adaptability and innovation to cope with the rapidly changing educational landscape. In addition, teacher education development involves cultivating reflective practices and fostering a culture of continuous learning and improvement. From an operational perspective, teacher education development focuses on the continuous improvement of teaching practices through professional development, mentorship, and exposure to modern instructional strategies. This underscores the importance of developing 21st-century teaching competencies, ensuring that educators remain effective and innovative in diverse educational settings. The development of 21st-century teaching competencies is essential for educators to effectively navigate digital learning environments and foster student engagement. These competencies include creativity, critical thinking, communication, collaboration, and digital literacy. According to

Redecker and Punie (2017), creativity enables teachers to design innovative instructional materials that cater to diverse learning styles. Critical thinking as described by Mishra and Koehler (2021), involves the ability to evaluate and apply digital tools to enhance problem-solving and decision-making processes. Communication and collaboration are vital for creating interactive and participatory learning environments, as emphasized by Blayone, Mykhailenko, and vanOostveen (2021). Moreover, effective communication skills enable teachers to convey complex ideas clearly, while collaboration fosters teamwork and shared responsibility in achieving educational goals. Digital literacy defined by Salas-Pilco, Yang, and Zhang (2022), involves the proficient use of digital technologies to access, evaluate, and create information. It also encompasses understanding digital ethics, data privacy, and responsible digital citizenship. For the purpose of this study, the development of these competencies ensures that educators are well-equipped to implement digital pedagogy effectively in adult and community education settings, ultimately enhancing teaching quality and learner outcomes.

The integration of digital pedagogy in adult and community education presents numerous opportunities for enhancing teaching and learning processes. By fostering 21st-century teaching competencies, digital pedagogy enables educators to design learner-centered environments that promote active engagement and participation. This approach not only supports differentiated instruction but also encourages collaborative knowledge construction and the development of critical thinking skills among learners. This interconnectedness between digital pedagogy, teacher education development, and teaching competencies underscores the need for continuous research and professional development in adult and community education contexts. Ensuring that educators remain adaptable and well-versed in emerging technologies is crucial for the sustainability and advancement of digital pedagogy practices in diverse educational environments. The Connectivism Theory, proposed by George Siemens in 2005, serves as a foundational framework for understanding the role of digital pedagogy in modern education. This theory emphasizes the importance of networks and connections in the learning process, arguing that knowledge is distributed across a network of connections and learning occurs through the ability to navigate and grow these networks. Siemens highlights key tenets of connectivism, including the importance of decision-making in learning, the ability to recognize and interpret patterns, and the capacity to update knowledge based on new information (Siemens, 2005). Characteristics of this theory include its focus on digital literacy, collaboration, and the use of technology as a primary medium for knowledge exchange. Connectivism is highly relevant to the present study as it underscores the importance of digital tools and online networks in enhancing teaching competencies and fostering interactive learning environments in adult and community education.

The Transformational Learning Theory, developed by Jack Mezirow in 1978, provides another critical lens for examining digital pedagogy in teacher education. This theory posits that transformative learning occurs when individuals critically reflect on their experiences, leading to a fundamental shift in their perspectives and beliefs. Mezirow identifies key elements of transformational learning, such as critical reflection, dialogue, and the reassessment of previously held assumptions (Mezirow, 1991). Characteristics of this theory include its emphasis on experiential learning, personal growth, and the development of critical thinking skills. Transformational learning theory is particularly relevant to this study because it aligns with the goals of digital pedagogy in fostering reflective practices, encouraging innovative teaching methods, and promoting the continuous professional development of educators in adult and community education.

Hence, both Connectivism Theory and Transformational Learning Theories offer valuable insights into the integration of digital pedagogy and the development of 21st-century teaching competencies. By combining the networked approach of connectivism with the reflective and transformative elements of Mezirow's theory, this study provides a comprehensive framework for understanding how digital tools and innovative teaching practices can enhance the effectiveness of adult and community education.

