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A program based on Some Interactive Artificial Intelligence Applications to Develop Pre-Service Kindergarten Teachers' EFL Expressive speaking Skills and Their Technological Literacy

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2025 - 1447

Date of receipt of the research: 26/6/2025

Date of acceptance for publication:11/7/2025

Abstract

The study aimed to investigate the effectiveness of a program based on interactive artificial intelligence (AI) applications in developing expressive speaking skills and technological literacy among pre-service kindergarten teachers. The study followed a one-group pre-post experimental design with 30 participants. Quantitative data were collected through pre- and post-assessments of expressive speaking and technological literacy. Results revealed statistically significant improvements in both expressive speaking post-test (sig 0.01) and technological literacy post-scale (sig 0.01). The effect sizes, as measured by Eta Squared, were 0.296 for expressive speaking and 0.610 for technological literacy, indicating large effects. The findings suggest that the integration of AI applications in language education can meaningfully enhance both Expressive speaking skills and digital competencies among pre-service kindergarten teachers.

Keywords: Artificial intelligence, expressive speaking skills, technological literacy, pre-service teachers.

مستخلص البحث

هدفت الدراسة إلى دراسة فعالية برنامج قائم على تطبيقات الذكاء الاصطناعي التفاعلية في تنمية مهارات التحدث التعبيري والوعي التكنولوجي لدى معلمات رياض الأطفال قبل الخدمة. اتبعت الدراسة تصميمًا تجريبيًا قبلي وبعدي لمجموعة واحدة، بمشاركة ٣٠ مشاركًا. جُمعت البيانات الكمية من خلال تقييمات قبلية وبعدية لكل من التحدث التعبيري والوعي التكنولوجي. أظهرت النتائج تحسنًا ذا دلالة إحصائية في كل من اختبار التحدث التعبيري اللاحق (**sig 0.01**) ومقياس الوعي التكنولوجي بعدي (**sig 0.01**). بلغ حجم التأثير، كما تم قياسه باستخدام معامل إيتا تربيع، ٠.٢٩٦ للكلام التعبيري و ٠.٦١٠ للوعي التكنولوجي، مما يشير إلى تأثيرات كبيرة. تشير النتائج إلى أن دمج تطبيقات الذكاء الاصطناعي في تعليم اللغة يمكن أن يعزز بشكل ملموس كلاً من مهارات التحدث التعبيري والكفاءات الرقمية لدى معلمات رياض الأطفال قبل الخدمة.

الكلمات المفتاحية: الذكاء الاصطناعي، مهارات التحدث التعبيري، الوعي التكنولوجي، معلمات ما قبل الخدمة.

1. Introduction:

Language is a vital tool for communication, enabling individuals to express ideas, emotions, and build social connections. Among global languages, English holds a dominant position due to its widespread use in fields like education, science, and international relations. For future educators, especially pre-service kindergarten (KG) teachers, English proficiency is crucial as they play a key role in supporting children's early linguistic development. At this formative stage, children are highly receptive to language input (Ilter & Yazıcı, 2023; Lee & Song, 2022), and teachers with strong expressive speaking skills are better equipped to engage young learners through storytelling, questioning, and classroom communication. However, EFL learners often struggle with expressive speaking due to limited vocabulary, pronunciation challenges, low self-confidence, and language anxiety (Celce-Murcia, 2001; Tuan & Mai, 2015).

In addition to language skills, technological literacy has become essential for pre-service teachers in today's digital classrooms (UNESCO, 2011). With tools like interactive whiteboards, educational apps, and online platforms becoming common, teachers must be adept at integrating technology into their instruction. Egypt's Vision 2030 highlights the need for both students and teachers to acquire digital competencies. For kindergarten educators, technological tools not only enhance lesson delivery and engagement but also enable access to a wide range of educational resources and innovative teaching practices. Technological literacy, therefore, is not merely a technical skill but a pedagogical asset that supports more effective and inclusive teaching.

