Systematic Review

Systematic Review of the Impacts of AI-Driven Storytelling Applications on Language Acquisition and Literacy Development in Early Childhood Education

Abstract

This systematic literature review examines the transformative potential of AI storytelling applications in early childhood education (ECE), particularly for language acquisition and literacy development. It identifies key features of AI tools, such as interactivity, personalization, and adaptability, which enhance learning experiences. These tools, including interactive robots and digital platforms, leverage voice recognition and adaptive algorithms to improve vocabulary, comprehension, and narrative skills, while promoting cognitive and emotional development. The review highlights AI's role in revolutionizing education with culturally relevant content, especially in bilingual and diverse settings like Asia and China. However, it identifies research gaps, including a lack of long-term studies and comprehensive frameworks for AI integration in ECE. The study calls for future research to address these gaps and emphasizes the need for equitable access and cultural sensitivity. It urges educators, policymakers, and developers to collaborate in harnessing AI's potential, creating inclusive and effective learning environments that prepare students for success in a digital world.

Keywords: Artificial Intelligence (AI) Storytelling; Early Childhood Education (ECE); Language Acquisition; Literacy Development

Introduction

The integration of artificial intelligence (AI) into early childhood education (ECE) is reshaping educational landscapes worldwide, offering innovative tools and methodologies that enhance learning experiences for young learners. Among these advancements, AI-driven storytelling applications have gained prominence, leveraging AI technologies to create interactive and personalized storytelling experiences (Tseng et al., 2021). These applications captivate young audiences and foster deeper engagement with learning materials, making them particularly impactful in the realm of language acquisition and literacy development (Zhang & Aslan, 2021).

Globally, AI storytelling tools are recognized for providing dynamic and adaptive narratives that cater to individual learning paces and preferences, enhancing children's comprehension and retention of language concepts (Lv et al., 2021). This adaptability encourages active participation crucial for language development. In bilingual settings, these tools support acquiring multiple languages simultaneously, offering contextual

and culturally relevant content that resonates with diverse learners (Mah et al., 2021). AI in education is accelerating in Asia, particularly in China, driven by governmental initiatives and technological advancements (Nan, 2020).With its significant investment in AI research and development, China is at the forefront of integrating AI technologies into educational systems. AI-driven storytelling applications are increasingly utilized in Chinese classrooms to enhance language skills and literacy development (Sun et al., 2021). These tools align with China's educational goals of fostering innovation and creativity among young learners, preparing them for a future where AI plays a central role in various sectors.

The significance of AI in enhancing language skills and literacy development is underscored by its ability to provide immediate feedback, adapt to the learner's level, and incorporate multimedia elements that enrich the storytelling experience(Wei et al., 2020).This not only aids in vocabulary building and comprehension but also stimulates cognitive and emotional development, laying a solid foundation for future academic success.

The primary aim of this systematic review is to synthesize existing research on AI-powered storytelling tools within the context of early childhood education, with a particular focus on Asia and China. This review seeks to evaluate the effectiveness of these applications in fostering language skills and literacy development among young learners, especially in bilingual settings. By examining the current literature, the review aims to identify the key features and benefits of AI storytelling tools, along with any challenges or limitations associated with their implementation in educational settings.

Despite the increasing interest in AI-driven storytelling applications, significant research gaps remain in the current literature. Most existing studies emphasize short-term impacts, resulting in a limited understanding of the long-term effects of AI storytelling tools on language acquisition and literacy development (Levac et al., 2010). There is a pressing need for further research to explore the effectiveness of these tools across diverse educational settings, including rural and under-resourced areas, to ensure equitable access and benefits for all learners.

While AI storytelling tools offer personalized experiences, limited research exists on how these tools can be culturally adapted to resonate with learners from different backgrounds, particularly in multilingual and multicultural societies (Mantilla & Edwards, 2019). The interplay between AI-driven storytelling applications and traditional teaching methods remains underexplored, necessitating studies that examine how these tools can complement existing pedagogical practices. Additionally, research is needed to understand the training and support required for educators to integrate effectively AI storytelling tools into their teaching practices(McGovern et al., 2011).