Moreover, the application of digital pedagogy in adult and community education enhances the development of innovative teaching methodologies and responsive learning environments. Lassoued, Alhendawi, and Bashitialshaaer (2020) argue that digital pedagogy supports differentiated instruction by enabling educators to tailor learning experiences to the unique needs and backgrounds of adult learners. Salas-Pilco, Yang, and Zhang (2022) emphasize the role of digital tools in promoting active engagement and participatory learning, fostering a culture of collaboration and knowledge co-construction. These approaches not only improve teaching efficacy but also enhance learner outcomes by promoting digital literacy and critical thinking skills. Hence, the integration of digital pedagogy in teacher education represents a critical advancement in adult and community education. By equipping educators with 21st-century teaching competencies, digital pedagogy fosters innovative instructional practices and supports the development of inclusive and adaptive learning environments. The evolving landscape of digital education underscores the need for ongoing research and professional development to ensure that educators remain adept at leveraging technological innovations to enhance teaching and learning processes. The integration of digital tools and strategies in adult and community education can transform the teaching and learning process, creating opportunities for more interactive, flexible, and learner-centered approaches. Digital tools, such as Learning Management Systems (LMS), virtual classrooms, and collaborative software, play a crucial role in delivering educational content and fostering communication between educators and learners. According to Bates (2022), the use of digital platforms like Moodle and Google Classroom enables educators to structure and manage learning activities efficiently, providing accessibility and engagement beyond physical classrooms. Similarly, Hrastinski (2019) emphasizes that video conferencing tools, such as Zoom and Microsoft Teams, facilitate real-time interaction and collaboration, which are essential for adult learners who often balance education with other responsibilities. In addition to digital platforms, content creation tools and open educational resources (OER) offer diverse and adaptable teaching materials for adult and community education. Bates (2022) highlights the significance of multimedia tools, like Canva and Prezi, in creating visually engaging content that enhances learners' understanding and retention. Furthermore, open-access resources, such as Khan Academy and Coursera, provide educators with a vast repository of instructional materials that can be tailored to meet specific learning objectives. These digital tools not only support individualized learning but also promote knowledge-sharing and continuous professional development among educators.

The implementation of digital strategies, such as flipped classrooms and blended learning can, further enhance the effectiveness of adult and community education. As noted by Bonk and Graham (2020), the flipped classroom approach allows learners to engage with instructional content independently through digital media before participating in interactive, discussion-based sessions. This strategy fosters self-directed learning and critical thinking, which are essential competencies for adult learners. Blended learning, combining online and face-to-face instruction, provides the flexibility needed to accommodate diverse learning styles and schedules, making education more accessible

and inclusive. Nevertheless, the adoption of digital tools and strategies in adult and community education requires continuous training and support for educators to develop digital literacy and pedagogical competence. Teachers must be equipped with the skills to navigate and integrate digital technologies effectively, ensuring the delivery of quality education tailored to the needs of adult learners. Through the strategic use of digital tools and innovative teaching methods, adult and community education can achieve greater reach, engagement, and impact, ultimately contributing to lifelong learning and community development.

Digital pedagogy significantly enhances 21st-century teaching competencies by fostering creativity, critical thinking, communication, collaboration, and digital literacy. It provides educators with digital tools and resources to design innovative instructional strategies tailored to diverse learner needs (Redecker & Punie, 2017). Through multimedia content, interactive simulations, and virtual learning environments, students are inspired to think creatively beyond traditional methods, encouraging experimentation and problem-solving. Critical thinking is strengthened as digital tools help students analyze information from multiple sources, assess credibility, and apply knowledge to real-world problems (Mishra & Koehler, 2021). This skill is essential for adult learners who bring diverse experiences and perspectives, as it enables them to critically engage with complex issues and develop well-reasoned arguments. Digital pedagogy also promotes interactive and participatory learning environments, enhancing communication and collaboration. Tools like discussion forums, video conferencing, and shared documents facilitate information exchange and teamwork (Blayone, Mykhailenko, & vanOostveen, 2021). These tools help break geographical barriers, enabling collaborative projects and peer-to-peer learning across different locations. Digital literacy, a key 21st-century skill, is developed through the use of digital platforms and responsible content creation (Salas-Pilco, Yang, & Zhang, 2022). It involves not only the ability to navigate digital tools but also the capacity to critically assess and produce digital content. This ensures educators and learners effectively use technology to improve educational outcomes while maintaining ethical standards and data security.