Artificial Intelligence (AI) is further transforming educational practices by offering adaptive, personalized, and data-driven learning experiences. AI systems, such as those used in speech recognition and natural language processing, can provide

instant feedback, facilitate autonomous learning, and support skill development (Zhang & Chen, 2021; Mohan, 2019). In teacher education, AI integration creates opportunities for pre-service KG teachers to practice and refine their expressive speaking skills in safe, low-pressure environments. Tools like AI-powered pronunciation trainers, chatbots, and virtual speaking companions help reduce anxiety and promote fluency (Haristiani, 2019; Kim, 2019; Yong, 2020). Moreover, using these tools enhances digital fluency, allowing future educators to become more confident and skilled in applying advanced technology in their classrooms.

As education evolves in the digital age, pre-service kindergarten teachers must be equipped with both expressive speaking skills and technological literacy to meet the needs of young. The integration of AI into teacher preparation programs offers a powerful means to support the development of these essential skills. By combining language proficiency with technological competence.

2. Theoretical Framework

This framework covers the integration AI in language teacher education, particularly for developing expressive speaking skills and technological literacy among pre-service kindergarten teachers.

Computer-Assisted Language Learning (CALL)

CALL approach provides the pedagogical foundation for understanding how technology can enhance language learning experiences. The evolution from traditional CALL to AI-enhanced language learning represents a paradigm shift toward more personalized, adaptive, and intelligent language learning environments. CALL has demonstrated positive outcomes in promoting learning engagement and supporting better language acquisition (Oberg & Daniels, 2013; Liu, Wang, & Tai, 2016). However, it faces challenges in offering seamless feedback and accommodating diverse learner needs (Huang et al., 2021).

Recent developments have evolved toward integration with artificial intelligence, creating Intelligent Computer Assisted Language Learning (ICALL), or Intelligent Computer Assisted Language Instruction (ICALI), which involves the application of computing technologies to the teaching and learning of second or foreign languages. ICALL is an interdisciplinary research field that integrates insights from computational linguistics and artificial intelligence into computer-aided language learning (Schulze, 2008; Amaral & Meurers, 2011).

ICALL represents a significant advancement over traditional CALL systems through several key characteristics: **Adaptive Intelligence:** ICALL is meant to intelligently adapt to student learning needs as a student progresses; this often means (partially or wholly) fulfilling a tutor or teacher role. This adaptive capability is crucial for pre-service teachers who require personalized learning pathways (Wijekumar, Meyer, & Lei, 2013; Bahari, 2022). **Intelligent Feedback Systems:** ICALL systems follow an accepted format, which utilizes an artificially intelligent tutor. The systems allow the user to input a sentence in the target language, and the AI tutor analyzes the sentence and provides error correction. Web-based ICALL tutoring systems equipped with process-oriented corrective feedback have shown effectiveness in grammar instruction (Choi, 2016; Ai, 2017). **Multidisciplinary Integration:** ICALL is a multidisciplinary area of research that combines natural language processing (NLP) (Kerins & Ramsay, 2012), intelligent tutoring systems (ITS), language acquisition, and foreign language teaching and learning. This integration is particularly relevant for developing comprehensive language learning programs (Wang & Liao, 2011). **Dynamic Exercise Generation:** ICALL dynamically produces exercises for languages with complex morphology, allowing language learners to practice a wide range of linguistic drills and receive feedback outside of class time (Heilman et al., 2010; Ibáñez et al., 2011).

3. Literature Review
Using AI on developing EFL speaking skills

The integration of AI applications in English as a Foreign Language (EFL) education has gained significant momentum recently. This literature review examines recent research developments focusing on interactive AI applications that support pre-service kindergarten teachers in enhancing their EFL expressive speaking abilities while simultaneously building their technological competencies.

AI applications have emerged as particularly promising tools for speaking skill development. Research on AI-powered mobile applications equipped with automatic speech recognition, natural language processing, and text-to-speech capabilities has shown substantial improvements EFL students' speaking performance (Lin et al., 2025). Similar findings were reported by Li et al. (2023), who found that AI learners exhibited greater improvements in both speaking skills and self-regulation compared to non-AI learners, attributing these positive outcomes to the creative and engaging environment that AI provided for interactive speaking activities.

