

Artificial Intelligence (AI) as Teaching Assistant for Effective Early Childhood Care Development
Education Stimulations
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Abstract

This study investigates the use of Artificial Intelligence (AI) as Teaching Assistant for Effective Early Childhood Care Development Education (ECCDE) Stimulation in public ECCDE centres in Pankshin Local Government Area of Plateau State. The study was guided by 2 research questions, which explore caregivers' background knowledge on AI and the extent of AI tool utilization in the centres. Adopting a survey research design, data were collected from 15 caregivers using a structured questionnaire. Data collected were analyzed using mean scores to answer the research questions, with a threshold of 2.50 for acceptance. The findings revealed that caregivers have limited background knowledge on AI, with an overall mean of 2.03, signifying a need for significant improvement in their understanding and proficiency. The utilization of AI tools in teaching was also found to be inadequate, with a mean of 2.32. To address these challenges, comprehensive training programmes enhanced technological infrastructure, clear guidelines for AI integration, and incentive programmes are recommended to improve caregivers' knowledge and the effective use of AI tools, in Pankshin LGA.

Keywords: Artificial Intelligence tools, Teaching Assistant, Stimulation, Education technology.

Introduction

Early Childhood Care Development Education (ECCDE) encompasses the educational experiences provided to children from birth to age 4 years. This holistic approach is essential for supporting children's early cognitive, physical, social, and emotional development. Moreover, ECCDE introduces young children and organized stimulation outside the family context, aiming to cultivate the necessary skills for academic readiness and to prepare them for primary education (UNESCO, 2019). In Nigeria, the Federal Republic of Nigeria (FRN, 2013), in its National Policy on Education, defines ECCDE as the care, protection, stimulation, and learning promoted for children aged 0-4 years in crèches or nurseries. The objectives of ECCDE, as outlined in the National Policy on Education (FRN, 2013), include ensuring a smooth transition from home to school, preparing children for primary education, providing adequate care, supervision, and security for children while their parents are at work, inculcating social and moral norms and values, and fostering a spirit of inquiry and creativity through the exploration of nature, the environment, art, music, and the use of toys.

However, the realization of these ECCDE objectives relies heavily on the effective implementation of teaching strategies by caregivers. One promising strategy that has gained significant attention is the use of Artificial Intelligence (AI) as a teaching assistant. AI can transform teaching and learning, making them more engaging, enticing, and enjoyable in ECCDE centres. As AI technology becomes increasingly prevalent in society, there will be a growing demand for AI-literate caregivers. In light of this, as our society confronts major public policy issues related to AI technologies, it is crucial for informed citizens to understand the fundamentals of AI. To prepare children with competencies needed to navigate the rapidly transforming and tech-driven world, they

must be adequately educated to work with and utilize AI effectively (Touretzky *et. al.*, 2017).

Furthermore, AI has emerged as a transformative force across various sectors, offering innovative solutions to complex problems. In the field of education, AI holds the potential to revolutionize traditional teaching methods and streamline research processes. While the importance of AI development has primarily been emphasized in secondary and higher education (Su *et. al.*, 2022), there is a growing recognition of its potential at the kindergarten level. Notably, today's younger generation often interacts with advanced technologies, including robots and intelligent agents, having access to computing power that far exceeds that of personal computers from just a decade ago (Williams, Park, Oh, & Breazeal, 2019). Recently, there has been a surge in studies focused on early childhood AI education (Prentzas, 2013; Williams, Park, Oh, & Breazeal, 2019; Kewalramani *et. al.*, 2021; Su & Yang, 2022). For example, educators can teach children AI concepts using tools such as PopBots, knowledge-based systems, supervised machine learning, and generative AI (Williams, Park, Oh, & Breazeal, 2019).

Ultimately, AI holds significant potential in ECCDE, enhancing children's interest and retention in learning, thereby improving their academic performance. For instance, AI-powered tools can provide personalized learning experiences, adapt to individual learning paces, and offer interactive and engaging educational content. Additionally, AI can assist teachers with administrative tasks, allowing them to devote more time to direct interactions with children. By incorporating AI into ECCDE, we can support the holistic development of children through diverse and adaptive learning experiences. This integration can help meet the objectives outlined in the National Policy on Education by fostering an environment that nurtures creativity, inquiry, and social cooperation, ultimately preparing children for a successful transition into primary education.

