

GENDERED DIMENSIONS OF AI INTEGRATION IN LANGUAGE LEARNING: A REVIEW IN THE CONTEXT OF ART AND DIGITALIZATION

DIMENSIONES DE GÉNERO DE LA INTEGRACIÓN DE LA IA EN EL APRENDIZAJE DE IDIOMAS: UNA REVISIÓN EN EL CONTEXTO DEL ARTE Y LA DIGITALIZACIÓN

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ABSTRACT

This review examines the integration of artificial intelligence (AI) in education, particularly its impact on language learning and gender perceptions. It examines AI's transformative potential in enhancing educational outcomes and addresses gender biases in AI interactions. Emphasizing the importance of ethical AI practices, the study highlights the need for a nuanced understanding of how gender influences interactions with AI systems in educational contexts. By exploring these dynamics, it sheds light on the complexities of technology adoption and its implications for gender equity in education.

Keywords: Artificial Intelligence, education, language learning, gender perception, ethical AI practices

RESUMEN

Esta revisión examina la integración de la inteligencia artificial (IA) en la educación, especialmente su impacto en el aprendizaje de idiomas y las percepciones de género. Se adentra en el potencial transformador de la IA para mejorar los resultados educativos y aborda los sesgos de género en las interacciones con la IA. Al enfatizar la importancia de las prácticas éticas de IA, el estudio destaca la necesidad de comprender de manera matizada cómo el género influye en las interacciones con los sistemas de IA en contextos educativos. Al explorar estas dinámicas, arroja luz sobre las complejidades de la adopción de la tecnología y sus implicaciones para la equidad de género en la educación.

Palabras clave: inteligencia artificial, educación, aprendizaje de idiomas, percepción de género, prácticas éticas de IA

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1. Introduction

Before the widespread of computer usage, education used to rely on manual instructions or human intervention. “With the help and the availability of personal computers during the 1970s, greater computational power had become available for the general population” (Aspray, 1991, p. 39). This technological surge was largely boosted by the advancements in personal computing, which led to its permeation into different sectors and to the promotion of computer utilization within society.

From the mid-20th century onwards, computers began to be used in different areas of educational fields. “This evolution was the dawn of computer-aided instruction and learning (CAI/L), which later revolutionized classroom dynamics” (Cairns & Malloch, 2017, p. 605). Other advances in computing and associated technologies such as networking and the Internet also developed the usage of computer applications in education, covering countless institutional departments.

Another significant breakthrough was the rise of Artificial Intelligence (AI). Whitby (2008) characterizes AI as “the exploration of intelligent behavior in humans, animals, and machines, with activities to imitate such behavior in computers and related systems”. AI represents the result of advancements in computing, machines, and technology, and it gives computers abilities that are similar to humans. It has become a part of education and it has also brought significant benefits like improved efficiency, worldwide learning, and customized experiences. As it keeps developing day by day, new educational uses are being discovered.

Learning a foreign language, as part of education, has changed significantly because of technology. Now, both instructors and learners have easy access to various resources such as mobile applications with AI and chatbots like ChatGPT, Gemini and Jasper. Adding AI into Learning Management Systems (LMS) improves the ability to teach languages by using features such as natural language processing and speech recognition systems. This enhances expertise in all language skills, namely speaking, writing, reading, and listening (Villegas-Ch et al., 2020; Khaled, 2014, p. 12). This is because AI enables applications to present tailored exercises to the learners.

With a focus on disparities and understanding perception, gender perspectives in technology use have been widely researched. Recent studies have examined gender differences in language learning strategies and benefits among males and females. The analysis of gender disparities in foreign language learning was debated in language acquisition

as well as learning for thirty years, as differences in language output between genders are held to shape language learning theories, teaching approaches, and the understanding of individual and gender differences in language learning.

Acknowledging technology's impact on learning, the influence of AI-powered English language learning on university students yet remains unexplored. This study analyzes 55 articles investigating how males and females use technology for education and language learning, as well as gender discrimination in education between 1997 and 2022.