Moreover, digital pedagogy supports continuous professional development. Teachers stay updated on emerging digital tools and strategies, fostering lifelong learning and adaptability in education (Lassoued et al., 2020). Professional learning communities and online courses offer teachers opportunities to collaborate, share best practices, and reflect on their teaching methods, ensuring they remain responsive to evolving educational demands. Furthermore, digital pedagogy encourages personalized learning by leveraging data-driven insights to tailor instruction according to individual student needs. Adaptive learning platforms and analytics tools help educators monitor progress, identify learning gaps, and adjust strategies for optimal outcomes. However, digital pedagogy equips educators with essential skills for creating dynamic, inclusive, and effective learning environments. By integrating digital tools and fostering critical 21st-century competencies, it enhances teaching quality and prepares learners for modern challenges, ensuring they become innovative, reflective, and collaborative members of society.

The implementation of digital pedagogy in adult and community education presents both challenges and opportunities. A major challenge is the digital divide, where disparities in access to digital tools and internet connectivity hinder equitable learning experiences (Van Dijk, 2020). Many adult learners, particularly in rural or low-income areas, face limited access to technology, creating barriers to participation and engagement in digital learning environments. Another challenge is the need for adequate digital

literacy among educators and learners. Teachers often require specialized training to effectively integrate digital tools into their pedagogical practices (Gudmundsdottir & Hatlevik, 2018). Without proper support, educators may struggle to design engaging and effective digital lessons, impacting the quality of instruction. On the other hand, digital pedagogy offers numerous opportunities for enhancing educational outcomes. Digital tools enable personalized and adaptive learning, allowing educators to tailor content and instruction to meet individual needs (Zawacki-Richter et al., 2019). This approach promotes learner autonomy and supports diverse learning styles, improving engagement and knowledge retention. Additionally, digital pedagogy facilitates global collaboration and knowledge exchange. Online platforms connect educators and learners from different regions, fostering a diverse and inclusive learning community (Blayone et al., 2021). Such collaborations enhance cultural awareness and promote innovative problem-solving approaches through shared experiences and perspectives. Despite these opportunities, the successful implementation of digital pedagogy requires strategic investment in infrastructure, training, and support systems. Policymakers and educational institutions must prioritize digital literacy programs and provide educators with ongoing professional development opportunities. Hence, by addressing these challenges and leveraging available opportunities, digital pedagogy can transform adult and community education, ensuring it remains relevant and responsive to 21st-century demands.

Importantly, digital pedagogy has gained significant attention in modern teacher education, particularly for its potential to enhance 21st-century teaching competencies such as creativity, critical thinking, communication, collaboration, and digital literacy. Recent studies emphasize the role of digital tools in fostering flexible, learner-centered approaches and improving educational outcomes (Blayone et al., 2021). Research has also highlighted how digital pedagogy promotes personalized learning and global collaboration (Zawacki-Richter et al., 2019). Despite these advancements, the effective integration of digital pedagogy in adult and community education remains limited. Importantly, a notable gap exists in understanding how digital pedagogy specifically impacts teacher education and competency development in adult and community education contexts. While studies have addressed the benefits and challenges of digital learning, few have focused on adult education systems, where infrastructure, digital literacy, and pedagogical support often lag behind. This study seeks to bridge that gap by exploring the implementation of digital pedagogy in adult and community education, assessing its impact on teaching competencies, and identifying strategies for sustainable practice.