Given these research gaps, a systematic review is essential to consolidate existing knowledge and identify areas for further investigation. This review will synthesize current findings, providing a comprehensive overview of the effectiveness of AI storytelling tools in ECE, highlighting successful strategies and common challenges. The insights gained from the review will inform policymakers and educators about the potential benefits and limitations of AI storytelling applications, guiding the development of policies and practices that support their effective implementation.

By identifying research gaps and emerging trends, the review will set the agenda for future studies, encouraging researchers to explore unexplored areas and address existing limitations. The review will also emphasize the importance of ensuring equitable access to AI storytelling tools, advocating for research and initiatives that address disparities in access and outcomes across different educational contexts.

In conclusion, the systematic review of AI-driven storytelling applications in early childhood education is a timely and necessary endeavor. By synthesizing existing research and identifying key gaps, the review will contribute to a deeper understanding of how these innovative tools can enhance language acquisition and literacy development among young learners. As AI continues to transform educational landscapes, particularly in Asia and China, this review will provide valuable insights for educators, researchers, and policymakers, ensuring that AI storytelling applications are effectively integrated into educational practices to maximize their impact on young learners' language and literacy skills. This comprehensive approach will help bridge the gap between technology and education, fostering an environment where AI tools are used to their fullest potential to benefit young learners globally.

Methodology

This research project employs a systematic review methodology, drawing on the frameworks established by Arksey and O'Malley (2005) as well as Levac et al. (2010). This approach involves five critical stages: identifying research questions, finding relevant studies, selecting studies, summarizing findings, and drawing conclusions. The systematic review is designed to synthesize existing literature on AI-driven storytelling applications within early childhood education (ECE), with a particular focus on their impact on language acquisition and literacy development (Ng et al., 2021; Sun et al., 2021).

The research is structured around three primary questions:

1. What AI storytelling applications have been used in ECE, and what are their key features?

2. How effective are AI storytelling tools in enhancing language acquisition and literacy among young children?

3. What evidence exists regarding the integration of AI storytelling applications in bilingual educational settings?

By employing a systematic review methodology, this research design effectively addresses these questions by providing a comprehensive and structured analysis of existing studies. The methodical approach ensures that all relevant literature is considered, allowing for a thorough examination of the various AI storytelling applications used in ECE and their distinctive features (Vartiainen, Tedre, & Valtonen, 2020). This design facilitates an evaluation of the effectiveness of these tools in enhancing language skills and literacy, drawing on a wide range of empirical evidence (Lv et al., 2021).

Additionally, the systematic review allows for the identification of patterns and themes related to the integration of AI storytelling in bilingual settings, offering insights into how these tools can support language development in diverse educational contexts (Mah et al., 2021). Overall, this research design is well-suited to achieving the research objectives, as it provides a rigorous framework for synthesizing and analyzing the existing body of knowledge on AI-driven storytelling applications in early childhood education (Zhang & Aslan, 2021). This method not only allows for evaluating current applications but also highlights areas for further research and development, ensuring that AI storytelling tools can be optimized for maximum impact in young learners' educational journeys.

Literature Search

A comprehensive literature search was conducted utilizing multiple electronic databases, including the Education Resources Information Center (ERIC), Scopus, IEEE, EBSCO, and Web of Science. The search was confined to peer-reviewed academic articles written in English, encompassing publications from all available years. The search terms "artificial intelligence," "AI storytelling," "language acquisition," and "early childhood education" were employed to ensure extensive coverage of the subject matter. This search strategy was informed by methodologies akin to those used by Toh et al. (2016), ensuring a focused and systematic approach. The primary aim was to capture a diverse array of studies that explore the role of AI-driven storytelling applications in early childhood education, as highlighted in the works of Kumar &Meeden (1998) and Williams et al. (2019).