Study by Fathi et al. (2024) investigated the impact of AI platforms on EFL learners' speaking skills, including fluency, coherence, lexical resources, grammatical range and accuracy, pronunciation, and willingness to communicate. Their findings demonstrated that AI-mediated interactions significantly enhanced learners' speaking performance and willingness to communicate, with participants showing positive attitudes toward the AI-based instruction.

The literature identifies several applications of AI in EFL contexts that support speaking skills development (Zou et al., 2023): 1) Automatic Evaluation Systems for real-time feedback. 2)AI Chatting Robots for conversational practice (Wu et al., 2025). 3) Intelligent Virtual Environments for immersive speaking

experiences 4) Affective Computing in Intelligent Tutoring Systems for emotional support.

4. Technological literacy

The integration of technology in early childhood education has become increasingly important in the 21st century, necessitating a comprehensive understanding of pre-service teachers' technological literacy. Egypt's Education 2.0 reform plan includes technology integration as one of five key components, alongside a new multidisciplinary curriculum (Ministry of Education and Technical Education, 2018). This policy initiative suggests growing recognition of technology's importance in early childhood education within the Egyptian context. However, implementation challenges remain significant, particularly in terms of infrastructure, teacher preparation, and resource allocation (Alalkamy, 2021).

The study of Alharbi (2023) explored the challenges faced by kindergarten teachers in implementing distance education. Using a descriptive-analytical approach and a questionnaire consisting of 40 items, data were collected from 161 teachers. The findings revealed a high level of challenges, particularly in educational and technological domains, such as managing children's participation and creating an effective home learning environment. Psychological and social difficulties were also noted, including the lack of training for both children and teachers. The study recommended improving teachers' technological skills through professional development and enhancing the digital infrastructure to support more effective teaching practices.

The study by Kedwany and Hussein (2022) aimed to identify the essential requirements for achieving digital empowerment among kindergarten teachers in light of contemporary educational changes. Using a descriptive approach, the researchers identified six core categories of digital empowerment requirements: knowledge-based, skill-based, technical, human, security, and administrative.

One of the key recommendations was the need to focus on the preparation and professional development of kindergarten teachers, particularly in enhancing their technological and digital skills.

These studies highlight the potential of AI in developing speaking skills and the importance of technological literacy for teachers. However, there is still a need to explore how AI can support pre-service kindergarten teachers specifically. Therefore, the current research aims to use an AI application to develop both expressive speaking skills and technological literacy among pre-service kindergarten teachers.

5. Problem of the study

The problem of the research can be identified through three different approaches: 1) the researcher's experience, 2) the pilot study, and 3) reviewing literature and previous studies. During the researcher's supervision of pre-service teachers' educational practicum in schools, it was observed that many of them struggle with using the English language and lack essential technological literacy skills. To validate these observations, a pilot study was conducted with 48 pre-service teachers at the Hurghada Faculty of Education. The expressive speaking skills test revealed challenges related to fluency, grammatical accuracy, and self-expression. A technological literacy test also confirmed deficiencies in their ability to use digital tools effectively

Analyzing the content of the English course at Hurghada Faculty of Education (childhood department), revealed that the course objectives, content, and assessment procedures primarily focus on general texts for reading and translation, grammar, and language drills and they neglect expressive language skills. The analysis showed that there is a lack in the development of expressive language skills that are required for pre-service kindergarten teachers.

And the study of Khalifa (2019) as it surveyed teachers and found among its results a shortage of specialized teachers in some required fields, it also confirmed that the development of the 2.0 curriculum included the English language program, Connect, the ministry set a plan that English language teachers are the ones responsible for implementing the activities of that curriculum, but due to a shortage of English language teachers, many kindergarten teachers have taken on this role, which requires a lot of necessary English language skills to implement its activities.