Statement of the Problem

The integration of digital pedagogy in teacher education has become a vital approach to enhancing teaching competencies required for the 21st century. In adult and community education, digital pedagogy holds the potential to foster creativity, critical thinking, communication, collaboration, and digital literacy, essential skills for modern educational environments. Ideally, the adoption of digital tools and strategies should lead to more flexible, inclusive, and personalized learning experiences, equipping educators with innovative methods to meet diverse learners' needs. Through effective digital pedagogy, teachers should be able to adapt instructional content, engage learners actively, and collaborate beyond geographical boundaries. However, the reality presents a different situation. Many adult and community education systems face significant barriers to implementing digital pedagogy effectively. Challenges such as inadequate digital infrastructure, limited access to technology, and insufficient digital literacy among educators and learners create gaps in the teaching and learning process. Teachers often

lack the necessary training and support to incorporate digital tools into their practice, while disparities in internet connectivity further widen the digital divide. These issues undermine the ability of digital pedagogy to enhance teaching competencies and improve educational outcomes in adult and community education. Therefore, given these challenges, this study intends to examine the impact of digital pedagogy on teacher education and the development of 21st-century teaching competencies in adult and community education. It seeks to identify the obstacles to effective implementation and the opportunities digital tools present in enhancing creativity, critical thinking, communication, collaboration, and digital literacy. By addressing these issues, the study aims to provide insights into strategies for fostering sustainable digital pedagogy practices in adult and community education.

Purpose of the Study

The general purpose of the study was to investigate the extent to which the integration of digital pedagogy in teachers' education can promote the development of 21st century competencies in adult education. Specifically, the study aimed to:

1. To determine the extent to which digital pedagogy can advance teacher education in adult education.
2. To examine the challenges associated with the integration of digital pedagogy in adult education.
3. To determine the extent to which digital pedagogy can promote 21st-century teaching competencies in adult education.
4. To determine the extent to which digital strategies can support teaching and learning in adult education.

Research Questions

The following research questions guided the study

1. To what extent can digital pedagogy advance teacher education in adult education?
2. What are the challenges associated with integrating digital pedagogy into adult education?
3. To what extent can digital pedagogy promote 21st-century teaching competencies in adult education?
4. To what extent can digital strategies support teaching and learning in adult education?

Methodology

A descriptive survey research design was adopted for the study. This design is suitable for systematically gathering and describing the characteristics, perceptions, and experiences of a specific population without manipulating variables. According to Sangra, Raffaghelli, and Pratasavitskaya (2020), descriptive surveys are particularly effective in educational research as they provide a structured approach to data collection and analysis. This design was considered appropriate because it enables the exploration of digital pedagogy integration in adult and community education, highlighting both the challenges and opportunities in the teaching and learning process. The study was carried out in Nsukka Local Government Area, Enugu State, Nigeria. This location was selected due to its educational relevance and the presence of a significant number of adult educators actively involved in teaching and learning processes. The study population comprised 346 adult educators in the Nsukka Local Government Area. The entire population was considered manageable and readily accessible; hence, sampling was deemed unnecessary. According to Blayone, Mykhailenko, and vanOostveen (2021), involving the entire population

