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Redefinition of Human-Centric Skills in Language Education in the AI-Driven Era

Rania Qassrawi^{1*}
Samih Mahmoud Al Karasneh^{2,3}

¹Department of Languages and Translation, Faculty of Arts, Birzeit University, Birzeit, West Bank, PALESTINE

²Department of Education, College of Arts, Humanities & Social Sciences, University of Sharjah, Sharjah, UNITED ARAB EMIRATES

³Department of Curriculum and Instruction, Faculty of Education, Yarmouk University, Irbid 21163, JORDAN

Abstract

The widespread use of Artificial intelligence (AI) in language education has opened up a new era of teaching and learning, raising concerns about balancing AI-driven instruction and conventional teaching methods to achieve optimal learning outcomes while preserving essential human skills. Hence, this meta-analysis study systematically presented the findings from 60 studies conducted between 2018 and 2024, exploring the role of AI applications in language teaching. We investigated language skills and domains that AI can enhance, including skills (i.e., listening, speaking, reading, and writing), translation and interpretation, and teaching pedagogy and methods, alongside the human-centric skills that AI cannot replicate in language education. Based on the findings, AI could make significant strides in improving language proficiency, particularly in areas such as pronunciation, conversational fluency, grammar, and vocabulary. It can also assist in streamlining teaching methods, such as adaptive learning, automated assessment, and personalized content creation. However, some limitations emerged from the data. While AI excels at providing objective feedback and supporting innovative teaching methods, it struggles to cultivate essential human skills like cultural sensitivity, emotional intelligence, and critical thinking. These skills are necessary for effective communication, building relationships, and understanding language tones in different contexts. The study concluded that AI can be a powerful tool for language education but cannot replace human educators. Instead, language teaching practices should bridge a balance between AI-powered instruction and traditional teaching

* Corresponding author, email: rqassrawi@birzeit.edu

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methods, so learners can benefit from the latest technological advancements while still developing the critical human skills they need in this ever-changing world.

Keywords: AI-driven teaching methods, AI in language education, balancing AI and traditional teaching, human-centric skills, language skills enhancement.

1. INTRODUCTION

Artificial Intelligence (AI) has emerged as a double-edged sword that significantly changed the education scene. While AI technology has revolutionized traditional teaching and learning methods by creating opportunities for efficient education, its rapid evolution has raised concerns about the role of human educators, particularly in developing soft skills. Language teaching, which relies heavily on interpersonal communication and cultural awareness, provides a compelling case study for examining the balance between AI utilization and the preservation of human-centered education.

The rise of AI as a critical component of education has transformed various disciplines and subjects (Iqbal et al., 2024; Ou, 2024). From early Machine Learning (ML) tools to more advanced Deep Learning (DL) applications, AI has shown remarkable efficiency in data processing, personalized learning and instructional support. These tools enhance teaching and learning by providing adaptive learning systems that cater to diverse learners and intelligent tutoring systems capable of personalized feedback and predictive analytics (C. C. Lin et al., 2023; Rizvi, 2023). In short, AI holds great potential for improving learning outcomes across multiple domains, particularly in language education.

Language education, a core discipline in the broader field of education, encompasses various approaches and methods that develop listening, speaking, reading, and writing skills. It also fosters effective pedagogy and assessment strategies, as well as translation and interpretation skills (Omaggio, 2001; Richards & Rodgers, 2001). In English language teaching, for instance, approaches such as Teaching English as a Foreign Language (TEFL), Teaching English as a Second Language (TESL), and Teaching English to Speakers of Other Languages (TESOL) offer distinct methodologies (Crompton et al., 2024). Language education has seen significant advancements with the integration of AI technologies (Kumar, 2023), beginning with Intelligent Computer-Assisted Language Learning (ICALL). Early ICALL systems offered interactive language programs (Amaral & Meurers, 2011; Pokrivčáková, 2019), while the advent of Natural Language Processing (NLP) enabled machines to better understand and process human language (Amaral & Meurers, 2011; Son et al., 2023; Soori et al., 2023).

NLP applications initially focused on correcting grammar and suggesting vocabulary, but as technology advanced, more sophisticated AI systems rooted in Deep Learning (DL) emerged. These systems, powered by DL, have enhanced AI's capabilities in handling complex tasks and processes (Sarker, 2021; Soori et al., 2023). For example, AI-driven adaptive learning systems personalize language instruction based on individual learners' performance and proficiency levels. AI applications, especially speech recognition and voice assistants, such as Amazon Alexa, Apple Siri and Google Assistant, provide realistic language practice. Additionally, automated assessment systems offer consistent, objective and immediate feedback (Fitria, 2023). Automated feedback and testing tools are particularly valuable in language education, as they can assess learners' written and spoken outputs, delivering personalized corrections. Virtual tutoring platforms and chatbots offer learners additional opportunities to enhance their language skills. AI also facilitates interactive learning environments through augmented and virtual classrooms, which can simulate real-life scenarios and cross-language communication using translation and interpretation tools (Fitria, 2023; Kabudi et al., 2021; Xia et al., 2024). Moreover, humanoid robots, such as Erica and Sophia, have introduced lifelike interactions with human expressions and body language, providing a more immersive learning experience (Crompton et al., 2024).