1.1. Research Questions:

1. How does the integration of AI technologies, specifically in language learning, influence educational outcomes, considering gender dynamics and diverse learner demographics?
2. What are the underlying gender biases shaping interactions with AI systems in educational settings, and how do these biases impact user perceptions, acceptance, and equitable access to AI-enabled educational tools?
3. How can AI design be optimized to challenge and mitigate traditional gender roles and stereotypes within education, promoting inclusivity, diversity, and ethical AI practices?

2. Methodology

2.1. Search Strategy and Framework

This study employs a systematic literature review framework from Charles Sturt University, adhering to established protocols and criteria to ensure clarity, transparency, and rigor, and to minimize bias. The search strategy was shaped by the key terms of the study's topic: artificial intelligence, language learning, education, gender perceptions, and technology. Synonyms for these keywords were also considered.

Google Scholar: Chosen for its comprehensive coverage of academic literature across various disciplines, which ensures a wide range of sources and perspectives.

ScienceDirect: Selected for its extensive collection of scientific and technical research, particularly in the fields of computer science and education.

SpringerLink: Preferred for its reputable peer-reviewed journals and conference papers, providing high-quality research in technology and education.

The chosen articles were published between 1997 and 2022. In order to choose the articles, some keywords with their synonyms were used.

	Keyword	Synonym
1	Artificial Intelligence	AI, Natural Language processing
2	Technology	MALL, CALL
3	Gender Perception	male, female, gender discrimination, gender role, men, women
4	Language Learning	EFL, ESL, TEFL, TESL, language learning

Table 1. Keywords and their synonyms.

Selecting relevant articles for the study required careful attention to inclusion and exclusion criteria. As indicated in Table 2, the inclusion criteria were applied carefully to ensure positive selection. To be included, a paper needed to be in one of the four databases and written in English.

	Inclusion Criteria	Exclusion Criteria
Language	Articles which were published in English language were included.	Articles which were published in other languages were excluded.
Source	Primary studies, research articles, conferences and books chapters which had relevant information were included.	Articles which did not adequately define the research topic were excluded.
Topic	Articles which were relevant to the research topic were included.	Articles which were not relevant to the research topic were excluded.

Table 2. Inclusion and exclusion criteria.

As for the selection procedure, the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework was utilized. The PRISMA framework involves several key steps:

Database searches were conducted using the selected keywords and synonyms. Over twenty-five years, 532 records were identified from Google Scholar, ScienceDirect, SpringerLink, and ERIC.

Duplicate Removal: 207 duplicates were identified and removed, resulting in 325 unique records.

Title and Abstract Screening: The titles and abstracts of the remaining records were screened for relevance regarding the research questions. During this phase, 289 articles were excluded. This included 176 articles not published in English and 113 articles irrelevant to the research topic.

Full-text articles of the remaining 55 studies were assessed for eligibility. Each article was evaluated based on the inclusion and exclusion criteria to ensure they met the study's objectives.

The final set of 55 articles was included in the systematic review. These articles were analyzed to extract relevant data and insights.

2.2. Data Analysis

To analyze the landscape of research on artificial intelligence (AI) in education, a comprehensive review of 55 articles was conducted. The articles span from 2014 to 2022, with a notable increase in publications observed in recent years. Specifically, the years 2019 and 2020 stand out, constituting the majority of the reviewed literature. This surge in publications reflects the growing interest and recognition of AI's potential to transform educational practices. The breadth of topics covered in these articles underscores the multifaceted nature of AI's impact on education, ranging from the use of conversational agents to the presence of gender stereotypes in AI recommendations. This review provides valuable insights into the evolving discourse surrounding AI's role in shaping the future of education.