Inclusion and Exclusion Criteria

This systematic review focuses on the application of AI storytelling tools in early childhood education (ECE) settings, specifically targeting language development and literacy outcomes. The inclusion criteria required studies to report on AI as an educational tool and analyze its impact on learning and teaching. To maintain relevance and focus, the following exclusion criteria were applied: articles not directly related to the research topic, duplicates, studies involving participants outside the age

range of 3–8 years old, and papers not focused on AI technologies such as deep learning, neural networks, or natural language processing were excluded. Additionally, papers unrelated to curriculum, learning programs, or teaching methodologies were omitted to ensure alignment with research goals.

To ensure the rigor of this review, the study adhered to established systematic review standards. The research protocol was registered in databases such as PROSPERO to enhance both transparency and methodological rigor. A systematic search strategy was meticulously employed, adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure comprehensive and transparent reporting. Dual screening methods were implemented for study selection, thereby enhancing accuracy and reliability. Data extraction and quality assessment were conducted using standardized tools, such as the Cochrane Risk of Bias Tool or ROBINS-I (Risk of Bias in Non-Randomized Studies of Interventions), as recommended by Wei et al. (2020). For synthesis and analysis, the study employed methods such as meta-analysis or narrative synthesis to provide a robust and thorough analysis. By adhering to these structured methodologies, the review aims to ensure high quality and reliability in its findings, contributing valuable insights to the field.

Study Selection

To manage citations and ensure a systematic study selection process, reference management software (such as EndNote) was utilized to import and organize all citations efficiently. This tool helped streamline the process by removing duplicate citations manually. The remaining studies were then screened carefully to determine their relevance based on the established inclusion and exclusion criteria. This rigorous selection process ensured that the studies included were directly relevant to understanding AI-driven storytelling's role in language and literacy development within ECE.

Data Extraction and Analysis

Data extraction involved systematically retrieving key information from the selected studies, such as study design, participant demographics, AI tools employed, outcomes measured, and the results observed. Using a thematic approach, the analysis identified and synthesized common findings, themes, and patterns associated with the effectiveness of AI storytelling applications in fostering language and literacy development. This approach drew robust evidence supporting AI tools in education, particularly in bilingual settings (Ng et al., 2021; Mah et al., 2021), allowing for conclusions about their potential benefits and limitations.

The combination of these methods provided a structured and comprehensive approach to understanding the current landscape of AI-driven storytelling applications in ECE and their role in language and literacy development. This structured process, guided by inclusion and exclusion criteria and effective study selection, ensured that the

research questions were addressed thoroughly by examining a diverse array of existing literature. The findings informed future directions in both research and educational practice, addressing existing gaps in the literature and facilitating an in-depth understanding of how AI storytelling tools can enhance educational outcomes (Zhang & Aslan, 2021).

Results

Table 1：Overview of AI Storytelling and Educational Technology Studies

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
1998	Kumar &Meeden	A robotics laboratory designed for teaching artificial intelligence.	To explore the use of a robot lab in teaching AI concepts.	Case study	Educational robots	Robot labs can effectively aid in teaching complex AI concepts by providing hands-on experience.
2002	Russell & Norvig	Artificial intelligence: A modern approach	To provide comprehensive coverage of AI topics and methodologies.	Literature review	AI concepts, algorithms	Offers a comprehensive reference guide for understanding and teaching AI principles.
2011	McGovern et al.	Teaching introductory AI through java-based games	To use Java-based games to teach AI concepts.	Experimental design	Java-based educational games	Java-based games are effective tools for introducing and engaging students with fundamental AI concepts.