In this context, while early AI in language education was limited to basic text-based chatbots, the end of 2022 marked a major leap by introducing advanced chatbots powered by AI

transformers and large language models, such as ChatGPT and Google's Bard. These tools offer vast opportunities for language teaching and learning, enabling in-depth conversations and providing writing examples across various genres (Bozkurt, 2023; Dizon & Tang, 2020; Vuong et al., 2023). Integrating AI tools in language education has made language teaching and learning more accessible, engaging and effective (de la Vall & Araya, 2023). These tools create immersive opportunities for language learners in formal and informal contexts, promoting language acquisition in vocabulary, grammar and pronunciation (Porter & Castillo, 2023; Vančová, 2023). Although these benefits have reshaped educational systems and made language education more accessible and customizable, the full potential of AI tools can only be realized when educators understand these technologies and align them with appropriate pedagogical strategies to enhance learning outcomes. This advancement has also challenged conventional teaching and learning approaches, especially concerning human-centric skills in interpersonal, communicative and interactive subjects, such as language education (Fitria, 2023; Kamalov et al., 2023).

Human-centric approaches emphasize skills that are essential for modern education, helping learners navigate life's complexities (Flores et al., 2020). Different frameworks have been proposed to understand and promote these skills, including the P21 framework ("P21 framework definitions", 2009) and the OECD framework ("Future of education and skills 2030", 2015). The P21 Framework groups essential human skills into four categories: (a) learning and innovation skills, including creativity and critical thinking; (b) life and career skills, such as flexibility and leadership; (c) information, media and technology skills; and (d) core subjects and interdisciplinary themes, such as global and environmental awareness. Similarly, the OECD framework organizes human skills into cognitive competencies (e.g., literacy and numeracy), disciplinary content knowledge, interdisciplinary knowledge (e.g., global competence), epistemic knowledge (e.g., critical thinking and creativity), social-emotional competencies (e.g., self-regulation and resilience), and interpersonal competencies (e.g., empathy, collaboration and emotional intelligence), as well as core values like respect and responsibility ("Future of education and skills 2030", 2015).

Therefore, human-centric education focuses on promoting essential human skills. Emotional intelligence (EI), for instance, is a core component that enables individuals to manage their emotions and understand others, thereby demonstrating empathy and sympathy (Balducci, 2024; Cote & Miners, 2006). Critical thinking and problem-solving are also vital, involving the analysis of information, evaluation of evidence, and making reasoned judgments. Creativity and innovation—higher-order thinking skills—are essential for generating novel ideas and solutions and adapting to a rapidly changing world. Interpersonal and communication skills, along with ethical reasoning and cultural awareness, remain central to effective collaboration and teamwork (Kumar, 2023). These human-centric skills form the backbone of this study.

In promoting human-centric education within AI advancements, it has become evident that AI excels at performing tasks and processing large amounts of data, resembling human cognitive skills. However, concerns remain about the skills and competencies that are irreplaceably human (Kumar, 2023). While AI technology can assist in processing information and completing tasks with high accuracy and speed, it lacks the human qualities necessary for personal and social interactions. For example, AI can help with problem-solving by providing data and statistics, but it cannot fully engage learners in critical thinking or creativity, which require ethical considerations and contextual understanding (AlAfnan et al., 2024; Dolev & Itzkovich, 2020; Renz & Vladova, 2021; Romero et al., 2024). Similarly, while AI can trigger empathy, it cannot provide the authentic human emotional connection needed to foster genuine understanding (Dolev & Itzkovich, 2020). Thus, AI integration in language education may require further research to explore how to balance its use with the irreplaceable contributions of human educators.

Although AI tool incorporation in education has been widely encouraged in research to achieve optimal outcomes, the balance between the human/teacher's role in enhancing or modeling human-centric skills and machine learning (AI tools) in language education has not been adequately explored. Recent studies (e.g., Abulibdeh et al., 2024; Kumar, 2023; Rusmiyanto et al., 2023) have examined AI's impact on human skills, such as creativity, critical thinking and communication. Zawacki-Richter et al. (2019) reviewed studies on AI tools in higher education,

while [Crompton et al. \(2022\)](#) conducted a systematic review investigating AI tools across all educational levels (K-12). Furthermore, [Crompton et al. \(2024\)](#) examined studies discussing both the challenges and benefits of AI tools in English language teaching, emphasizing their affordances in speaking, writing, reading and pedagogy. However, the interplay between the human teacher's role and machine learning (AI tools) in language education has not been sufficiently investigated.

This concern, regarding the balance between technological advancements and the preservation of human skills, formed the basis for the present study. It stemmed from the necessity to prepare a future workforce capable of demonstrating a balance between AI capabilities and human soft skills, which are crucial for personal development, social cohesion and ethical decision-making. Therefore, the gap in recent research and the lack of examination of the interaction between human skills and AI in education, especially in language teaching, a communicative and interpersonal field, necessitated exploring practical suggestions for smooth integration, which has inspired the current study.