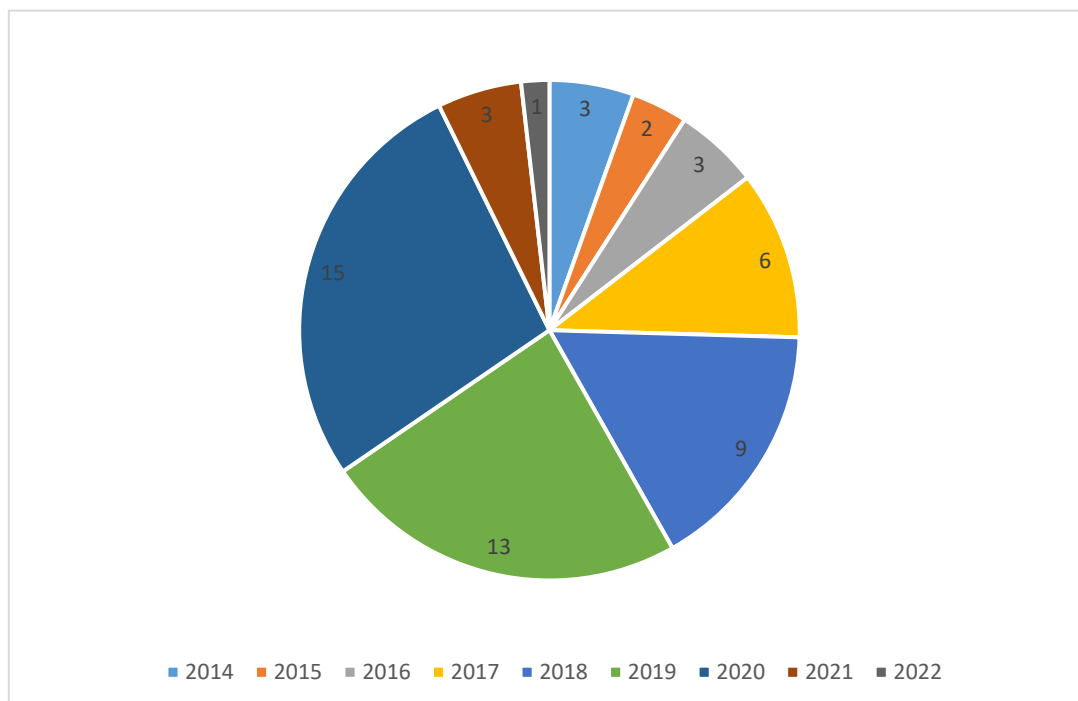


Figure1. Distribution of articles on artificial intelligence in education by year of publication.

The research on artificial intelligence (AI) in education is a global endeavour, as evidenced by the diverse geographical distribution of publications. The majority of the articles reviewed originate from the United States, indicating the significant contribution of American scholars to this field. Following the USA, China emerges as another prominent contributor, underscoring the growing interest and investment in AI research within Chinese academia. Furthermore, publications from the United Kingdom, Germany, and Canada demonstrate the international collaboration and exchange of knowledge in advancing AI applications in education. This global perspective enriches the discourse on AI's impact on educational practices, fostering cross-cultural insights and collaborations.