Statement of the Problem

Despite the significant potential of Artificial Intelligence (AI) to enhance teaching and learning, its application in Early Childhood Care Development Education (ECCDE) is still in its infancy, particularly in developing regions. The integration of AI in ECCDE can provide personalized learning experiences, foster engagement, and streamline administrative tasks. However, the adoption of AI in ECCDE centres faces several challenges, including lack of infrastructure, insufficient knowledge among caregivers, and limited access to technology. In Pankshin Local Government Area (LGA) of Plateau State, these challenges are particularly acute. ECCDE centres in this region often suffer from outdated teaching methods, inadequate learning materials, and a general lack of technological integration. Caregivers in Pankshin LGA typically lack the training and resources necessary to effectively incorporate AI tools into their teaching strategies. As a result, children in these centres may not receive the full benefits of a modern, engaging, and holistic early childhood education. There is a pressing need to assess the current state of AI integration in ECCDE centres in Pankshin LGA, identify the barriers to its effective use, and explore strategies for overcoming these obstacles. By focusing on the specific challenges faced in this region, this study aims to provide actionable insights and recommendations for leveraging AI to improve ECCDE instruction. Addressing these issues is crucial for enhancing the quality of early childhood education and ensuring that children in Pankshin LGA are well-prepared for their future academic endeavors.

Purpose of the Study

The objective of this study is to assess the use of Artificial Intelligence (AI) as a Teaching Assistant for Effective Early Childhood Care Development Education Stimulations in public ECCDE centers in Pankshin Local Government Area of Plateau State. Specifically, the study aims to:

- assess caregivers background knowledge on use of AI as teaching assistant in ECCDE centres in Pankshin Local Government Area of Plateau State.
- assess the extent to which artificial intelligence-based tools are utilized for teaching in ECCDE centres in Pankshin Local Government Area of Plateau State.

Research Questions:

Based on the study's objectives, the following research questions have been formulated:

- What is the level of caregivers' background knowledge on the use of AI as teaching assistant in ECCDE centres in Pankshin Local Government Area of Plateau State?

- To what extent are AI based tools utilized by caregivers in teaching at the ECCDE centres in Pankshin Local Government Area of Plateau State?

Methodology

The research design employed in this study was a survey research design, aimed at gathering insights from teachers in public Early Childhood Care Development and Education (ECCDE) centres in Pankshin Local Government Area of Plateau State, Nigeria. The target population consists of 25 ECCDE centres in Pankshin Local Government Education Authority (LGEA). The sample size for this study comprised of 15 caregivers, selected using simple random sampling techniques from the selected 5 ECCDE centres across the study area. The researcher developed a twenty (20) item structured questionnaire titled "Caregivers Background Knowledge and Teaching Tools Utilization on Artificial Intelligence Questionnaire (CBKTTUAIQ)" to assess caregivers background knowledge on AI and tools utilized by teachers in ECCDE centres in Pankshin LGA. The instruments were validated using face and content validity by experts, in the Department of Early Childhood Care and Education, Measurement and Evaluation unit. Reliability test was conducted using Cronbach Alpha to ascertain the internal consistency of the instruments. Therefore, reliability index of 0.78 and 0.74 were obtained. A four-point rating scale of Strongly Agree, Agree, Disagree and Strongly Disagree rated as 4, 3, 2, and 1 respectively were used. The data were analyzed using Mean score to answer the research questions. The threshold of 2.50 was adopted.

Results

Research Question One: What is the level of caregivers' background knowledge on the use of AI as teaching assistant in ECCDE centres in Pankshin Local Government Area of Plateau State?