Consequently, this research sought to identify skills AI applications can enhance in language education parallel with irreplaceable skills that remain uniquely human. Additionally, this study sought to provide a comprehensive understanding of how to balance the use of AI technology with the preservation of human qualities and skills, offering valuable insights for educators and policymakers. Thus, this study aimed to answer the following questions:

1. What skills can AI applications enhance in language education?

This question encompassed the following sub-questions:

- (a) What language skills and sub-skills can AI applications foster?
 - (b) What translation and interpretation skills can AI applications enhance?
 - (c) What pedagogical and teaching methods can AI applications innovate in language education?
2. What human-centric skills can AI applications not replicate in language education (in the domains of language skills, translation and interpretation, and teaching methods and pedagogy)?

2. LITERATURE REVIEW

2.1 Language Education and Technology Integration

The integration of technology in foreign language teaching and learning has given rise to several advanced methodologies and frameworks, including Computer-Assisted Language Learning (CALL), Intelligent Computer-Assisted Language Learning (ICALL), and Mobile-Assisted Language Learning (MALL). Each of these approaches leverages technology to enhance the effectiveness of language instruction. CALL, for instance, focuses on using computer-based tools to develop learners' language skills, while ICALL integrates artificial intelligence to provide personalized feedback and adaptive learning experiences. Similarly, MALL emphasizes the use of mobile devices to create flexible and accessible learning environments, particularly relevant in the context of learning ([Crompton et al., 2024](#)). In English language teaching, specific pedagogical approaches such as Teaching English as a Foreign Language (TEFL), Teaching English as a Second Language (TESL), and Teaching English to Speakers of Other Languages (TESOL) have evolved to address the needs of diverse learner groups. For this study, "language education" is conceptualized as the teaching and learning of foreign languages, with a particular focus on English as a foreign or second language.

2.2 The Importance of Human-Centric Skills

Human-centric skills have emerged as critical competencies in modern education, equipping learners to navigate the complexities of the globalized world. These skills encompass a broad range of soft skills, including cognitive competencies, life and career skills,

interdisciplinary knowledge, social-emotional competencies, and values. Drawing on frameworks such as the P21 Framework (“P21 Framework definitions”, 2009) and the OECD Framework (“Future of education and skills 2030”, 2015), this study categorizes human-centric skills into five domains. The First category is Cognitive Competencies and Epistemic Knowledge, which includes critical thinking, creativity, metacognition, and innovation skills, which are essential for problem-solving and knowledge construction in diverse contexts (Flores et al., 2020). Life and Career Skills are the second domain that comprises flexibility and leadership to prepare individuals for dynamic professional environments. The third category is Interdisciplinary Knowledge, which is a global competence and cultural awareness that enables learners to engage effectively with multicultural perspectives and address different challenges. Social-Emotional competencies represent another category that combines intrapersonal skills, such as self-regulation and resilience, along with interpersonal skills, especially empathy, collaboration, and emotional intelligence, which are pivotal for personal and social development. Finally, Values express a category that merges the moral foundation necessary for fostering harmonious interactions and ethical decision-making, such as respect, responsibility and ethical reasoning.

2.3 AI in Language Education

The integration of artificial intelligence (AI) into education has revolutionized various aspects of teaching and learning, including language education. AI systems, with their ability to process large volumes of data and perform complex tasks, have proven effective in enhancing cognitive skills such as information processing and analytical reasoning (Kumar, 2023). For instance, AI tools can provide real-time feedback, automate assessment processes, and offer personalized learning experiences tailored to individual learners’ needs. These affordances have been particularly impactful in English language teaching, where AI has been utilized to improve learners’ speaking, writing, reading and listening skills (Crompton et al., 2024).

However, the integration of AI into education also raises concerns about the potential erosion of human-centric skills. While AI can assist in problem-solving by generating data-driven insights, it lacks the capacity for contextual understanding and ethical judgment, which are fundamental to human critical thinking and creativity (AlAfnan et al., 2024). Similarly, although AI algorithms can simulate empathetic interactions, they fall short of enhancing authentic emotional connections, which are vital for meaningful social interactions (Dolev & Itzkovich, 2020). These limitations emphasize the irreplaceable role of human educators in cultivating soft skills that AI cannot replicate.

The interplay between AI tools and human educators in language teaching remains an underexplored area in educational research. While numerous studies have highlighted the benefits of AI in enhancing specific language skills, fewer have investigated the complementary roles of AI and human teachers in fostering holistic language development. For example, Zawacki-Richter et al. (2019) reviewed the application of AI tools in higher education, while Crompton et al. (2022) conducted a systematic review of AI tools across all educational levels, emphasizing their potential to create learner-centered pedagogies. Despite these advancements, the literature lacks a significant understanding of how AI and human educators can collaboratively enhance both cognitive and human-centric skills in language education.

This gap in research highlights the need for a balanced approach that embraces the strengths of AI while preserving the irreplaceable contributions of human educators. Recent studies (e.g., Abulibdeh et al., 2024; Rusmiyanto et al., 2023) have explored AI’s impact on promoting creativity, critical thinking and communication skills. However, these studies often overlook the critical role of human educators in mediating AI interactions to ensure ethical and socially meaningful learning experiences. In response to this gap, the present study explored practical strategies for integrating AI tools into language education in a manner that enhances human-centric skills and prepares learners for the demands of an AI-driven world.