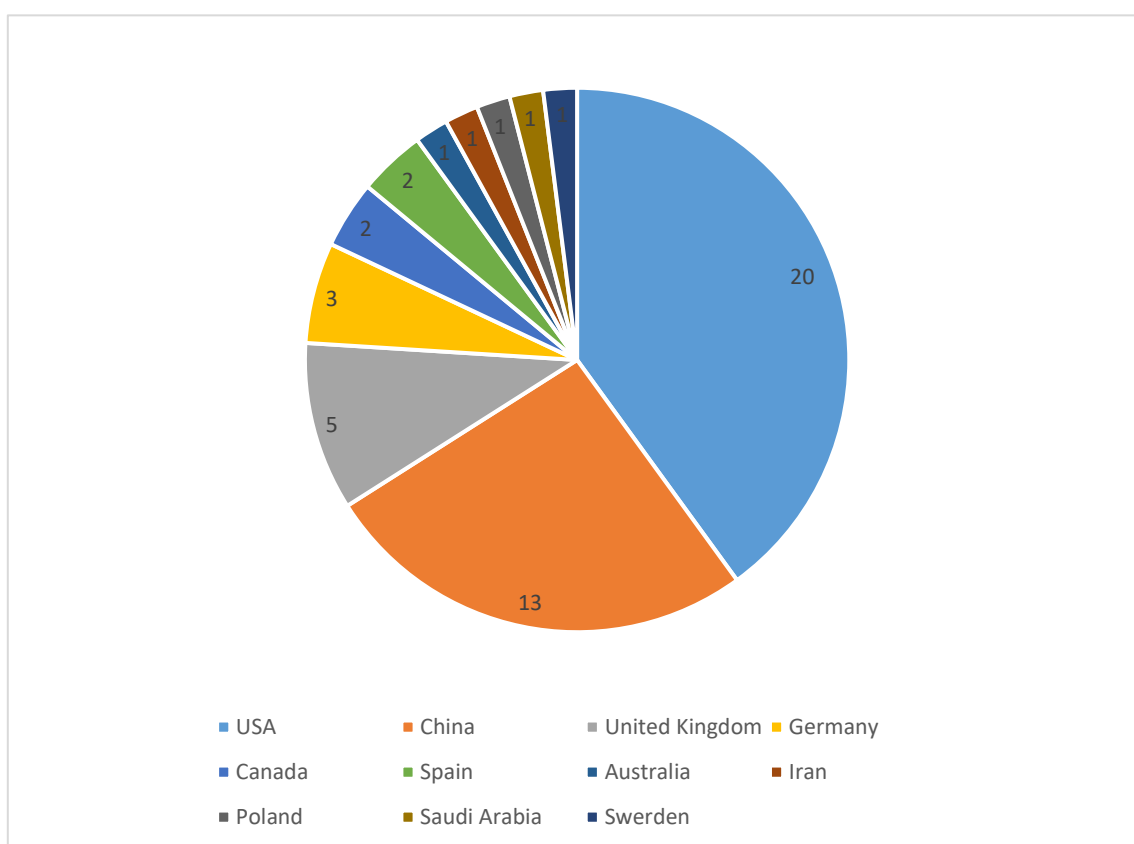


Figure 2. Distribution of articles on artificial intelligence in education by the country of publication.

2.3. Glossary

Artificial Intelligence: Artificial Intelligence (AI) is the idea and creation of computer systems that can do tasks usually needing human intelligence, like seeing, understanding speech, making decisions, and translating languages.

Artificial Intelligence in Teaching: AI in teaching involves the use of intelligent tutoring systems, chatbots, and adaptive learning algorithms to support educators and learners. These AI-driven tools can analyze student data, identify learning gaps, and deliver customized instructional materials.

Chatbot: At the most basic level, a chatbot is a computer program that simulates and processes human conversation (either written or spoken), allowing humans to interact with digital devices as if they were communicating with a real person.

Cobot: A collaborative robot, also known as a cobot, is an industrial robot that can safely operate alongside humans in a shared workspace. In contrast, autonomous robots are hard-coded to repeatedly perform one task, work independently and remain stationary.

English as a Foreign Language (EFL): English as a Foreign Language refers to the practice and theory of learning and teaching English for its use in countries where it is not an official medium.

English as a Second Language (ESL): English as a Second Language is taught to people whose native language is not English but who live in a society in which English is the main language or one of the main languages.

Gender: Gender refers to the social, cultural, and psychological attributes and roles associated with being male, female, or non-binary. It is distinct from biological sex and encompasses a spectrum of identities.

Gender Perception: Gender perception refers to being male or female based on the social and cultural roles expected for men and women.

Learning Management System (LMS): A Learning Management System is a software application used to deliver, manage, and track educational content and activities. LMS platforms facilitate online learning by providing features such as course administration, content authoring, and assessment tools.

Technology and Teaching: Technology has revolutionized teaching methodologies by offering new tools and platforms to enhance learning experiences. From interactive whiteboards to virtual classrooms, technology integration in education has transformed traditional pedagogical approaches.

The study uses a systematic literature review framework from Charles Sturt University. It outlines steps like protocols and criteria which are established before starting the review. This framework enhances the research's clarity, transparency, and rigor, and lowers the risk of bias.