In addition, prior studies have stressed the importance of enhancing English language and technological skills among pre-service teachers. While several researchers (e.g., Ghoneim & Elghotmy, 2015; Hadi, 2019; Koşar, 2020) have explored strategies for developing English language skills among pre-service teachers in general, there remains a noticeable gap when it comes to kindergarten teacher preparation specifically. Similarly, researchers like Alolqami (2021) and Mohamed (2022) emphasized the need to improve technological literacy among early childhood educators.

Research highlights the potential of AI in supporting language learning. Studies in the Egyptian context (Ahmed, 2020; El Shazly, 2021) and globally (e.g., Kim, 2019; Obari & Lambacher, 2019; Xiaohong & Yanzheng, 2021) have shown that AI tools, including chatbots and speech recognition systems, can improve speaking, grammar, and listening skills in EFL contexts. Therefore, this study is attempted to develop pre-service kindergarten teachers' EFL expressive speaking skills and their technological literacy by using a program based-on some interactive artificial intelligence applications.

6. Statement of the problem:

The problem of the research can be stated that some pre-service kindergarten teachers lack key expressive speaking skills (e.g., using proper spoken structure, applying gestures, speaking

fluency and accuracy, Additionally they lack some necessary technological literacies (e.g. use app, use of websites-test).

7. Objectives of the study

Designing a program based on some interactive artificial intelligence applications to develop pre-service kindergarten teachers' EFL Expressive speaking skills and their technological literacy.

1. Investigating the effect of using a program based on some interactive artificial intelligence applications for developing the pre-service kindergarten teachers' EFL expressive speaking skills.
2. investigating the effect of using a program based on some interactive artificial intelligence applications for developing pre-service kindergarten teachers' technological literacy.

8. Significance of the research

The present research is thought to be significant for the following:

1. For learners: it may help enhance pre-service kindergarten teachers' EFL expressive language skills and their technological literacy.
2. For course designers: compiling a program that can develop EFL expressive skills and technological literacy.
3. For researchers:

   3.1 Paving the way for other researchers to conduct further studies on using Artificial intelligence for developing EFL teaching and learning.

   3.2 Motivating other researchers to conduct further studies on enhancing pre-service kindergarten teachers' English language and their technological literacy.

9. Study questions

1. What are the EFL Expressive speaking skills that are needed for pre-service kindergarten teachers?
2. What are the technological literacy skills that are needed for pre-service kindergarten teachers?
3. Expressive speaking skills for pre-service teachers?
4. What is the effectiveness of using AI-based program in developing some technological literacy for pre-service kindergarten teachers?

10. Hypotheses of the study

1. There would be statistically significant differences between the mean scores of the participants in the pre-post testing of the expressive speaking skills favoring the post-testing.
2. There would be statistically significant differences between the mean scores of the participants in the pre-post testing of the Technological literacy favoring the post testing.

11. Instruments

1. Expressive speaking skills questionnaire
2. Expressive speaking skills test
3. Interactive AI applications list.
4. Speaking rubric.
5. Technological literacy questionnaire.
6. Technological literacy scale.
7. Program based on some interactive artificial intelligence applications.

12. Definition of terms

A. Artificial Intelligence

According to Wang (2018), Artificial intelligence (AI) refers to the device or system's ability to think as a human being, having the power and skills to learn, perceive, and decide rationally and intelligently.

Interactive Artificial Intelligence Applications are defined procedurally as a set of applications powered by AI technology, designed to verify learners' inputs and provide interactive and personalized feedback to foster their expressive language skills and their technological knowledge.

Expressive language skills Expressive language is the ability to express and share thoughts, ideas, and feeling through the production of words and sentences (Levey, 2017, p.2) Expressive language skills are operationally defined as pre-service kindergarten teachers' abilities to spontaneously transmit their ideas, thought , needs ,points of view and aspirations in either spoken or written interactive formats with no fear or barriers.