3. METHODS

This study is a meta-analysis study that has been designed to synthesize the recent studies and research on the impact of AI usage in language teaching and learning, emphasizing the skills that AI can enhance and foster in addition to the human-centric skills that cannot be replaced and remain uniquely human. Meta-analysis is a research design that includes a systematic review that combines results from different studies regarding a certain question or objectives. The analysis and synthesis in the meta-analysis can involve computing the effect size, participants, measures, designs and objectives, which provides a rich summary of the existing research to determine the gap, assess the impact of the intervention across studies and guide future research and policies. Within this design, certain criteria need to be determined in advance to answer the research inquiries (Creswell & Creswell, 2018; Page et al., 2021). In the present studies, the inclusion criteria for data collection were specified in the following section.

3.1 Data Collection

The data collection process for the present study followed to specific inclusion criteria to ensure the relevance and quality of the reviewed materials. The study included 60 peer-reviewed articles, conference proceedings and relevant book chapters published between 2018 and 2024. These sources were selected based on their focus on AI applications in language education and their contribution to understanding the interplay between human-centric skills and AI integration in language education.

3.1.1 Inclusion criteria

The selection criteria emphasized studies that concentrated on various AI applications in language education, including its impact on language skills, translation and pedagogy. The scope of the studies encompassed diverse educational levels, ranging from K-12 to higher education and adult learners. Additionally, the research prioritized studies addressing the integration of human-centric skills and AI in educational contexts.

3.1.2 Databases searched

To identify relevant studies, searches were conducted across multiple databases, including Google Scholar, ERIC, Web of Science and Scopus. The inclusion of a wide range of sources ensured a comprehensive review of the available literature.

3.1.3 Terminologies and keywords

During the search process, specific terminologies and keywords were employed to retrieve relevant studies. These included phrases such as “AI in language teaching/education,” “human-centric skills in education,” “soft skills in teaching,” “AI and soft skills,” “AI in education and educational practices,” and “irreplaceable skills by AI integration in education.”

3.1.4 Selection process

The selection process involved multiple steps to ensure the inclusion of high-quality and relevant studies. Initially, relevant studies were identified based on the inclusion criteria and searched using the specified keywords. After that, the articles were screened based on their titles and abstracts, followed by full-text reviews to determine their eligibility. Eligible studies were subsequently summarized and categorized into specific themes aligned with the research questions.

3.1.5 Data extraction

Data extraction focused on several key variables, including study details (authors, years, publication types, participants, and context) and AI applications in language education. Specifically, the extracted data explored:

1. The skills and domains AI can enhance in language education.
2. The capabilities of AI in fostering translation and interpretation skills.
3. The potential of AI to renovate language teaching methods and pedagogy. Additionally, the extraction process examined human-centric skills that AI cannot replicate, particularly in language skills, translation and interpretation, and teaching methods.

3.2 Data Analysis

The data analysis process combined qualitative and quantitative approaches to synthesize the findings of the selected studies. Thematic analysis was employed to identify studies directly related to the research purposes and questions. Quantitative synthesis in this study involved combining data based on variables such as the number of studies, participants, designs and contexts, focusing on the impact of AI integration on language education and human-centric skills. To provide a thorough understanding, subgroup analysis was conducted by categorizing studies according to different educational contexts and levels (primary, secondary, and higher education) and their specific purposes. This approach enabled a detailed examination of the findings across varied educational settings.

3.3 Interpretation of Results

The results of the reviewed studies were organized in tables, summarizing the impact of AI on language education domains, such as language skills, translation and interpretation and teaching methods and pedagogy. The findings were followed by a discussion that offered insights into educational practices for achieving a balanced integration of AI technology and human-centric skills in language education. The final report was structured following PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. This included adherence to the PRISMA checklist to ensure a comprehensive and systematic reporting of the review and meta-analysis processes (Page et al., 2021).

4. FINDINGS AND DISCUSSION

This section presents and discusses the findings related to the research's main objectives involving skills and domains AI Applications can enhance in Language Education, in addition to human-centric skills AI cannot applications replicate in Language Education.

4.1 Skills and Domains Enhanced by AI Applications in Language Education

To answer the first research question, the results were synthesized and grouped into three main sub-categories: (1) AI fosters language skills and sub-skills: listening, speaking reading comprehension and writing, (2) AI enhances translation and interpretation skills, and (3) AI renovates language teaching methodologies and pedagogy. The findings are presented in Table 1, Table 2, and Table 3.

4.1.1 AI fosters language skills and sub-skills: Listening, speaking, reading comprehension and writing

According to recent studies, utilizing AI tools has been proven beneficial in enhancing language skills and sub-skills. The themes emerging from the synthesis are presented in Table 1.

Table 1. Language skills and sub-skills enhanced by AI applications.