3. Literature Review

3.1. AI in Education

According to Chassignol et al. (2018, p. 22), “AI has the power to cause significant changes in society, particularly in education”. Various articles that were used in this research show that AI has been effectively applied in education, particularly in teaching, which leads to improved student learning experiences. AI has become an essential part of education, automating administrative tasks and enhancing curriculum development, content creation, and instructional methods. This integration has made administrative processes more efficient and enabled learners to access better learning resources and experiences.

In a different context, UNESCO has highlighted the growing role of AI in the educational sector, discussing its impact on teaching strategies, tools, and methodologies (Vega et al., 2019). Education is evolving due to changes in the job market which demand the incorporation of AI into both teaching and learning processes (Wartman & Combs, 2018). A prominent example of this is the extensive use of AI in the healthcare industry, which supports the integration of AI in medical education to equip students for practical, real-world scenarios (Wartman & Combs, 2018, p. 1107).

“AI plays a significant role in education by creating sub-fields such as intelligent education, virtual learning, data analysis, and prediction” (Bozkurt, 2019, p. 499). Intelligent education leverages machine learning and data mining to offer personalized instruction and feedback to both learners and educators, enhancing learning analysis and recommendation systems (El Alfy et al., 2019, p. 25). AI systems provide personalized recommendations, adaptive learning paths, and real-time feedback to learners that improve their learning experience.

Artificial intelligence’s application in education has progressed beyond traditional computers to include embedded systems like robots and cobots, enabling collaboration between educators and AI systems (Chassignol et al., 2018). “It includes professionals from different fields including system designers, data scientists, psychologists, and education experts” (Putra et al., 2020, p. 15).

AI has been utilized in curriculum development, content personalization, teaching methods, assessment, and communication between teachers and students (Chassignol et al., 2018). Platforms like Interactive Learning Environments (ILEs) and Intelligent Tutoring Systems (ITSs) have been implemented to monitor performance, offer feedback, and enhance teacher-student interactions (Song-Nichols et al., 2020).

3.2. AI in Language Learning

Learning speed is different among students. While some students grasp concepts quickly, others may require more repetition. Students can review course materials multiple times when they use AI tools in LMS, which ensures deep understanding without direct teacher intervention (Enríquez, 2018). In contrast, most instructors (more than 90% of survey respondents) use learning software as supplementary material (Zheng et al., 2018). McDonnell and Baxter (2019, p. 116) argue that “digital technology can enhance English language learning, with AI tools like Loquendo, improving comprehension and making learning more engaging for all learners”.

The incorporation of AI tools into LMS has changed language learning, particularly productive skills. Li (2020, p. 2) witnessed improved learning satisfaction and academic achievement after applying AI speech recognition systems in LMS. Smart tools do optimize class time which is done through focusing on advanced issues which need teacher guidance (Kahraman et al., 2010). “AI facilitates assessment by providing instant feedback to students” (Vega et al., 2019).

AI initiatives in education, particularly those focusing on productive skills like speaking and writing, have been implemented by several countries, demonstrating the potential of technological advancements (Gong et al., 2019; Eryilmaz & Yeşilyurt, 2022). Chatbots and AI platforms support students in enhancing grammar and writing skills, fostering both independent and collaborative work (Peredo et al., 2011, p. 38; Enríquez, 2018). The integration of Computer-Assisted Language Learning (CALL) into language-learning applications improves writing skills and provides real-time corrections to learners (Lousado et al., 2019).

Intelligent tutoring systems, such as those integrated into Moodle Learning Management Systems (LMS), improve reading skills by structuring and verifying the learning process (Bradac & Walek, 2017, p. 414). Social Networking Service (SNS) tools enhance informal learning and speaking skills (Dogoriti et al., 2014, p. 260). Hybrid models like Deep Neural Networks (DNNs) and Natural Language Toolkit (NLTK) enhance grammar reading within LMS (Enríquez, 2018).

“Studies that focus on listening skills show promise for modern learning progress” (Reich-Stiebert & Eyssel, 2017). UNESCO highlights the integration of speech recognition AI tools at the university level, improving listening skills through adaptable and cost-effective courses (UNESCO, n.d.).

