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Artificial Intelligence Supported Language Learning: A Systematic Review

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Abstract

Several recent advancements have been made in the field of artificial intelligence (AI) language learning. Given the widespread adoption and enabling power of immersive technologies, as well as the potential applications of Artificial Intelligence Supported Language Learning (AISLL), it is critical to continuously investigate the literature to identify trends and practices in language education research. Of the 89 publications located between 2021 and 2023, 10 were selected based on the criteria for inclusion and exclusion from WoS and Scopus. Using five codes obtained from earlier systematic reviews, the researcher conducted an analysis and synthesis of these studies. The codes were as follows: 1) aim, 2) methodology, 3) sample, 4) country, and 5) outcomes. The systematic review revealed several key trends in AISLL. It was found that universities were the predominant setting for AISLL research, with most studies employing quantitative research methods. The methodologies varied widely, with emphasis on experimental and quasi-experimental designs. The countries represented in the studies were diverse, yet there was concentration in technologically advanced regions. Significant outcomes reported include improved student performance and positive attitudes toward AI tools in language learning. To better understand AI utilization in language teaching and learning, academics are urged to broaden the scope of future studies and involve students at all educational levels in future AISLL practices.

Keywords: Artificial Intelligence; Systematic Review; Language Teaching and Learning; Trends; Practices

INTRODUCTION

The last five years have witnessed a meteoric rise in the use of artificial intelligence (AI) at universities worldwide (Zainuddin & Abdullah, 2025; Chu et al., 2022). Educators and students alike can profit from artificial intelligence, according to research (Chen et al., 2020; Crompton & Song., 2021). The use of AI in higher education has many benefits, including the ability to tailor lessons to the needs of different students (Verdu, 2006), giving students immediate, personalized feedback on their work (Dever et al., 2020), creating effective tests (Baykasoğlu et al., 2018), and forecasting student performance in the classroom (Çağataylı & Çelebi, 2021).

AI is pervasive in modern society and has been used as a tool that may be used to enhance and advance many facets of human life (Gorriz et al., 2020). Many people are interested in AI because of its potential applications in higher education, which are significantly influenced by ICT development (Alajmi et al., 2020). AI is used as a teaching tool in various disciplines, including language (Liang et al., 2021), engineering (Shukla et al., 2019), mathematics (Hwang & Tu, 2021) and medicine (Winkler-Schwartz et al., 2019).

AI is the ability of machines to learn, solve problems, and make decisions, all of which traditionally require human intelligence. A similar amount of progress has been made in the development of AI-based systems over the past decade. For instance, "Apple Siri", "Amazon Alexa", "Microsoft Cortana", and "Google Home Assistant" that are chatbots capable of responding to human voice instructions. Furthermore, intelligent machines have allowed the creation of conversational robots such as Erica and Sophia. The humanoid female robot Erica was created by researchers at Kyoto and Osaka universities and led by Hiroshi Ishiguro. Erica is considered a fully autonomous android bot with human-like qualities and expressivity, as well as sophisticated multimodal sensing capabilities (Sindermann et al., 2020).

Hanson Robotics of Hong Kong has developed a socially intelligent humanoid robot named Sophia (Akib et al., 2019), which has a human-like appearance and can communicate with humans. By reshaping how students learn and boosting teachers' productivity, AI has the potential to revolutionize the field of language instruction. To analyze human language, language learning technologies employ natural language processing (NLP) and machine learning (ML) techniques. However, research on the role of AI in language learning is still in its infancy (Gera & Chadha, 2021; Woschank et al., 2020) despite its apparent promise (Dizon & Tang, 2019; Haristiani, 2019). AI applications have four main goals for online higher education. These goals include performance prediction, resource selection, automated evaluation, and an improved learning experience. Salas-Pilco and Yang (2022) focused on the use of AI at Latin American universities. Predictive modelling, intelligent analytics, assistive technology, automatic text analysis, and image analytics were the most common applications of AI in Latin American universities.