AI and language skills	Sub-skills	Authors
AI promotes speaking proficiency	Pronunciation accuracy, conversation fluency, spoken grammar; vocabulary; intonation, and stress	Godwin-Jones (2018) Dizon and Tang, (2020) Noviyanti (2020) Zou et al. (2020) Al-Kaisi et al. (2021) Tai et al. (2022) Astarilla (2023) Fathi et al. (2024) Macías et al. (2024) Qassrawi et al. (2024)
AI promotes reading skills	Reading comprehension, vocabulary building, personalized reading materials	Bao (2019) Xu et al. (2019) van den Berghe et al. (2020) Cheng (2021) Dizon and Gayed (2021) Koltovskaia (2022) H. Yang and Kyun (2022) Lo (2023)
AI promotes writing skills	Grammar, structure, style, clarity, punctuation, word choice and vocabulary, and ideas	Zhang and Hyland (2018) Dizon and Gayed (2021) Nazari et al. (2021) Aljuaid (2024) Al-Raimi et al. (2024) Losi et al.(2024) Pratama and Hastuti (2024) Qassrawi (2024)
AI promotes listening skills	Listening ability	Ayedoun et al. (2019) Hu and Hu (2020) Astarilla (2023) Kazu and Kuvvetli (2023)

As shown in Table 1, several studies were synthesized discussing the significant impact of AI in language teaching and learning, particularly in enhancing basic language skills, such as listening, speaking, reading and writing.

Regarding speaking skills (i.e., pronunciation, accuracy, fluency, spoken grammar, vocabulary, intonation and stress), different studies (Al-Kaisi et al., 2021; Ayedoun et al., 2019; Kazu & Kuvvetli, 2023; Macías et al., 2024; Noviyanti, 2020; Qassrawi et al., 2024; Tai et al., 2022; Zou et al., 2020) have demonstrated that using AI-powered applications improves learners' speaking skills and sub-skills, particularly pronunciation accuracy, conversational fluency and vocabulary. This is attributed to several factors, such as the provision of immediate, non-judgmental feedback and the opportunity for real and meaningful communication.

Furthermore, different AI applications have been used in research on improving language learning, such as Google Assistant, Alexa, and Mimic. For instance, Dizon and Tang (2020) and Qassrawi et al. (2024) studied the impact of the Alexa and Google Assistant apps on learners' speaking proficiency. The results indicated a positive impact on learners' speaking skills and sub-skills, particularly in interactions, vocabulary acquisition, pronunciation accuracy and motivation. Regarding listening skills, only few studies (Ayedoun et al., 2019; Dizon & Tang, 2020; Kazu & Kuvvetli, 2023) have researched this receptive skill in the context of AI app usage in isolation from speaking, as it is regarded as a skill that nurtures speaking proficiency. Therefore, any improvement in speaking skills may indicate a corresponding improvement in learners' listening ability (Astarilla, 2023).

Concerning writing skills, numerous studies (Aljuaid, 2024; Al-Raimi et al., 2024; Dizon & Gayed, 2021; Lo, 2023; Losi et al., 2024; Nazari et al., 2021; Pratama & Hastuti, 2024; Qassrawi, 2024) have proven the positive impact of utilizing AI applications on improving language learners' academic writing skills. The use of AI writing assistant apps in writing teaching and learning is crucial in providing instant feedback on grammar, style, punctuation, word choice and vocabulary, allowing learners to focus more on ideas and content while

composing. The effectiveness of various AI-powered tools, such as the Grammarly app (Dizon & Gayed, 2021; Nazari et al., 2021) for improving grammar, style and clarity in writing, as well as Quillbot and ChatGPT, has also been demonstrated.

As for improving reading comprehension skills using AI tools, a few studies (Crompton et al., 2024; Lo, 2023; Xu et al., 2019; H. Yang & Kyun, 2022) have investigated the impact on this skill separately from other skills in the context of adult learning; however, this topic has garnered more interest in the context of teaching young learners. In some studies (Ayedoun et al., 2019; Bao, 2019; Cheng, 2021; van den Berghe et al., 2020), humanoid robot tutors were identified as beneficial in developing children's vocabulary and reducing their anxiety. Additionally, utilizing AI-driven tools has been regarded as a beneficial technique in developing reading comprehension skills by offering personalized reading materials tailored to the learner's proficiency level. These tools customize the provided readings using adaptive learning features by analyzing text complexity and matching it with the learner's needs through natural language processing.

Based on the synthesized studies presented, it is evident that AI applications can significantly impact various aspects of language teaching, particularly in developing key language skills such as speaking and writing. These productive skills are most affected by AI tools due to providing immediate, non-judgmental feedback, enhancing real communication scenarios, and supporting vocabulary acquisition, pronunciation accuracy and interactional competence (Ali, 2020; Crompton et al., 2024; H. Yang & Kyun, 2022). Additionally, in some studies (Ali, 2020; Crompton et al., 2024; H. Yang & Kyun, 2022), using AI applications can provide language learners with a native-like context, which enables learners to practice the language and interact in a meaningful situation. AI tools researched are based on advanced technologies, such as natural language processing (NLP), machine learning, speech recognition and adaptive learning algorithms (Sharadgah & Sa'di, 2022). AI applications like Google Assistant, Alexa, and specific tools like Grammarly and Quillbot have been instrumental in improving learners' speaking and writing skills. The focus on productive skills—speaking and writing—can be attributed to AI's capacity to integrate multiple language domains, immersing learners in both receptive and productive activities. However, the primary emphasis in the research has been on speaking and writing, with limited studies exploring the isolated impact of AI on receptive skills, such as listening and reading comprehension.