Table 1

Caregivers' background knowledge on the use of AI as teaching assistant in ECCDE centres in Pankshin Local Government Area of Plateau State

| S/N | Item | SA | A | D | SD | MEAN | DECISION |
|-------------------------|--|----|---|---|----|-------------|-----------|
| 1. | I am familiar with the concept of Artificial Intelligence (AI). | 4 | 3 | 5 | 3 | 2.5 | Agreed |
| 2. | I have heard about AI being used as a teaching assistant in ECCDE. | 5 | 4 | 3 | 3 | 2.8 | Agreed |
| 3. | I have received formal training on AI tools for teaching. | 2 | 2 | 4 | 7 | 1.8 | Disagreed |
| 4. | The training I received on AI tools for teaching was adequate. | 1 | 2 | 6 | 6 | 1.6 | Disagreed |
| 5. | I understand the basic functions of AI tools used in ECCDE. | 2 | 1 | 4 | 8 | 1.7 | Disagreed |
| 6. | I am confident in my ability to use AI tools for teaching | 1 | 2 | 5 | 7 | 1.6 | Disagreed |
| 7. | I use AI-based tools in my teaching frequently. | 0 | 1 | 3 | 11 | 1.2 | Disagreed |
| 8. | I am knowledgeable about different types of AI tools available for ECCDE | 3 | 2 | 5 | 7 | 1.9 | Disagreed |
| 9. | Integrating AI tools in early childhood education is important. | 6 | 4 | 3 | 2 | 3.1 | Agreed |
| 10. | I have used AI based tools in learning things | 3 | 3 | 4 | 5 | 2.1 | Disagreed |
| Weighted average | | | | | | 2.03 | |

Table 1 above reveals the assessment of caregivers' background knowledge on the use of AI as a teaching assistant in ECCDE centres in Pankshin Local Government Area of Plateau State. The results show that caregivers were familiar with the concept of AI (mean = 2.5) and recognize the importance of integrating AI tools in early childhood education (mean = 3.1), among others. However, aspects such as formal training on AI tools (1.8), the adequacy of training received (1.6), confidence in using AI tools (1.6), and the frequency of AI tool usage in teaching (1.2) are all below 2.50 and thus rejected. Consequently, the weighted average of 2.03, falling below 2.50, indicates that the overall level of caregivers' background knowledge on AI in these centres is inadequate and requires significant improvement.

Research Question Two: To what extent are AI based tools utilized by caregivers in teaching at the ECCDE centres in Pankshin Local Government Area of Plateau State?

Table 2

Utilization of AI based tools by caregivers in teaching at ECCDE centres in Pankshin Local Government Area of Plateau State

| S/N | Item | SA | A | D | SD | MEAN | DECISION |
|-----|--|----|---|---|----|------|-----------|
| 1. | AI-based tools are regularly used for teaching practice at the ECCDE centre. | 0 | 2 | 5 | 8 | 1.67 | Disagreed |
| 2. | I have access to a variety of AI -based tools for teaching. | 1 | 2 | 5 | 7 | 1.87 | Disagreed |
| 3. | The use of AI -based tools has enhanced the learning experience for children. | 7 | 4 | 2 | 2 | 3.07 | Agreed |
| 4. | Training on how to use AI -based tools is provided regularly at the ECCDE centre. | 2 | 4 | 5 | 4 | 2.13 | Disagreed |
| 5. | The administration supports the integration of AI -based tools in teaching. | 4 | 5 | 4 | 2 | 2.73 | Agreed |
| 6. | AI-based tools are easy to integrate into the existing curriculum. | 3 | 4 | 3 | 5 | 2.20 | Disagreed |
| 7. | I feel comfortable using AI -based tools in my daily teaching activities | 1 | 3 | 6 | 5 | 1.87 | Disagreed |
| 8. | AI-based tools can be used for personalized learning in the ECCDE centre. | 6 | 4 | 2 | 3 | 2.87 | Agreed |
| 9. | The use of AI -based tools has improved the overall teaching quality at the ECCDE centre | 5 | 6 | 3 | 1 | 3.00 | Agreed |
| 10. | There is a clear policy on the use of AI -based tools in the ECCDE centre. | 2 | 1 | 5 | 7 | 1.80 | Disagreed |
| | Weighted average | | | | | 2.32 | |