Technological literacy: Garmire & Pearson,(2006) Define Technological literacy as " an understanding of technology at a level of that enables effective functioning in a modern technology society". refers to the knowledge, skills, and abilities needed to effectively use and interact with technology.

Preservice kindergarten teachers students who are enrolled at the Faculty of Education (childhood department).

13. Results

The results obtained from the study included both quantitative results (from the expressive speaking skills test and technological literacy scale) and qualitative results from pre-service

teachers' feedback. The following section describes the results obtained from SPSS analysis of participants' scores.

H.1. There would be statistically significant differences between the mean scores of the participants in the pre-post testing of their expressive speaking skills, favoring the post-testing.

To test this hypothesis, the following statistical results show the mean differences between the scores of the participants in the pre-post testing of their expressive speaking skills using paired-samples statistics.

Table (2) Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre_speaking	4.10	30	1.269	.232
	post_speaking	6.07	30	1.437	.262

The above table (2) shows that the means of participants in expressive speaking skills was (4.10) in the pre resting compared to the post-test (6.07). this shows increase in participants' means in expressive speaking skills. To verify if the following difference is significant or not, the following analysis was run.

Table (3) Paired Samples T-Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	Df	Sig. (2-tailed)
					Lower	Upper			
Pair 1	pre_speaking - post_speaking	-1.967	1.474	.269	-2.517	-1.416	-7.310	29	.000

Print: (ISSN: 2535-2334) Online: (ISSN: 2682-4809)

The above table shows that the significant level (sig) is less than 0.01. This proves hypothesis (1) that there are statistically significant differences between the mean scores of participants in the pre-post testing of the expressive speaking skills, favoring the post-testing.

Table (4) Effect Size using Eta Square		
	Eta	**Eta Squared**
post_speaking * pre_speaking	**.544**	**.296**

Table (4) presents the effect size of the relationship between pre- and post-expressive speaking scores using Eta and Eta Squared statistics. The obtained Eta Squared value is 0.296, indicating that approximately 29.6% of the variance in post-speaking scores can be attributed to the pre-speaking scores. According to Cohen's (1988) criteria, this value represents a large effect size (small = 0.01, medium = 0.06, large = 0.14). The value of 0.296 represents a large effect size, suggesting that the procedure had a strong and meaningful impact on the development of participants' expressive speaking skills.

H.2. There would be statistically significant differences between the mean scores of the participants in the pre-post testing of the Technological literacy favoring the post testing.

To test this hypothesis, the following statistical results shows the mean differences between the scores of the participants in the pre-post testing of their Technological literacy

Table (5) Paired Samples Statistics					
		Mean	**N**	**Std. Deviation**	**Std. Error Mean**
Pair 1	**pre_tec**	**21.40**	**30**	**4.739**	**.865**
	post_tech	**37.87**	**30**	**4.688**	**.856**

Print: (ISSN: 2535-2334) Online: (ISSN: 2682-4809)

The above table (5) shows that the means of the participants in technological literacy (21.40) in the pre resting compared to the post testing (38.87). this shows increase in participants' means in technological literacy. To verify if the following difference is significant or not, the following analysis was run.

Table (6) Paired Samples Test

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	pre_tec - post_tech-	-16.467	5.355	.978	-18.466	-14.467	-16.844	29	.000

The above table shows the significant level is (sig) is less than 0.01. This proves hypothesis (2) that there are statistically significant differences between the mean scores of participants in the pre-post testing of the technological literacy favoring the post-testing.

Table (7) Effect Size using Eta Square

	Eta	Eta Squared
post_tech * pre_tech	.781	.610

Table (7) presents the effect size of the relationship between pre- and post-assessment scores in technological literacy using Eta and Eta Squared. The Eta Squared value is 0.610, indicating that approximately 61% of the variance in post-technological literacy scores is explained by the pre-technological literacy scores. This value reflects a large effect size. This suggests that the applied procedures had a strong impact on the development of participants' technological literacy.