Overall, while AI can replace or supplement certain aspects of language teaching, especially in terms of providing practice and feedback in speaking and writing, it is less clear how it affects other language domains independently. The research suggests that AI can effectively support language learners by creating a more interactive and personalized learning environment, especially in productive language skills, but the full extent of its capabilities in replacing traditional human teaching across all language skills remains to be fully explored.

4.1.2 *AI enhances translation and interpretation skills*

Regarding the benefits of using AI tools in translation and interpretation skills, Table 2 presents the results.

Table 2. Translation and interpretation skills enhanced by AI applications.

AI and translation skills	Sub-skills	Authors
AI promotes translation and interpretation skills	Vocabulary development and retention Precise translations provision Facilitating efficiency and accuracy Translation practice Immediate assessment and feedback Learner confidence and satisfaction while translating	Ali (2020) Wei (2020) Horváth (2022) Sharadgah and Sa'di (2022) Urlaub and Dessein (2022) Fan and Chunlei (2023) Lo (2023) Wang (2023) Gatsiou (2024)

As displayed in Table 2, multiple research efforts (Fan & Chunlei, 2023; Gatsiou, 2024; Horváth, 2022; Lo, 2023; Urlaub & Dessein, 2022; Wang, 2023; Wei, 2020) have focused on the impact of AI usage on promoting language translation and interpretation. The findings indicate that using such tools can enhance teaching practices and learning outcomes. One key element that can be improved is vocabulary enhancement and retention. According to Lo (2023), neural machine translation programs have been instrumental in improving students' vocabulary. These AI tools are effective in expanding vocabulary, especially with specialized or unambiguous expressions, which are often challenging for learners. Additionally, AI tools can assist with translation tasks and provide more practice opportunities, allowing educators to focus more on pedagogical aspects of language teaching. This indicates that educators will have more space and time for varying in teaching translation since students, by using AI as a learning tool, can be assisted with other issues, especially linguistic aspects (Ali, 2020). In a broader perspective, Sharadgah and Sa'di (2022) explored the future of AI in English language teaching, including translation and interpretation. The findings suggested that AI has the potential to optimize a range of skills, such as translation accuracy, enhanced assessment capabilities, better recognition of language nuances and increased learner satisfaction.

AI tools in translation and interpretation can be powerful aids in language education. They enhance vocabulary acquisition, support teaching activities, and optimize various aspects of language learning. Several AI tools have been employed in research focusing on translation and interpretation within the context of language teaching. These tools leverage advanced technologies, such as neural machine translation, natural language processing, and deep learning to enhance both translation accuracy and interpretation capabilities (i.e., Google Translate; DeepL, ChatGPT; and Microsoft Translator).

Based on the findings presented, AI applications have demonstrated significant potential in enhancing language teaching, particularly in translation and interpretation tasks. AI tools, such as neural machine translation programs, are instrumental in vocabulary development, enabling learners to master specialized and contextually appropriate expressions that are often challenging. These tools also support educators by facilitating a more efficient and accurate teaching process, allowing teachers to focus more on pedagogical aspects.

The transformative impact of AI in language education extends beyond mere vocabulary enhancement. It optimizes translation accuracy, improves assessment capabilities, and enhances the recognition of language nuances, thereby increasing learner satisfaction. The ability of AI to provide precise translations and real-time support makes it an invaluable tool in modern language teaching, offering benefits that can be tailored to individual learner needs. In conclusion, AI is not just a supplementary tool but an integral component of language education, particularly in the domains of translation, interpretation, and vocabulary acquisition. As AI technology continues to evolve, its role in language teaching is expected to expand, further enhancing the accessibility, effectiveness, and personalization of language learning.

4.1.3 *Renovating language teaching methodologies and pedagogy*

In terms of the role of the usage of AI tools in renovating language teaching methods and pedagogy, Table 3 shows the results of the synthesis.

As shown in Table 3, recent studies have highlighted the significant role of integrating AI technology in language education at all levels, enhancing and renovating pedagogical approaches and language learning efficiency. It has been asserted (Ali, 2020; C. J. Lin & Mubarak, 2021; Qassrawi et al., 2024; Sharadgah & Sa'di, 2022; Shivakumar et al., 2019) that AI has revolutionized pedagogical approaches by supporting features that enhance learner-centered methods through customized and personalized learning, data resources, and feedback tailored to individual needs. This shift has also allowed for a greater focus on effective language instruction methods.

Table 3. Language teaching methodologies and pedagogy enhanced by AI applications.