The term Artificial Intelligence Supported Language Learning (AISLL), refers to the use of AI in language teaching and learning methods to ensure that students are given the best possible assistance during their studies. Language acquisition can be accelerated with the aid of AI, as shown in previous studies (Liang, 2021; Yong, 2020). With no need for direct teacher involvement, students may learn at their own pace, receive immediate feedback on their progress, and be guided through their coursework (Keerthiwansha, 2018). It can provide students with learning experiences tailored to their individual needs (Gao, 2021), provide revision suggestions, measure their progress (Zhou, 2019), and allow students to relax when communicating with a computer (Kim, 2019). Artificial intelligence (AI) provides a new foundation for teachers to construct an adaptive and individualized English classroom (Li, 2017). AI-based solutions can ease teachers' burdens in several ways (Yong, 2020). Some examples include the use of facial recognition for attendance, automatic evaluation of students, correction of English pronunciation (Na, 2021), monitoring and recording of student emotions and behaviors (Hou, 2021), collecting resources, marking homework, and answering student questions (Hou, 2020).

Another key benefit of AI in language learning is its ability to personalize the learning experience of each student. By analyzing the learner's performance, AI can identify areas of strength and weakness, tailor the learning content, and approach the learner's needs (Bhutoria, 2022). This personalized approach can increase learner engagement and motivation, leading to better learning outcomes. AI can also facilitate language learning through its ability to provide real-time feedback. For example, an AI-powered language learning tool can listen to a learners' speech and provide feedback on their pronunciation and grammar. This immediate feedback can help learners improve their language skills faster and more effectively than with traditional methods (Chen et al., 2022).

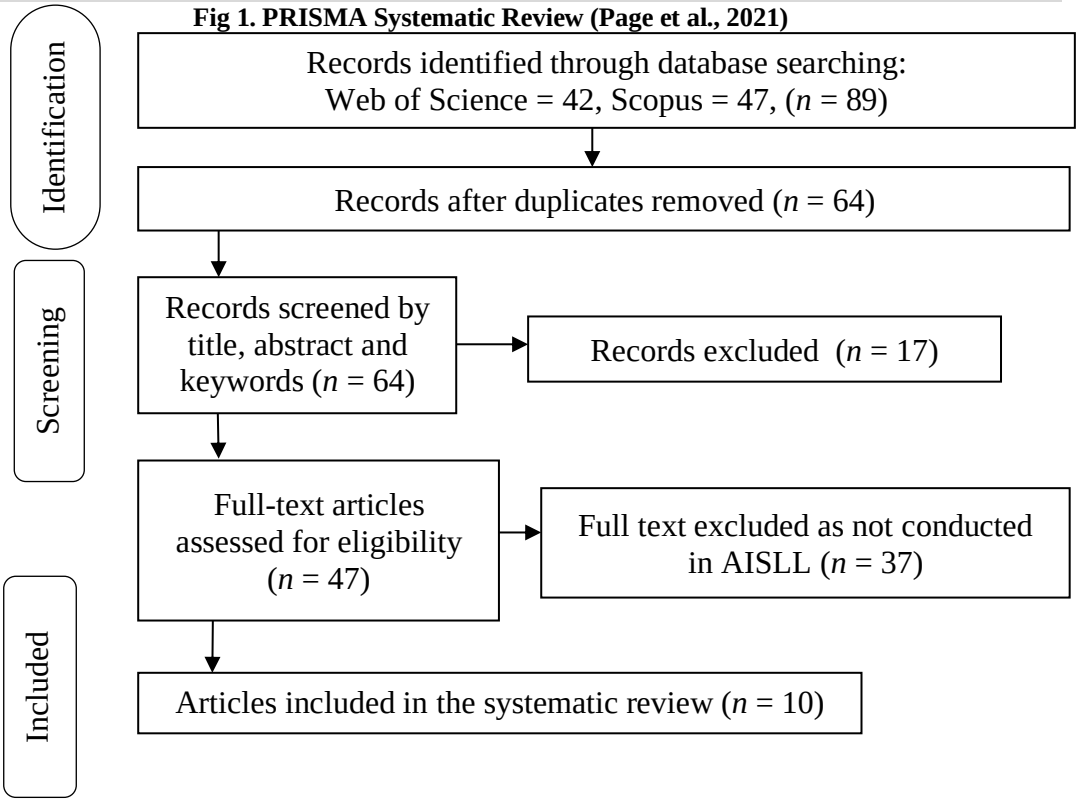
AI impact on language learning is also evident in the advancements made in chatbot and virtual assistant technology. These AI-powered tools can provide learners with conversational practice, allowing them to practice their language skills in a safe and non-judgmental environment. Chatbots and virtual assistants can also provide learners with instant access to language resources such as dictionaries and grammar guides, helping them learn more efficiently (Belda-Medina & Calvo-Ferrer, 2022). As AI technology advances, we expect to see more complex and effective language-learning systems in the future.