B. Discussion

This part discusses the study results in the light of the pertinent literature and related studies. It deals with using interactive AI applications in developing expressive speaking skills and technological literacy of pre-service Kindergarten teachers.

1. Ai and Technology use in pre-service KG teachers' education

In alignment with the findings of the current study, various studies have examined the integration of artificial intelligence in teacher education (e.g., Zhang & Zhang, 2024; Alqaed, 2024; Tunjera & Chigona, 2023). These studies aimed mainly to develop their language skills or teaching skills. For instance, The study of Alqaed (2024) aimed to investigate undergraduate EFL student-teachers' perceptions and usage of AI applications, with the goal of enhancing their awareness of AI tools and improving their English language accuracy. Involving 68 participants, the study guided their use of AI through prompts, categorized their errors, and collected data through pre- and post-questionnaires and focus group interviews. It resulted in generally positive perceptions and active engagement, indicating that AI can support English language development.

The study of Zhang and Zhang (2024) aimed to examine the opportunities, challenges, and effects of incorporating AI into teacher education. Using quantitative methods and data from 202 college students and 68 staff members, the research assessed AI's impact across five areas: teaching support, inclusive learning environments, digital literacy, personalized teaching, and teacher-student relationships. It resulted in a comprehensive understanding of how AI can enhance various aspects of teaching, while also identifying key challenges that need to be addressed for effective implementation in educational settings.

The study of Tunjera and Chigona (2023) aimed to investigate the use of AI technology, specifically ChatGPT, in teacher education to enhance the teaching skills of 2nd- and 3rd-year pre-service teachers enrolled in an ICT in Education curriculum. The research explored how ChatGPT, as an advanced natural language processing tool, could support lesson planning and classroom activities. It resulted in useful findings on how AI can be used to support teaching development, showing that ChatGPT helps pre-service teachers create educational content and encourages independent learning.

1- AI and Expressive Speaking

The study highly developed the pre-service kindergarten teachers' Expressive speaking skills, including pronunciation, vocabulary, grammar, fluency, and function. As indicated by the results of this study, the participant achieved more progress in post-administration than in the pre-administration in expressive speaking. The present study agreed with other studies i.e. (Chen, 2024; DU & Daniel, 2024; Riaz & Kausar, 2024; Cahyono & Rosita, 2023) on that AI significantly improved speaking and it should be integration between the use of AI and developing EFL speaking.

Both the current study and Chen (2024) highlight the positive role of artificial intelligence in developing English speaking skills. While the Chinese study explored university students' perceptions through qualitative interviews, showing that learners found AI helpful yet identified areas for improvement, the current study used a quantitative pre-post design to measure actual gains in expressive speaking and technological literacy among pre-service kindergarten teachers. Unlike the perception-based focus of the former, this study provided empirical evidence of significant improvements.

The findings of the present study are consistent with the studies of Shehata (2024), which demonstrated that the use of an AI program significantly improved English pronunciation among

prospective teachers, highlighting the potential benefits of technology in language education. Align with the results of a study. the study of Almutairi and Alghammas (2025), also demonstrated that the use of AI applications significantly improved learners' speaking sub-skills, including pronunciation, fluency, grammatical accuracy, and lexical resource development.

2- AI and Technological Literacy

The results of the present study indicate that integrating AI applications into educational settings significantly enhances students' technological skill development. Various studies highlighted the effectiveness of AI tools in fostering technological literacy and skills, i.e., (Huang et al., 2025; Abdelmagid et al., 2024; ElSayary, 2024)

Huang et al. (2025) found that frequent use of generative AI tools, such as large language models, significantly enhances digital literacy, including skills like information processing, problem-solving, and critical thinking. Personalized feedback and project-based learning through AI were particularly effective, highlighting the value of integrating generative AI in teacher education for fostering essential digital skills.

Similarly, Abdelmagid et al. (2024) showed that an AI-augmented edX-based learning environment was more effective than a traditional platform in improving university students' technological innovation skills. The study emphasized how AI-enhanced blended learning can significantly support students' ability to use technology creatively and effectively in educational contexts.