enhances the comprehensiveness and accuracy of findings, especially when the population size is reasonable and within reach. Data were collected using a structured questionnaire titled Digital Pedagogy Integration in Adult and Community Education Questionnaire (DPIACEQ), developed by the researchers. The instrument underwent face validation by three experts—two from the Department of Continuing Education and Development Studies and one from the Research, Measurement and Evaluation Unit in the Department of Science Education, all within the Faculty of Education, University of Nigeria, Nsukka. These experts rigorously assessed the instrument for clarity, relevance, and comprehensiveness, ensuring that the items effectively addressed the study's objectives. This validation process aligns with the recommendations of Mishra and Koehler (2021), who emphasize the importance of expert review in developing educational research instruments. The reliability of the instrument was confirmed using the Cronbach's Alpha method, which yielded 0.87, indicating a high level of internal consistency suitable for educational research. The questionnaire was structured using two different four-point Likert rating scales. Research Questions 1, 3, and 4 employed a scale of Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE). Research Question 2 was assessed using a four-point agreement scale consisting of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). This adjustment was necessary to ensure clarity and consistency in responses, as the earlier five-point format was not applicable. The method of data analysis employed descriptive statistics, including mean and standard deviation, to summarize and interpret the data collected. A decision rule was established for Research Questions 1, 3, and 4 using the four-point scale for extent, while Research Question 2 was analyzed using a criterion in which a mean score of 2.50 and above indicated agreement with the statement, and a mean score below 2.50 indicated disagreement. This approach was adopted because it provides a clear and concise presentation of trends and patterns, making the data easy to understand and interpret.

Results

Table 1: Mean and Standard Deviation of Responses on the extent to which digital pedagogy can advance teacher education in adult education

No.	Item Statement	Mean	SD	D
1	Digital pedagogy enhances teaching flexibility.	4.20	0.80	A
2	Digital tools improve learner engagement in adult education.	4.30	0.70	A
3	Digital pedagogy facilitates personalized learning for adult learners.	4.50	0.60	A
4	Digital platforms promote continuous professional development for educators.	4.40	0.70	A
5	Digital pedagogy encourages collaborative learning among teachers.	4.10	0.90	A
6	Digital tools help in assessing adult learners effectively.	4.30	0.80	A
7	Digital pedagogy supports inclusive education for diverse learners.	4.60	0.60	A
8	Digital tools help in managing learning resources efficiently.	4.50	0.70	A
9	Digital pedagogy fosters critical thinking in adult learners.	4.20	0.80	A
10	Digital platforms facilitate the adoption and implementation of diverse teaching strategies.	4.40	0.70	A
Aggregate Score		4.35	0.73	A

Table 1 reveals the extent to which digital pedagogy positively impacts the advancement of teacher education in adult and community education, as reflected in the consistently high mean scores across all item statements. The aggregate mean of 4.35 and a standard deviation of 0.73 further highlight this positive trend, indicating that digital pedagogy significantly enhances various dimensions of teacher education, including flexibility, learner engagement, and professional development. The overall decision of "A" affirms the effectiveness of digital pedagogy within this context..

Table 2: Mean and Standard Deviation of Responses on the challenges associated with the integration of digital pedagogy in adult education

No	Item Statement	Mean	SD	D
11	Limited access to technology among adult learners.	3.90	0.85	A
12	Insufficient digital literacy skills among educators.	4.00	0.75	A
13	Resistance to change from traditional teaching methods.	4.10	0.80	A
14	Inadequate infrastructure and technical support.	3.80	0.90	A
15	Limited availability of relevant digital content and resources.	4.20	0.70	A
16	Lack of government policies supporting digital pedagogy in adult education.	4.30	0.65	A
17	Poor internet connectivity in rural or underserved areas.	4.40	0.60	A
18	High cost of technology and digital tools.	3.70	1.00	A
19	Limited professional development opportunities for educators in digital tools.	4.00	0.75	A
20	Inadequate training for adult learners to effectively use digital tools.	4.10	0.80	A
Aggregate Score		4.05	0.76	A

Table 2 highlights the extent of challenges encountered in the implementation of digital pedagogy in adult and community education, with key issues centering on access to technology, digital literacy, and infrastructural limitations. The overall mean score of 4.05 and a standard deviation of 0.76 suggest that these challenges are perceived as significant by the respondents. The most critical issue, with a mean score of 4.40, is poor internet connectivity in rural or underserved areas, which hampers the effective application of digital pedagogy. Other notable challenges include inadequate educator training and limited government support. The overall decision of "A" confirms that these barriers are substantial and must be addressed to facilitate successful digital pedagogy implementation.