In light of the widespread use and enabling power of immersive technologies and the potential applications of AISLL, it is essential that the literature be continuously investigated to identify the types and trends of recent studies to understand current practices and guide future research in the field, with the two research questions what are the trends and practices of the AISLL? What research methodologies are employed in AISLL studies? Therefore, this study investigates AISLL from many perspectives, such as the distribution of research themes, the range of devices, the methodological elements of AISLL studies, and thorough summaries and annotated references. It paints a fuller picture of AISLL by critically evaluating many research topics, ends, and methods used in AISLL studies.

METHOD

This study adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria, which includes four phases (explained in Figure 1): identification, screening, eligibility, and inclusion. PRISMA is a popular tool among academics because to its comprehensiveness and adaptability. As a result, the following summarizes the goals of this study and how the systematic review will be conducted.

Fig 1. PRISMA Systematic Review (Page et al., 2021)



PRISMA guidelines explain the identification method, which is the initial stage of any systematic review. Two databases were chosen for this study: the Web of Science (WoS) and Scopus. The core words for the review were carefully crafted to reflect topics to be addressed appropriately. Several AISLL-related words were used in this study. The search strings used in this study are listed in Table 1.

Table 1: Search String Used In This Study

Database	Search String
WoS	TS=(("artificial") AND ("intelligence") AND ("language learn*" OR "language teach*" OR "teaching language*" OR "language teaching and learning" OR "language pedagogy" OR "language teaching and learning"))
Scopus	TITLE-ABS-KEY ((“artificial”) AND (“intelligence”) AND (“language learn*” OR “language teach*” OR “teaching language*” OR “language teaching and learning” OR “language pedagogy” OR “language teaching and learning”))

*: Search String.

Once the articles have been located, they undergo processing, the first step of which is the elimination of duplicates found across several databases. After the first round of screening, only 64 articles remained after the removal of 25 duplicates. Reviewing the titles, abstracts, and keywords of these 64 papers, we found the ones most pertinent to "AI Supported Language Learning." The screening method resulted in the removal of 17 publications that were judged irrelevant to the study's aims. Table 2 shows the outcomes of inclusion/exclusion screening of the remaining 47 articles.

Table 2: Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Studies 2021 and 2023	Studies conducted before 2021
Articles from journals	Conference proceedings, review articles, book
The text was written in English	Text not written in English
Related to AISLL	Not related to AISLL

The inclusion of 10 publications in this systematic review was predicated on their eligibility and assessed using specified inclusion and exclusion criteria. The researcher conducted a review, but he excluded book chapters and conference proceedings because they were not as comprehensive (González-Albo & Bordons, 2011). The included studies are listed in Table 3. Using the data in table above, one article was chosen from WoS, two articles from Scopus, and the remaining seven articles were indexed in both WoS and Scopus databases. The databases were chosen because of the high quality of their instructional information. Each inquiry focused on different aspects of the AISLL ecosystem. Most studies were conducted at the tertiary level.

Table 3. Summary Of The Selected Studies

Study	Journal	Database
Dizon et al., 2022	Computers and Education: Artificial Intelligence	Scopus
Chung & Bong, 2022	Journal of Asia TEFL	WoS, Scopus
Xu et al., 2022	American Journal of Distance Education	WoS, Scopus
Chen et al., 2022	Education Sciences	WoS, Scopus
Rahman & Tomy, 2023	World Journal of English Language	Scopus
Ma, 2021	Mobile Information Systems	WoS, Scopus
Jia, 2022	Sustainability	WoS, Scopus
Peña-Acuña & Crismán-Pérez, 2022	Frontiers in Psychology	WoS, Scopus
Belda-Medina & Calvo-Ferrer, 2022	Frontiers in Psychology	WoS, Scopus
Kushmar et al., 2022	Arab World English Journal	WoS

All the selected articles were moved to Mendeley, a citation manager. Thematic analysis was used to answer the study questions.

RESULTS AND DISCUSSION

The trends and practices of the AISLL

The rising number of papers published between 2021 and 2023 demonstrates that interest in this field has grown during the last three years. AISLL trends and practices were classified into six categories relevant to RQ 1. The codes are: 1) aim 2) methodology 3) sample 4) country and 5) outcomes as shown in Table 4.