Table 2 above reveals the extent to which AI-based tools are utilized by caregivers in teaching at the ECCDE centres in Pankshin Local Government Area of Plateau State. The results indicate that AI-based tools are not regularly used for teaching practice (mean = 1.67), caregivers do not have adequate access to a variety of AI-based tools (1.87), and regular training on AI tools is lacking (2.13), among others. However, certain positive aspects were noted, such as the enhancement of the learning experience for children (3.07), administrative support for the integration of AI tools (2.73), the potential for personalized learning (2.87), and the improvement in overall teaching quality (3.00). Despite these positive aspects, the overall weighted average of 2.32, which falls below the threshold of 2.50, suggests that the extent of AI-based tool utilization by caregivers in these centres is insufficient and requires significant enhancement.

Discussion of Findings

The study indicates that caregivers' knowledge about AI and its tools is significantly lacking. Addressing this issue requires a multifaceted approach involving education, training, infrastructure enhancement, and institutional support. Encouraging a culture of innovation and providing the necessary resources can significantly contribute to integrating AI in ECCDE. Improving training programmes for caregivers and ensuring access to AI tools can enhance the overall quality of early childhood education, ensuring that children in Pankshin LGA receive a modern, engaging, and holistic education. Khan et al. (2023) emphasize the importance of improving training programs for caregivers and ensuring access to AI tools to enhance the overall quality of early childhood education, thereby ensuring that children in Pankshin LGA receive a modern, engaging, and holistic education.

Additionally, study reveals the extent of utilization of Artificial Intelligence (AI) as a Teaching Assistant for Effective Early Childhood Care Development Education (ECCDE) instruction among caregivers in Pankshin Local Government Area of Plateau State is very low. This insight highlights the current state of technology adoption in ECCDE, indicating a need for further exploration and strategies to enhance AI integration in ECCDE centres. These results align with previous studies by Thomas and Gambari (2021) and Tella (2022), who also reported low levels of AI tool utilization in teaching.

Conclusion

The findings of the study reveal a shortfall in knowledge about AI and the utilization of AI tools among caregivers in Early Childhood Care Development Education (ECCDE) centres in Pankshin Local Government Area of Plateau State. This gap highlights a critical challenge in the adoption and effective integration of AI technologies within early childhood education settings. The study shows that while caregivers recognize the potential benefits of AI, such as enhancing learning experiences and improving teaching quality, practical application and familiarity with these tools are notably insufficient. To address these challenges, targeted interventions are necessary, including comprehensive training programmes, improved infrastructure, and stronger institutional support. Embracing AI tools can transform early childhood education by making teaching more engaging and adaptive. Moving forward, it is essential for stakeholders to foster a culture of innovation and invest in resources that will enable caregivers to effectively integrate AI into their teaching practices. Continued research and strategic initiatives will be vital to bridging the current gaps and optimizing the benefits of AI in ECCDE.

Recommendations

Based on the findings of this study, the following recommendations are made to enhance caregivers' knowledge and the utilization of artificial intelligence (AI) tools in Early Childhood Care Development Education (ECCDE) centres in Pankshin Local Government Area of Plateau State:

- The government and educational authorities should organize comprehensive training programmes for ECCDE caregivers to improve their understanding and proficiency in using AI tools. These programmes should cover basic AI concepts, practical applications, and hands-on experience with various AI-based educational tools.
- Investments should be made in upgrading the technological infrastructure of ECCDE centres. This includes providing necessary hardware, software, and reliable internet connectivity to facilitate the effective use of AI tools in teaching and learning processes.
- Local and regional educational policymakers should develop clear guidelines and policies regarding the integration of AI tools in ECCDE centres. Supportive policies will help in setting standards for AI tool usage, ensuring that these technologies are effectively incorporated into the curriculum and teaching practices.
- Incentive programmes should be introduced to encourage ECCDE centres to adopt and utilize AI tools. This could include grants, awards, or recognition for centres that effectively implement AI-based tools in their teaching practices, thereby fostering a culture of innovation and commitment to technological advancement.
- Establish platforms for collaboration and knowledge sharing among ECCDE centres, technology providers, and educational researchers. Regular workshops, conferences, and online forums can

facilitate the exchange of best practices, experiences, and innovations related to AI tools in early childhood education.

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