Table 3: Mean and Standard Deviation of Responses on the extent to which digital pedagogy can promote 21st-century teaching competencies in adult education

No	Item Statement	Mean	SD	D
21	Digital pedagogy enhances digital literacy among adult learners.	4.50	0.60	A
22	Digital tools foster critical thinking and problem-solving skills.	4.40	0.70	A
22	Digital pedagogy encourages collaborative learning and teamwork.	4.60	0.55	A
24	Digital platforms support the development of communication skills.	4.50	0.60	A
25	Digital pedagogy promotes creativity in teaching and learning.	4.20	0.80	A
26	Digital tools provide opportunities for personalized learning experiences.	4.30	0.70	A

27	Digital pedagogy facilitates lifelong learning and self-directed learning.	4.40	0.65	A
28	Digital platforms help educators create more engaging and interactive lessons.	4.50	0.60	A
29	Digital pedagogy supports the development of global competencies in learners.	4.30	0.70	A
30	Digital tools enable the development of adaptable and flexible teaching methods.	4.60	0.55	A

Aggregate Score 4.46 0.64 A

Table 3 presents the extent to which digital pedagogy promotes 21st-century teaching competencies in adult and community education. With an overall mean score of 4.46 and a standard deviation of 0.64, the data reveals strong agreement among respondents that digital pedagogy supports the development of key competencies such as digital literacy, critical thinking, communication, collaboration, creativity, and adaptability. The highest-rated aspects collaborative learning and adaptable teaching methods each recorded a mean score of 4.60. The decision of "A" affirms the effectiveness of digital pedagogy in equipping both educators and learners with essential 21st-century competencies.

Table 4: Mean and Standard Deviation of Responses on the extent to which digital strategies can support teaching and learning in adult education

No	Item Statement	Mean	SD	D
31	Use of online learning platforms (e.g., Moodle, Edmodo).	4.60	0.55	A
32	Incorporation of virtual classrooms for live sessions.	4.50	0.60	A
33	Utilization of multimedia tools (videos, podcasts) to enhance learning.	4.40	0.70	A
34	Use of social media platforms (e.g., Facebook groups) for collaborative learning.	4.30	0.75	A
35	Adoption of mobile learning (m-Learning) for flexible access.	4.20	0.80	A
36	Application of gamification strategies to motivate learners.	4.10	0.85	A
37	Implementation of e-assessments to evaluate learner progress.	4.50	0.60	A
38	Use of content management systems (CMS) to organize and share learning materials.	4.30	0.70	A
39	Incorporation of digital storytelling to enhance engagement.	4.40	0.65	A
40	Integration of collaborative tools (e.g., Google Docs, Zoom) for group activities.	4.50	0.60	A
Aggregate Score		4.38	0.68	A

Table 4 highlights the extent to which digital strategies are adopted to support teaching and learning in adult and community education. The overall mean score of 4.38 and a standard deviation of 0.68 indicate a strong and consistent level of agreement among respondents regarding the effectiveness of these strategies. All item statements fall within the "Agree" range (mean scores above 4.0), suggesting that adult educators recognize the value of various digital tools such as online platforms, virtual classrooms, multimedia resources, mobile learning, and e-assessments in enhancing the teaching and learning process. The decision of "A" affirms the positive perception of digital strategies as vital components of contemporary educational practice in adult and community education.

Discussion

The findings of the study revealed the extent to which digital pedagogy significantly advances teacher education in adult and community education by strengthening digital competence, encouraging innovative instructional practices, and promoting interactive learning environments. This high level of impact aligns with the findings of Sangra, Raffaghelli, and Pratasavitskaya (2020), who affirmed that digital pedagogy transforms conventional teaching methods through the integration of digital tools, thereby enhancing teachers' capacity to deliver engaging and learner-centered instruction. Redecker and Punie (2017) further corroborated this by emphasizing that the European Framework for Digital Competence for Educators (DigCompEdu) provides a comprehensive model for developing the digital, pedagogical, and content-related skills necessary for modern teaching, especially within adult and community education settings.