Table 4. Trends of AISLL

Study	Aim	Method	Sample	Country	Outcomes
Dizon et al., 2022	To investigate out-of-class, self-directed use of the intelligent personal assistant, Alexa.	Quantitative	6 Japanese as a second language learners.	Japan	Intelligent personal assistants have the potential to be effective tools for self-directed foreign language learning in languages other than English.
Chung &	To study the virtual reality technology college English	Quantitative	Freshmen from class 1 and class 2	China	College English immersive context instruction (which

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Bong, 2022	immersive context teaching method based on artificial intelligence and machine learning.		of economics major.		combines constructivism theory and VR technology) may increase students' English proficiency.
Xu et al., 2022	To investigate the generalizability of the Lingua Franca Core and conduct a Korean-accented English intelligibility test with human subjects and Artificial Intelligence mobile applications.	Mixed-method	30 college students from North Carolina University.	United States	To prepare for the AI-Intervened/Mediated Circle, learners should attempt to interact intelligibly with humans with diverse accents by practicing/communicating using currently accessible AI applications.
Chen et al., 2022	To present the developmental process and methods used for an AI-enabled English language learning system and to identify key design features for English learning in authentic contexts.	Mixed-method	20 undergraduate and postgraduate students from diverse majors.	China	The notion of mobile learning is at the forefront of this study's contribution to the evolution of the of AI in language education.
Rahman & Tomy, 2023	To examine an AI-powered automated system that uses voice and facial recognition to track both teacher and learner speech, facial expressions, and interactions in real-time in a one-to-one 25-minute online English class.	Quantitative	159 participants from a student database of an online education technology company, called VIPKid.	United States	Automated AI measurements can be used in online learning systems to forecast and track student engagement.
Ma, 2021	To examine learners' perceptions of the linguistic and learning potential of an AI-based English language learning app called Papua.	Quantitative	128 students of the degree in Primary Education at the University of Huelva.	Spain	Participants emphasized the app's ability to improve vocabulary memorization and favorably rated the app's self-evaluation function.
Jia, 2022	To create an application system using robots as a tool for training English language tour guides.	Qualitative	2 Master's degree students from the University of Science and Technology.	Taiwan	Students perceived that Robot-assisted language learning could help develop autonomy, enhance interactions, and provide an active learning experience.
Peña-Acuña & Crismán	To examine the knowledge, level of satisfaction and perceptions	Mixed-method	176 undergraduates from	Spain	Positive impressions of the integration of conversational agents in language

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-Pérez, 2022	concerning the integration of conversational AI in language learning among future educators.		Spain and Poland.		acquisition, notably in terms of perceived ease of use and attitudes.
Belda-Medina & Calvo-Ferrer, 2022	To enable second language learners to gain fluency in English through the use of Voice Assistant in L2 classrooms.	Quantitative	40 first- year engineering students.	India	The learners' success with the Voice Assistant was quite encouraging, and they discovered that this approach was ideal for achieving oral fluency.
Kushmar et al., 2022	To examine the role of AI in English language learning, how effective it is, and what practical methods can be used to apply it effectively.	Quantitative	418 students from Kyiv National University of Trade and Economics and Zhytomyr Ivan Franko State University.	Ukraine	The knowledge of human content creators and educational specialists is required for AI in language acquisition.

The review found that universities were the most common settings for AISLL research. This prominence can be attributed to universities' resources, research capabilities and student populations, which are ideal for conducting experimental studies. A significant number of studies employed quantitative research methods, reflecting a focus on measurable outcomes and statistical analysis. Researchers used these methods to validate hypotheses about the efficacy of AISLL tools, highlighting a scientific approach to assessing AI's impact on language learning. The research aims varied across the studies, with common objectives including improving language proficiency, enhancing learner engagement and personalizing learning experiences. This variety demonstrates the potential of AI in addressing different aspects of language education, catering to both learners' needs and educational goals. The studies were conducted in various countries. This distribution suggests that AISLL research is gaining global traction, although there is a need for more studies in underrepresented regions to understand the broader applicability of AI tools in diverse educational contexts. The review reported several positive outcomes, including improved student performance and favorable attitudes toward AI in language learning. These findings underscore the potential benefits of integrating AI into educational practices and the positive reception from learners, reinforcing the value of AISLL in enhancing language education.

Research Methodologies Are Employed in AISLL Studies

Across all ten studies included in this systematic review, three main types of research methodology were used. A quantitative research technique has been used in the majority of studies on language teaching and learning trends and practices. Only three studies used a mixed-method approach (see Table 4). Six quantitative studies were conducted, one with an experimental design, two with a quasi-experimental design, and three using a survey method employing questionnaires. The findings of this review

support (Mohammed, 2022; Park, 2022; Choi, 2020) arguing that quantitative research methodologies are becoming more widespread among educational academics.