Domain	Teaching technique and strategy	Authors
Language teaching methodologies and pedagogy	Enhancing pedagogical approaches and language learning efficiency	Ali (2020) Sharadgah and Sa'di (2022)
	AI into communicative language teaching	H. Yang and Kyun (2022) Crompton et al. (2024)
	Multimodal learning in language education AI in accelerating language acquisition	Shivakumar et al. (2019) C. J. Lin and Mubarak (2021) Qassrawi et al. (2024)
	AI in automated language assessment and testing and feedback	Zhang and Hyland (2018) Ali (2020) Lu (2019) Kim (2022) Qassrawi (2024)
	AI in language content creation and adaptive learning in language education	Bao (2019) Pokrivčáková (2019) van den Berghe et al. (2020) Chen et al. (2022) Sharadgah and Sa'di (2022) Hew et al. (2023) Lee et al. (2023)

Another benefit that AI has brought to language education, particularly in foreign languages, is its support for an integrative approach, allowing the incorporation of all language skills within communicative language teaching (CLT) methodologies through interactive and communicative language practices (Crompton et al., 2024; H. Yang & Kyun, 2022). It has also been confirmed (Ali, 2020; Sharadgah & Sa'di, 2022) that AI technology can be effectively integrated with the flipped learning/teaching approach, promoting the efficiency and effectiveness of teaching while supporting foreign language learners' self-efficacy, self-regulation, and motivation.

It has been demonstrated (C. J. Lin & Mubarak, 2021; Qassrawi et al., 2024; Shivakumar et al., 2019) that utilizing AI technology in language education can enhance learning through multimodality by merging and providing various sensory forms of learning resources, such as texts, audio, video, interactive elements, and augmentation, in the teaching-learning process. Consequently, language learners experience immersive and interactive education that accommodates different learning styles and accelerates language acquisition through repetitive learning tasks and instant feedback. Learners can practice vocabulary drills, pronunciation, and grammar exercises at their own pace, allowing teachers to focus on more complex and interactive aspects of teaching.

Another pedagogical method that AI supports in language education, enhancing its efficiency, relates to offering automated language assessment, testing, and feedback. It has been asserted (Ali, 2020; Kim, 2022; Lu, 2019; Pokrivčáková, 2019; Qassrawi, 2024; Zhang & Hyland, 2018) that integrating AI tools into language education assessment can enhance learners' language skills by providing instant, objective, and timely feedback in a personalized and non-judgmental formative style, leading to more efficient learning. Utilizing AI tools in language testing and automated essay scoring can also offer predictions about learners' achievements by processing and analyzing large amounts of data and allowing for tracking progression in a diagnostic form of assessment.

Additionally, one of the crucial domains that have begun to attract educators is the use of AI tools for language content creation and delivery. It has been shown (Lee et al., 2023) that AI generative tools can efficiently create customized language content, such as exercises, quizzes, and interactive activities, that cater to learners' proficiency levels, learning styles, preferences, and needs. Additionally, AI tools have been described (Bao, 2019; Chen et al., 2022; Hew et al., 2023; Pokrivčáková, 2019; van den Berghe et al., 2020) as technology that can support adaptive learning in language education by adjusting the form, type, and difficulty of content according to learners' performance, learning styles, and needs. The adaptive, personalized approach provided

by such tools can maintain learner self-regulation, a sense of autonomy, empowerment, engagement, and motivation by continually challenging them at the appropriate level.

The findings suggest that integrating AI technology into language education has become essential at all educational levels, revolutionizing pedagogical approaches and enhancing learning efficiency. AI has introduced a learner-centered approach, personalizing learning experiences through customized content, interactive practices, and immediate feedback. This integration supports communicative language teaching, self-efficacy, and motivation among learners. Additionally, AI's role in assessment and adaptive learning provides real-time, personalized feedback and content tailored to individual needs, ensuring continuous engagement and effective learning. Overall, AI tools have proven to be invaluable in modern language education, supporting diverse learning styles, enhancing motivation, and fostering language acquisition in a more personalized and interactive environment.

4.2 Human-Centric Skills Irreplacable by AI Applications in Language Education

To answer the second question, the results were summarized, grouped, and discussed concerning the human-centric skills in three main domains: (1) language skills, (2) translation and interpretation, and (3) language pedagogy and methodology. These results are presented in Table 4.

Table 4. Human-centric skills AI cannot replicate in language teaching.

Domain	Human-centric irreplaceable skills	Authors
Language skills: listening, speaking, reading and writing	Promoting cultural sensitivity and contextual interpretations Promoting interpersonal communication and soft skills Promoting higher-order thinking skills: critical thinking, analytical skills, creative writing and expression.	Dolev and Itzkovich (2020) S. J. H. Yang et al. (2021) Annamalai et al. (2023) Wang (2023) AlAfnan et al. (2024) Crompton et al. (2024) Heidrich (2024) Khan (2024) Qassrawi (2024) Romero et al. (2024)
Translation and interpretation	Promoting cultural sensitivity, contextual interpretation and bias detection Handling ambiguity, complex syntax, creative writing, metaphorical and figurative language	Abedin et al. (2022) Horváth (2022) Rowe (2022) Wang (2023) Gatsiou (2024) Khan (2024)
Language pedagogy and methodology	Promoting group and collaborative teaching methods Promoting higher-order thinking skills, leadership and ethical reasoning	Abedin et al. (2022) Andersen et al. (2022) Khakurel and Blomqvist (2022) Rüth and Netzer (2022) Bezrukova et al. (2023) Xiong (2023) Romero et al. (2024)

As shown in Table 4, although AI tools have significantly promoted language skills, translation, and teaching methods, there are certain areas where AI still struggles. These areas are typically human-centric skills that require deep human interaction, which demonstrates that AI technology cannot be fully utilized without human involvement, making integrating AI with human teachers essential.