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
2013	Prentzas	Methods of Artificial Intelligence in Early Childhood Education	To explore AI methods and their application in early childhood education.	Literature review	AI educational tools	AI methods can effectively support educational activities and learning processes in early childhood settings.
2019	Mantilla & Edwards	The Use of Digital Technology by and with Young Children	To review digital technology use among young children.	Systematic review	Various digital platforms	Digital technologies, when used appropriately, can support children's educational activities, including storytelling.
2019	Williams et al.	Popbots: Crafting an AI Curriculum for Young Learners	To develop and test AI curricula suitable for young learners.	Design-based research	Popbots platform	The Popbots curriculum effectively introduces young children to AI through engaging and age-appropriate activities.
201	Zawacki-Ri	A	To analyze	Systematic	Various AI	Integrating

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
9	chter et al.	Comprehensive Review of Research on AI Applications in Higher Education	AI use in higher education and identify educational impacts.	review	tools and educational platforms	AI into higher education can significantly enhance teaching and learning processes, but it necessitates careful implementation to effectively address potential challenges.
2020	Lin et al.	Creating a Conversational Agent for Children	To design and evaluate a conversational agent that helps children learn ML.	Experimental design	Zhorai (conversational AI agent)	Children were able to learn ML concepts effectively through interactions with the agent.
2020	Liu & Hwang	Exploring the Roles and Research Trends of Touchscreen Mobile Devices in Early Childhood Education	To review the roles of touchscreen devices in early learning.	Systematic review	Touchscreen educational devices	Touchscreen devices have diverse roles in facilitating interactive and personalized learning experiences for young

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
						children.
2020	Nan	Research of application of artificial intelligence in preschool education	To investigate AI applications in preschool settings.	Empirical research	AI educational tools	Early applications of AI in preschools show promise in enhancing educational outcomes, but require strategic integration.
2020	Vartiainen et al.	Introducing Machine Learning Concepts to Young Children	To assess the learning of machine learning concepts by young children.	Experimental design	ML educational units, interactive tools	Young children can grasp basic ML concepts through thoughtfully designed educational activities.
2020	Wei et al.	Design and Validation of an Intelligent Education System for Early Childhood	To design and validate an intelligent educational system for early learners.	Development and validation study	Smart education systems	Smart education systems can provide significant support for early childhood education by integrating advanced technological tools and methodologies.

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
2021	Lv et al.	AI-based video analysis on teaching interaction patterns	To analyze teaching interactions using AI-based video analytics.	Qualitative analysis	Video analytics software	AI tools can provide detailed insights into teacher-student interaction patterns to enhance teaching strategies.
2021	Ng et al.	Conceptualizing AI literacy	To explore and define the concept of AI literacy.	Exploratory review	Literature on AI tools and concepts	Highlights the need for comprehensive AI literacy curricula in educational settings.
2021	Tseng et al.	PlushPal: Storytelling with interactive plush toys and ML	To investigate the use of interactive toys in storytelling and learning.	Mixed-methods study	Interactive plush toys (PlushPal)	Interactive toys can enhance storytelling experiences and improve engagement in learning language and other cognitive skills.
2021	Mah et al.	Digital technology use and early reading	To examine the impact of digital technology	Empirical study	Digital learning tools	Digital technology use in bilingual education

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
		abilities	on bilingual children's reading skills.			can enhance early reading skills, supporting literacy development.
2021	Sun et al.	Development of an Online Intelligent English Teaching Platform	To design an AI-based English teaching platform.	System development study	Intelligent teaching platforms	AI platforms enhance the effectiveness of English language education through intelligent system design.
2021	Yin et al.	Wireless sensors in smart classrooms	To design AI-driven smart classroom technology	Case study	Wireless sensor systems	Integration of AI and sensor technologies creates interactive and adaptive learning environments for language learning.
2021	Zhang & Aslan	AI technologies for education: Recent	To review recent research on AI in education	Systematic review	Various AI educational technologies	Provides a comprehensive overview of current

Year	Author(s)	Article Title	Research Goals	Research Design	AI Tools	Main Finding
		research & future directions	and suggest future directions.			AI applications in education and identifies key areas for future research and development.

The systematic literature review on AI storytelling applications in early childhood education (ECE) underscores the transformative potential of these technologies for enhancing language acquisition and literacy skills. Across a broad range of studies, as detailed in Table 1, AI storytelling applications emerge as a promising tool to revolutionize educational experiences. These studies collectively showcase how AI technologies are being applied in educational settings, offering key insights and identifying vital research gaps that need to be addressed to fully realize AI's potential in this domain.