One possible reason for this predicament is that academics would want to explore the growing popularity of AI as a tool for enhancing language learning using quantitative methodologies. According to Babbie (2021) and Creswell (2019), statistical analysis is more reliable, objective, and accurate than traditional techniques of data collection and interpretation because it uses well-established computing tools that allow for study generalizations. Of the 10 studies, only one qualitatively collected the data. To better educate English-speaking tour guides using robots coupled with AI and VR technologies, Rahman & Tomy (2023) combined observations, interviews, and self-reporting of learning results to create an application system.

Researchers appear to be more interested in obtaining a superficial understanding of AISLL than conducting in-depth studies, as evidenced by the dearth of qualitative research in the field. Small sample numbers, anecdotal character, lack of rigour, reliability and validity difficulties, difficulty generalising, uncontrolled bias, and subjectivities are often cited as reasons why qualitative research results can't be trusted (Hennink & Kaiser, 2021; Lenger, 2019; Luo, 2011).

Analyzing qualitative data may be challenging, iterative, intricate, perplexing, and time-consuming, despite providing well-founded, extensive, and prolonged narrations of individuals' experiences and reasoning in relation to the issues at hand (Morgan, 2022; Miles et al., 2018). Even when employing proven methodologies for qualitative data analysis, researchers often fail to elucidate the latent meanings that individuals connect with their behavior and responses to an event. This is because the researcher's preconceptions, theories, and biases may skew the results (Erlingsson & Brysiewicz, 2017; Hilal & Alabri, 2013). Although more qualitative research is needed in the AISLL field because of its diversity, quality, and authority, it can contribute to the development of a more nuanced understanding of educational problems. Many researchers continue to avoid qualitative research due to the external criticism and analytical difficulty it entails.

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s conducted between 2021 and 2023 on AISLL in language education, only three used a mixed-method strategy. Questionnaires with free-form questions or semi-structured interviews were used in three separate studies. By using many research strategies, we highlight the importance of observing AISLL's actions from different perspectives. The findings of the systematic review corroborate those of other academics who have been claiming for some time that mixed-method research designs are gaining favor in the social sciences (Bell & Warren, 2023; Seyfried & Reith, 2019). By combining quantitative and qualitative approaches, researchers in the field of education hope to gain a complete understanding of their research questions and the phenomena they plan to explore (Flick, 2022; Creswell & Clark, 2017). In addition, it is difficult for researchers to use a mixed-method approach to collect triangulated data (Creswell & Clark, 2017; Mukumbang, 2023), which strengthens the validity and comprehensiveness of AISLL evidence.

CONCLUSION

The study found that research on artificial intelligence and its use in language teaching and learning is still in its preliminary phases, despite the considerable progress and promise of technology. Given the current analysis's findings, much more study is needed to fill in the blanks and ensure that AISLL is implemented effectively across all

levels of education to satisfy the needs of Education in the Fourth Industrial Revolution. While the COVID-19 pandemic accelerated the adoption of digital tools and AI technologies in education, its influence has led to lasting changes that continue to shape the educational landscape. This study, like many others, has limitations, but these are all excellent jumping-off points for future studies. To begin, the scope of this review is limited by the journals included in the analysis. As the number of articles in AISLL grows, it becomes increasingly challenging to conduct comprehensive and detailed search. This is why the researchers established hard and fast rules for picking the papers they would include in their study. The journals listed in WoS and Scopus were selected as the only sources for this study despite a substantial quality gap between them. The advantages of publishing in high-impact journals have recently been established by AISLL research, although this preference recognizes the drawbacks of ignoring similarly great contributions published in other high-impact journals. Studies of AISLL in other publications such as conference proceedings, project reports, and academic dissertations may be of interest to future researchers looking to better understand its development and current condition. The scope of this study is small since the keywords utilized, the questions asked, and the period covered by the articles are all quite precise. Although the review covered almost the entire corpus of recent research in detail due to its focus on 2021-2023 and diverse research questions, an examination of articles produced within a broader time span, or of articles with a different area of research focus, would reflect even broader trends of development and changes in AISLL studies over time. The results of future studies might shed light on whether AISLL is typically utilized as a standalone modality or whether it is integrated into pre-existing courses or programs based on great teaching.

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