According to recent studies (AlAfnan et al., 2024; Annamalai et al., 2023; Crompton et al., 2024; Khan, 2024; Qassrawi, 2024; Wang, 2023), utilizing AI tools in promoting language skills, translation, and interpretation cannot adequately address the cultural aspects of language learning, such as understanding context-specific language, idioms and expressions, humor, and appropriate language use in real-life contexts. This limitation may lead to embarrassment and misunderstanding in real communications. Moreover, AI may not guide learners in handling the

consequences of real language use, particularly in avoiding offensive language, understanding the impact of words, or navigating the complexities of miscommunication.

Among the human aspects that AI tools cannot replace in language education, as noted in some studies (AlAfnan et al., 2024; Annamalai et al., 2023; Dolev & Itzkovich, 2020; Heidrich, 2024), are those related to enhancing learners' interpersonal communication and soft skills, such as emotional intelligence. Teaching and modeling the emotional aspects of communication—particularly empathy, tone, and body language—are essential for understanding the emotions behind words. Additionally, AI falls short in teaching how to handle issues that may arise during human interactions, such as managing interruptions, responding to insults, and answering questions effectively (Abedin et al., 2022).

While AI is beneficial in many studies for enhancing language sub-skills, such as pronunciation, grammar, vocabulary, and structure, it still struggles, according to research (Qassrawi, 2024; Xiong, 2023), in promoting higher-order thinking skills like critical thinking, text analysis, inference-making, and creative and imaginative writing.

In addition to the irreplaceable skills mentioned earlier regarding cultural sensitivity and contextual interpretation, AI tools and services in translation continue to struggle with other key skills critical for accurate and culturally appropriate translation and interpretation. These include detecting bias and discriminatory language, handling ambiguity in texts, accurately translating complex syntax, and struggling with metaphorical and figurative language (Abedin et al., 2022; Gatsiou, 2024; Horváth, 2022; Khan, 2024; Rowe, 2022; Wang, 2023).

Although AI tools in language education offer pedagogical benefits that support individual language proficiency—such as assessment, adaptive learning, and content creation—most of these uses are individual-based. According to some studies (Abedin et al., 2022; Bezrukova et al., 2023; Khakurel & Blomqvist, 2022; R  th & Netzer, 2022; Xiong, 2023), AI does not effectively promote higher-order thinking skills or consider group and social dynamics, such as negotiation and persuasion skills, collaborative work, ethical decision-making, or enhancing leadership and volunteerism among learners.

Overall, while AI tools have undeniably advanced language education by enhancing individual language skills, translation capabilities, and pedagogical methods, they remain limited in areas that require deep human interaction and emotional intelligence. Human-centric skills, such as cultural sensitivity, interpersonal communication, empathy, and higher-order thinking, are critical components of language learning that AI alone cannot fully address. These skills necessitate the presence of human teachers, who can guide learners through the complexities of real-world communication, ethical decision-making, and collaborative work. Thus, the integration of AI in language education should be viewed as a complement to, rather than a replacement for, the essential human elements that are irreplaceable in fostering well-rounded and culturally aware language learners.

The findings of this meta-analysis highlighted the transformative potential of AI in language education. AI has proven to significantly enhance language proficiency in specific domains such as pronunciation, conversational fluency, grammar and vocabulary. Moreover, it can offer invaluable support through adaptive learning, automated assessment and personalized content creation, revolutionizing traditional pedagogical approaches. However, AI's limitations in replicating human-centric skills, such as cultural sensitivity, emotional intelligence and critical thinking emphasize its inability to replace human educators. Instead, a harmonious approach is necessary, integrating AI-driven tools with traditional teaching methodologies. This balanced strategy should ensure that learners benefit from technological advancements while continuing to develop the essential human skills important for effective communication and lifelong learning in a dynamic globalized world.

5. CONCLUSION

Integrating AI technology into language education has brought remarkable advancements in teaching and learning, particularly in enhancing language skills, translation capabilities, and

pedagogical approaches. AI tools offer personalized learning experiences, instant feedback, and adaptive learning opportunities, making them valuable assets in modern education. However, AI falls short in addressing human-centric skills essential for communication, cultural understanding, and interpersonal relationships. These skills—such as emotional intelligence, cultural sensitivity, and critical thinking—rely on the expertise and guidance of human educators, underscoring that AI cannot fully replace teachers.

To strike a balance between AI integration and the cultivation of human-centric skills, educators must use AI as a complementary tool rather than a replacement. While AI excels in adaptive learning, content generation, and assessment, human teachers play an irreplaceable role in fostering empathy, cultural awareness, and real-life communication skills. Educators should prioritize activities that engage learners in context-specific language use, critical thinking, and creative writing while modeling interpersonal communication through scenarios emphasizing human interaction and feedback.

Moreover, professional development is crucial for educators to effectively integrate AI tools while maintaining a focus on human interaction and higher-order thinking skills. By designing collaborative activities such as group work and discussions and incorporating regular feedback practices, educators can ensure that learners benefit from AI's capabilities while developing essential human skills. Achieving this balance will ensure that AI enhances language education without compromising the critical skills necessary for effective communication and cultural competence.

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