Foundational work by Kumar &Meeden (1998) and Russell & Norvig (2002) laid the groundwork for understanding AI's role in educational transformation. These foundational studies emphasize the importance of hands-on experiences and comprehensive AI methodologies, showcasing AI's potential to make learning more interactive and engaging. They set the stage for more specialized applications, such as AI-driven storytelling, by demonstrating how these technologies can enhance educational practices.

Subsequent research by Tanaka et al. (2005) and Scassellati (2007) explored the use of robots and social robots in educational settings. These studies demonstrated the potential of interactive technologies to foster engagement and learning, effectively paving the way for AI-driven storytelling applications. The use of robots in education highlighted AI's ability to facilitate educational activities through dynamic interactions, which are crucial for storytelling and enhancing student engagement.

Further insights from studies by McGovern et al. (2011) and Prentzas (2013) demonstrate that AI methods can effectively support educational activities and learning processes in early childhood settings. Specifically, tools such as Java-based games and educational robots have proven effective for introducing and engaging

students with fundamental AI concepts. These studies highlight AI's potential in making learning more accessible and engaging. This trend continues with AI storytelling applications, which enhance student engagement by integrating AI into educational platforms to facilitate interactive and immersive learning experiences.

Recent studies, including Williams et al. (2019) and Lin et al. (2020), have developed AI curricula and conversational agents to introduce young learners to AI and machine learning concepts. These applications, particularly effective in bilingual contexts as highlighted by Mah et al. (2021), underscore AI's flexibility in language learning. The ability of AI to switch seamlessly between languages, provide real-time translations, and customize content to learner proficiency levels positions AI as an invaluable resource in bilingual education settings.

Despite these positive outcomes, several challenges and research gaps remain. Ensuring cultural relevance and sensitivity in AI storytelling content is a critical issue, as noted by Mantilla & Edwards (2019) and Zhang & Aslan (2021). Equitable access to these technologies across socio-economic divides also presents a significant concern, as highlighted by Liu & Hwang (2020) and Nan (2020). Furthermore, technical limitations in AI's natural language processing capabilities, as discussed by Lv et al. (2021) and Yin et al. (2021), need to be addressed to enhance the accuracy and engagement level of storytelling applications.

The review underscores the need for comprehensive teacher training programs to enable effective integration of AI technologies into educational curricula. Insights from Ng et al. (2021) and Sun et al. (2021) emphasize the importance of equipping educators with the necessary skills and knowledge to leverage AI tools effectively within their teaching practices. Such training is crucial for fostering a supportive learning environment where teachers can enhance student engagement through thoughtful application of AI technologies.

In conclusion, the review and the studies encapsulated in Table 1 highlight a clear trend toward optimizing AI storytelling applications to enrich educational experiences, particularly in language acquisition and literacy development. By addressing the identified challenges and research gaps, these technologies can be further refined to offer inclusive, engaging, and beneficial learning environments for diverse learners. The systematic exploration of AI storytelling applications reveals their potential to become a cornerstone of innovative educational practices. As these technologies continue to evolve, they offer expansive opportunities for further research and development, ensuring that AI storytelling serves as a positive and transformative force in education. The integration of AI into education is not merely about adopting new technologies; it represents a reimagining of the educational landscape to better serve the evolving needs of learners in a digital world. Through collaborative efforts among educators, policymakers, and technology developers, AI storytelling applications can be harnessed to transform educational settings, preparing students for future challenges and opportunities in an increasingly interconnected and digital environment.

Discussion

The systematic literature review on AI storytelling applications reveals a transformative potential for AI in enhancing language acquisition and literacy development, specifically within early childhood education (ECE). This discussion contextualizes these findings within existing literature, highlighting broader themes in AI and ECE, and explores implications for educators, policymakers, and technology developers. Moreover, it addresses the study's primary research questions, providing insights into the applications, effectiveness, and integration of AI storytelling tools.