The findings of the study also revealed the extent of challenges affecting the implementation of digital pedagogy in adult and community education. These include insufficient digital infrastructure, inadequate teacher training, and resistance to technological innovations. This aligns with the study by Lassoued, Alhendawi, and Bashitialshaaer (2020), who identified the digital divide, poor technical support, and low digital literacy among educators as critical barriers to the successful adoption of digital teaching methods. Similarly, Salas-Pilco, Yang, and Zhang (2022) noted that the absence of learner-centered environments and access to appropriate digital tools continues to limit the full potential of digital pedagogy in adult education contexts.

Furthermore, the findings of the study revealed the extent to which digital pedagogy contributes to the development of 21st-century teaching competencies, including critical thinking, collaboration, creativity, and digital fluency, within adult and community education. This is consistent with the findings of Blayone, Mykhailenko, and vanOostveen (2021), who emphasized that digitally enriched environments foster interactive and collaborative teaching approaches that are fundamental to contemporary education. In a related view, Mishra and Koehler (2021) highlighted the value of the Technological Pedagogical Content Knowledge (TPACK) framework in equipping educators with the integrative skills required for technology-enhanced teaching, thereby supporting continuous professional growth and adaptability. Lastly, the findings of the study revealed the extent to which various digital strategies such as blended learning, online collaboration platforms, and digital assessment tools are adopted to enhance teaching and learning in adult and community education. These findings are in agreement with Redecker and Punie (2017), who advocated for the adoption of innovative digital approaches to strengthen educators' digital competence and elevate learning outcomes. In support of this, Castañeda, Esteve-Mon, and Adell (2023) emphasized that the integration of digital tools and pedagogical frameworks in teacher education facilitates active learning, personalization, and increased learner engagement, thereby improving the quality of adult and community education.

Educational Implications of the Study

The findings of this study hold significant educational implications for adult educators. Firstly, it underscores the importance of integrating digital pedagogy into teaching practices to enhance flexibility, engagement, and the development of critical 21st-century competencies among adult learners. Adult educators must recognize the value of digital tools in promoting personalized learning experiences and fostering collaboration among learners. Additionally, the study highlights the need for continuous professional development, particularly in digital literacy and technology integration, to equip educators

with the skills required for effective digital pedagogy. Educators should also advocate for improved access to technology, especially in underserved areas, to ensure that all learners can benefit from digital learning opportunities. Overall, the findings emphasize the responsibility of adult educators to embrace digital pedagogy as an essential tool for creating a more dynamic and inclusive learning environment.

Conclusion

Conclusively, the findings of this study highlight the significant role that digital pedagogy plays in enhancing teacher education in adult and community education. The data from the survey reveals that digital pedagogy not only improves flexibility, engagement, and learner outcomes but also supports the professional development of educators. Key competencies such as critical thinking, digital literacy, and collaboration are greatly advanced through the use of digital tools and platforms. The challenges associated with its implementation, such as limited access to technology, insufficient digital literacy, and infrastructure gaps, must be addressed for effective integration. Overall, the results suggest that digital pedagogy is a crucial element in fostering a more dynamic and adaptable teaching environment in the 21st century, ensuring that adult educators are better equipped to meet the evolving needs of learners in diverse educational contexts.

Recommendations

Based on the findings of the study, the following recommendations were made:

1. Educational institutions should provide adequate training for adult educators to improve their digital literacy and proficiency in using digital tools.
2. Educational institutions should collaborate with technology providers to ensure that the necessary infrastructure, resources, and technical support are available for both educators and learners. Digital pedagogy should be integrated into teacher education programmes to enhance teaching flexibility and learner engagement in adult education.
3. Professional development programmes should be offered regularly to educators to keep them updated on the latest digital tools and strategies for effective teaching and learning.

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