ElSayary (2024) also confirmed the positive impact of generative AI in active learning settings. By integrating GenAI tools within a reflective practice model, the study demonstrated improvements in students' metacognitive awareness and technological proficiency. Together, these studies underscore that AI

applications can play a crucial role in developing both technological literacy and advanced digital skills in education.

Qualitatively,

participants reported significant improvements in both their English language proficiency and technological competence. Several participants emphasized the program's role in enhancing their expressive language skills, particularly in speaking and writing. One participant noted, *"The training helped me improve my speaking and writing skills significantly and encouraged me to overcome my anxiety about speaking English,"* while another shared, *"The program helped me expand my vocabulary, use grammar more accurately, and understand how to pronounce words correctly."*

In addition to language development, participants highlighted improvements using technology in preparing instructional materials such as stories and visual aids, as well as writing professional emails. The program also fostered learner autonomy, with one participant stating, *"It taught me to rely on myself in learning and to continue developing my skills independently."* Moreover, participants reported a notable enhancement in their technological literacy, including the use of digital tools for assessment, content creation, and presentation design. For example, one participant stated, *"The training helped me improve my use of technology, especially in creating electronic assessments and designing effective presentations."* Overall, the feedback reflects a high level of satisfaction with the program.

Recommendations of the Study

In light of the study's findings, the following recommendations are proposed to enhance teacher preparation programs and promote effective integration of artificial intelligence (AI) in language education:

1. Integrate AI Applications into Teacher Education Curricula Teacher preparation programs, particularly in early childhood education, should incorporate AI-based tools and platforms that support the development of expressive speaking skills and digital literacy. This integration can better equip pre-service teachers for the demands of technology-rich classrooms.
2. Provide Professional Development on AI Pedagogy Institutions should offer targeted training workshops for both faculty and students on how to use interactive AI applications for language learning. Emphasis should be placed on pedagogically sound practices that align with language acquisition theories and child-centered teaching approaches.
3. Support the Development of Technological Confidence To ensure equitable access and effective use, programs should include components that build pre-service teachers' confidence and competence in using educational technologies, with attention to learners with limited prior exposure to digital tools.
4. Design Contextualized AI-Based Language Activities Curriculum developers should design AI-supported speaking tasks that are authentic, developmentally appropriate, and directly relevant to early childhood teaching scenarios, such as storytelling, role-play, and instructional dialogues.
5. Foster Ethical and Responsible Use of AI Teacher education programs should promote awareness of ethical considerations in AI use, including data privacy, algorithmic transparency, and responsible classroom integration to ensure safe and fair learning environments.

Suggestions for Further Research

In light of the obtained results, the study recommends conducting various research as follows

1. Assessing the role of adaptive AI systems in personalizing learning experiences based on individual learners' speaking proficiency levels, learning pace, and feedback preferences.
2. Exploring the integration of AI with other emerging technologies, such as virtual reality (VR) or augmented reality (AR), to support immersive EFL speaking experiences for future kindergarten teachers.
3. Investigating the effect of AI-driven peer collaboration tools, such as AI-supported discussion platforms or speaking clubs, on the development of communicative competence and collaborative learning skills.
4. Study the challenges and barriers pre-service teachers face when implementing AI tools in their learning process, including technological limitations, digital anxiety, or resistance to innovation.

Conclusion

This research demonstrates the significant impact of integrating interactive artificial intelligence (AI) applications on developing both expressive speaking skills and technological literacy among pre-service kindergarten teachers. The findings revealed substantial improvements in participants' performance after engaging with the AI-based program, with large effect sizes supporting the effectiveness of the intervention. These results highlight the potential of AI tools not only to enhance EFL speaking competencies but also to build essential digital skills needed for teaching in modern educational contexts. The study underscores the importance of incorporating AI-driven practices in teacher education programs, particularly in the early childhood education sector, to better prepare future educators for technology-integrated classrooms.

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