3.3. Gender Perception and Technology in education

“Anthropomorphization refers to the tendency of people to attribute human traits to animals as well as objects such as robots” (Ahn et al., 2022, p. 251). In the realm of technology, the concept is rooted in the computers as social actors (CASA) paradigm, pioneered by Clifford Nass, which elucidates the interactions and dynamics between humans and technology (Otterbacher & Talias, 2017). According to CASA, “individuals who interact with technology as they do with other humans perceive computers as social actors and engage with them accordingly” (Guzman & Lewis, 2019, p. 81).

This model supports research on virtual agents or artificial assistants that aim to enhance accessibility by filling technologies with human-like traits (Cercas Curry et al., 2020, p. 77). Studies reveal a preference for technology that shows human-like characteristics, with individuals having different preferences for agent personality and traits (Cercas Curry et al., 2020, p. 77). Stereotypes influence the perception of technology, with gendered technology that is often subject to biases. “Technology perceived as female is typically associated with warmth and empathy but is perceived as less trustworthy and intelligent compared to technology presented as male” (Gulz & Haake, 2008, p. 120).

Gender significantly impacts perception, with individuals more focused on solving tasks assigned to the opposite virtual agent gender. Men tend to trust female agents, while females find male agents more trustworthy. “Age and gender also influence stereotypical beliefs, with older individuals showing stronger biases towards female agents” (Woinaroschy, 2020).

3.4. Gender Perception and AI

AI permeates our daily lives through technologies such as GPS navigation and personal assistants, excelling in tasks like image generation, language understanding, speech recognition, and visual interpretation (Tumskiy, 2019; Lee & Cho, 2020, p. 240). As a computer-based system designed to mimic human-like traits, AI is often viewed through a gendered lens, which influences interactions with users (Tumskiy, 2019; Townsend & Hunt, 2019). “Individuals tend to attribute genders to AI, which can significantly impact their interaction patterns” (Ashiyan & Salehi, 2016). Despite AI being originally gender-neutral, societal perceptions often associate it with either masculine or feminine qualities, shaping user engagement (Bernotat et al., 2019, p. 280).

The influence of gender stereotypes on AI interactions is particularly evident in children’s perceptions of robots (Teo et al., 2015, p. 31). Virtual assistants, whose perceived competence and interaction dynamics are influenced by gender stereotypes, reflect these

biases in user experiences (Dufour & Ehrwein Nihan, 2016). Although research findings may differ, “female virtual assistants are sometimes perceived as more competent, underscoring societal biases and expectations” (Mezei, 2020; Borau et al., 2021, p. 1060).

Female AI assistants are often endowed with human-like traits to enhance acceptance, yet they also face challenges such as aggression and objectification (Brahnam & De Angeli, 2012, p. 142). Visual depictions of AI agents can reinforce stereotypes, with female agents being portrayed as more attractive, leading to objectification and mistreatment (Gustavsson, 2005; Wartman & Combs, 2018). Tasks designed without gender-specific attributes tend to reduce stereotyping tendencies (Mezei, 2020), although age can also influence perceptions of AI capabilities, especially when considering female agents (Petrova et al., 2020).

3.5. Gender Perceptions and Technology in Language Learning

The Technology Acceptance Model (TAM), a framework that predicts how consumers adopt new technology based on their perceived value and ease of use, provides valuable insights into technology acceptance across diverse domains (Herbert et al., 2019). “In the realm of language acquisition, gender differences and their impact on motivation have become a focal point within theories that advocate for integrating technology into learning processes” (Alzamil, 2020, p. 12).

Researchers are delving into how gender influences motivation in language learning, particularly in contexts where English acquisition is paramount, examining aspects such as perceived value, ability assessment, and emotional responses (Iwaniec, 2019). Bridging research gaps, studies like those focusing on Iranian EFL learners’ expectations of technology for language learning outside traditional classrooms shed light on potential gender-related implications in educational technology use (Zhang, 2020). Moreover, investigations into gender disparities in learning outcomes and motivational factors related to technology, encompassing elements like self-efficacy and motivational conditions, are shedding light on nuanced differences (Dang et al., 2016, p. 27).