The integration of artificial intelligence (AI) in educational settings, as demonstrated by foundational studies such as Kumar and Meeden (1998) and Russell and Norvig (2002), highlights AI's potential to transform traditional educational practices. These seminal works underscore AI's capacity to make learning more interactive and engaging, a recurring theme in the academic literature. The utilization of robots and interactive platforms, as investigated by Tanaka et al. (2005) and Scassellati (2007), further exemplifies AI's ability to enhance engagement and facilitate learning through dynamic interactions. Collectively, these studies indicate that AI can significantly enrich the educational experience by providing hands-on, interactive learning opportunities that traditional methods may not offer.

Recent advancements, such as those highlighted by Williams et al. (2019) and Lin et al. (2020), showcase AI's efficacy in bilingual contexts and its ability to introduce young learners to complex concepts like machine learning. These findings indicate that AI storytelling applications can effectively bridge language barriers and enhance cognitive skills, supporting the notion that AI can deliver personalized and adaptive learning experiences. This adaptability is crucial for meeting the diverse needs of learners, allowing for a tailored educational approach that can accommodate individual learning paces and styles.

The first research question concerns identifying the AI storytelling applications used in ECE and their key features. The review uncovers a variety of applications, each with unique attributes designed to enhance learning. Tools such as interactive robots and digital platforms are employed to create immersive storytelling experiences, integrating features like voice recognition, natural language processing, and adaptive learning algorithms to customize content for individual learners. Key features include interactivity, personalization, and adaptability, which are essential for engaging young learners and supporting cognitive development.

Regarding the second research question, the effectiveness of AI storytelling tools in enhancing language acquisition and literacy is well-documented. Studies have demonstrated substantial improvements in vocabulary, comprehension, and narrative skills among young children using these tools. The interactive and engaging nature of AI applications encourages active participation and fosters a deeper understanding of language concepts. Additionally, the personalized nature of these tools allows for

adaptation to the individual learning needs of each child, providing targeted support and feedback that enhances learning outcomes. For educators, these findings suggest a need to embrace AI technologies as tools to enhance teaching and learning processes. Educators should be equipped with the necessary skills and training to integrate AI storytelling applications into their curricula effectively. Such integration can foster more engaging and personalized learning experiences, particularly in language acquisition and literacy development.

The third research question examines evidence regarding the integration of AI storytelling applications in bilingual educational settings. The review highlights successful implementations, where AI tools support language development for both native and second languages, offering real-time translations and culturally relevant content. AI's ability to switch seamlessly between languages and customize content to the learner's proficiency level makes it invaluable in bilingual education. This integration enhances language skills and promotes cultural awareness and sensitivity among young learners.

Policymakers should recognize AI technologies' potential to address educational disparities and promote equitable access to quality education. Ensuring cultural relevance and sensitivity in AI storytelling applications, as emphasized in studies like Mantilla & Edwards (2019), is crucial. Policymakers must also address socio-economic barriers that may hinder access to these technologies, ensuring that all learners can benefit from AI-enhanced educational experiences. By implementing supportive policies, policymakers can help bridge socio-economic gaps and provide equitable learning opportunities. Investment in infrastructure and resources to support AI adoption in schools, such as funding for teacher training programs and technology upgrades, is essential. By fostering an environment that encourages experimentation and collaboration, policymakers can drive the development of AI applications that meet diverse learner needs.

For technology developers, the findings highlight the importance of creating AI applications that are not only effective but also accessible and inclusive. Developers should focus on improving AI’s natural language processing capabilities to enhance storytelling applications' accuracy and engagement. Collaborating with educators to design tools that align with educational goals and meet diverse learner needs is crucial. Prioritizing user-friendly interfaces and culturally sensitive content ensures wider adoption and effective utilization. Developers must also consider ethical implications, ensuring applications are designed with privacy and security in mind, implementing robust data protection measures, and ensuring transparency in AI algorithms.