Theoretical frameworks further explore how gender influences the integration of technology by educators in classroom settings, underscoring gender-specific impacts on the adoption and utilization of educational technology (Timms, 2016). “Understanding gender variations in technology adoption, including attitudes toward technology, perceptions of usefulness, ease of use, and willingness to embrace technological tools, remains critical for informing educational practices” (Timms, 2016, p. 707). These insights collectively highlight the multifaceted relationship between gender dynamics and technology adoption in

educational contexts, shaping how educators and policymakers approach the integration of technology in teaching and learning.

4. Discussion

Based on the different articles examined for this research, it is clear that technological progress has led to the rise of artificial intelligence (AI), which has become widespread in society and is poised to impact various industries. AI's influence is particularly significant in education, where it is vital to understand its defining features. Characterized by its intelligence, AI allows computers and systems to possess human-like abilities such as understanding, learning, and decision-making (Timms, 2016, p. 710; Bozkurt, 2019, p. 511). This innovation has transformed education, with AI being used to complete administrative tasks, provide instruction, and teach students (Chassignol et al., 2018).

AI's integration into learning management systems (LMS) has revolutionized foreign language education by leveraging tools like speech recognition and chatbots (Enríquez, 2018; Kahraman et al., 2010). Despite challenges such as distractions from social media, advancements in AI, particularly in natural language processing, offer promising solutions for enhancing reading comprehension skills (Dogoriti et al., 2014, p. 261).

Research indicates a gender-neutral adoption of mobile learning applications, with both male and female students displaying similar levels of enthusiasm, suggesting these apps' potential to foster knowledge acquisition (Putra et al., 2020). Moreover, students have shown keen interest in using Instagram as a tool for language learning, with no significant differences observed between genders in their perceptions of its effectiveness (Alzamil, 2020, p. 12). However, gender disparities emerge in performance and motivation, with females often outperforming males in certain areas of language acquisition (Iwaniec, 2019).

Gender stereotypes significantly influence perceptions of technology. Female-gendered technology is preferred due to perceived warmth and empathy, whereas male-gendered technology is associated with attributes of physical power (Borau et al., 2021; El Alfy et al., 2019). In tasks requiring cooperation and persuasion, female agents are perceived as more competent, whereas male agents are perceived as more adept at task-oriented problem-solving (Gulz & Haake, 2008; Ahn et al., 2022, p. 251). Ultimately, the perceived competence of AI agents hinges on how well their gendered attributes align with the requirements of the task at hand (Vega et al., 2019).

5. Conclusions

In summary, advancements in AI have revolutionized education, offering new opportunities for learning and teaching. Gender-neutral adoption of technology is observed, but gender disparities persist in performance and motivation. Understanding the influence of gender stereotypes on technology perceptions is essential for promoting inclusivity and equity in education and beyond.

As highlighted by studies such as those by Putra et al. (2020) and Alzamil (2020), the integration of artificial intelligence (AI) technologies in education offers significant potential to enhance learning experiences, particularly in language acquisition. However, research on the impact of gender stereotypes on AI recommendations and user perceptions underscores the need for a nuanced understanding of how gender influences interactions with AI systems (Ahn et al., 2022).

Examining gender differences in technology acceptance and usage patterns reveals complex dynamics influenced by individual characteristics and contextual factors. These findings emphasize the importance of considering diverse learner needs and preferences when designing AI-enabled educational tools (Putra et al., 2020).

Furthermore, research on conversational agents, robots, and virtual assistants suggests that AI design can play a transformative role in challenging traditional gender roles and stereotypes, thereby promoting inclusivity and diversity (Gulz & Haake, 2008; Cercas Curry et al., 2020).

However, concerns about gender biases in AI, privacy, and ethical considerations highlight the importance of responsible AI development and implementation (Wartman & Combs, 2018).

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