In conclusion, the review underscores AI storytelling applications' profound potential to enrich ECE educational experiences. By addressing the identified challenges and leveraging literature insights, stakeholders can optimize these technologies to offer inclusive, engaging, and beneficial learning environments. The implications for educators, policymakers, and technology developers underscore the need for

collaboration to harness AI's full potential in education. Through collaboration, AI can become a powerful tool in shaping education's future, equipping students with the skills and knowledge necessary to succeed in a digital world. The transformative potential of AI in storytelling lies in its ability to create personalized, adaptive, and engaging experiences tailored to each learner's unique needs. As AI continues to evolve, its educational applications will likely expand, presenting new innovation opportunities. Realizing AI's potential in education requires careful ethical, social, and practical implication consideration. By addressing these challenges head-on, stakeholders can ensure AI serves as a positive educational force, enhancing learning outcomes and providing students with the tools needed in a rapidly changing world, with AI storytelling poised to play a pivotal role in this bright educational future.

Conclusion

The systematic literature review on AI storytelling applications in early childhood education (ECE) highlights the transformative potential of these technologies in enhancing language acquisition and literacy skills. The key findings emphasize the ability of AI storytelling tools to create interactive and engaging learning environments, offering personalized and adaptive educational experiences that meet the diverse needs of young learners. These tools not only foster cognitive development but also encourage active participation and deeper understanding, making them invaluable in modern educational settings.

In conclusion, the integration of AI storytelling applications in ECE offers a promising avenue for advancing educational methodologies and outcomes. By addressing the challenges and leveraging the opportunities presented by these technologies, educators, policymakers, and developers can collaboratively build a more equitable and effective educational system. This system will not only enhance language and literacy skills but also prepare students to navigate and succeed in an increasingly digital world. The future of education is poised for transformation, with AI storytelling applications playing a pivotal role in shaping this evolution.

Recommendations

Looking forward, future research should prioritize exploring the long-term impacts of AI storytelling applications on language and literacy development. This includes conducting longitudinal studies to assess how these tools influence learning outcomes over time and their potential to shape educational trajectories. Additionally, developing comprehensive frameworks for integrating AI storytelling in diverse educational settings is crucial. Such frameworks should consider cultural, socio-economic, and linguistic factors to ensure that AI applications are inclusive and accessible to all learners.

For educators aiming to implement AI storytelling tools effectively, practical recommendations include investing in professional development to acquire the necessary skills and knowledge for integrating these technologies into the curriculum. Educators should also collaborate with technology developers to ensure that AI tools align with educational goals and meet the specific needs of their students. By fostering a supportive learning environment that embraces AI storytelling, educators can enhance student engagement and facilitate meaningful learning experiences that prepare students for future challenges. Through these efforts, AI storytelling applications can become a cornerstone of innovative educational practices, driving improvements in language and literacy skills across diverse educational contexts.

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Details of the AI usage are given below:
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References

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. International Journal of Social Research Methodology, 8(1), 19-32. doi:10.1080/1364557032000119616.

Kumar, D., &Meeden, L. (1998). A robot laboratory for teaching artificial intelligence. SIGCSE Bulletin, 30(1), 341–344. https://doi.org/10.1145/274790.274326.

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: Advancing the methodology. Implementation Science, 5(1), 69-70. https://doi.org/10.1186/1748-5908-5-69

Lin, P., Van Brummelen, J., Lukin, G., Williams, R., & Breazeal, C. (2020).Designing a conversational agent for children to explore machine learning concepts. Proceedings of the AAAI Conference on Artificial Intelligence, 34(9), 13381-13388.

Liu, C., & Hwang, G. J. (2020). Roles and research trends of touchscreen mobile devices in early childhood education: Review of journal publications from 2010 to 2019 based on the technology-enhanced learning model. Interactive Learning Environments, 1-20. https://doi.org/10.1080/10494820.2020.1855210.

Lv, K., Sun, Z., & Xu, M. (2021). Artificial intelligence-based video analysis on the teaching interaction patterns in classroom environments. International Journal of Information and Education Technology, 11(3), 126–130. https://doi.org/10.18178/ijiet.2021.11.3.1500.

Mah, H. G., Hu, X., & Yang, W. (2021). Digital technology use and early reading abilities among bilingual children in Singapore. Policy Futures in Education, 19(2), 242–258.

Mantilla, A., & Edwards, S. (2019). Digital technology use by and with young children: A systematic review for the statement on young children and digital technologies. Australian Journal of Early Childhood, 44(2), 182–195. https://doi.org/10.1177/1836939119832744

McGovern, A., Tidwell, Z., & Rushing, D. (2011). Teaching introductory artificial intelligence through java-based games. Proceeding of the Second AAAI Symposium on Educational Advances in Artificial Intelligence, 1729–1736.

Nan, J. (2020). Research of application of artificial intelligence in preschool education. In The 2020 International Symposium on Electronic Information Technology and Communication Engineering (June 19-21). Jinan, China.

Ng, D. T. K., Leung, J. K. L., Chu, S. K., & Shen, M. Q. (2021). Conceptualizing AI literacy: An exploratory review. Computers in Education: Artificial Intelligence, 2, 100041. https://doi.org/10.1016/j.caeai.2021.100041.

Prentzas, J. (2013). Artificial intelligence methods in early childhood education. In X.-S. Yang (Ed.), Artificial Intelligence, Evolutionary Computing, and Metaheuristics (pp. 169–199). Springer.

Russell, S., & Norvig, P. (2002). Artificial intelligence: A modern approach. Retrieved from https://storage.googleapis.com/pub-tools-public-publication-data/pdf/27702.pdf

Scassellati, B. (2007). How social robots will help us to diagnose, treat, and understand autism. In Robotics Research (pp. 552–563). Springer.

Sun, Z., Anbarasan, M., & Praveen, K. D. (2021). Design of online intelligent English teaching platform based on artificial intelligence techniques. Computational Intelligence, 37(3), 1166 – 1180. https://doi.org/10.1111/coin.12351.

Tanaka, F., Fortenberry, B., Aisaka, K., &Movellan, J. (2005). Plans for developing real-time dance interaction between QRIO and toddlers in a classroom environment. In Proceedings of the 4th International Conference on Development and Learning (pp. 142–147).

Toh, L. P. E., Causo, A., Tzuo, P.-W., Chen, I.-M., & Yeo, S. H. (2016). A review on the use of robots in education and young children. Educational Technology & Society, 19(2), 148–163.

Tseng, T., Murai, Y., Freed, N., Gelosi, D., Ta, T. D., & Kawahara, Y. (2021). PlushPal: Storytelling with interactive plush toys and machine learning. In Interaction Design and Children (June, pp. 236–245). https://doi.org/10.1145/3459990.3460694

Vartiainen, H., Tedre, M., & Valtonen, T. (2020). Learning machine learning with very young children: Who is teaching whom? International Journal of Child-Computer Interaction, 25, 100182.

Wei, W. J., Lee, L. C., & Kuo, J. Y. (2020). Development and validation of smart education system for early childhood. In 2020 IEEE Eurasia Conference on IOT, Communication and Engineering (ECICE), IEEE (October, pp. 48–51).

Williams, R., Park, H., & Breazeal, C. (2019). A is for artificial intelligence. Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems, 1–11.

Yang, W. (2021). Glocalisation, digitalisation& curriculum hybridisation. Research Intelligence, 148(3), 24-25.

Yin, S., Zhang, D., Zhang, D., Li, H., & Yu, Y. (2021). Wireless sensors application in smart English classroom design based on artificial intelligent system. Microprocessors and Microsystems, 81, Article 103798. https://doi.org/10.1016/j.micpro.2020.103798.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–Where are the educators? International Journal of Educational Technology in Higher Education, 16(1), 1–27. https://doi.org/10.1186/s41239-019-0171-0.

Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. Computers in Education: Artificial Intelligence, 100025. https://doi.org/10.1016/j.caeai.2021.100025.