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The Integration of Generative AI in Foreign Language Teacher Education: A Systematic Literature Review

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Annotation. The current paper presents a systematic review that was conducted based on the Preferred Reporting Items for Systematic Reviews (PRISMA) and contains a selection of 12 articles published in the Web of Science and Scopus. The aim is to identify research trends and directions that would contribute to the body of knowledge about empirical research on GAI integration in foreign language instruction from November 2022 (the launch of OpenAi's ChatGPT) to February 2024. The paper analyses the most novel practices, reveals teachers' approaches, and evaluates opportunities and challenges.

Keywords: *teacher education, foreign language teacher training, generative AI, GAI integration, digital AI competencies.*

Introduction

The 21st century, which has frequently been referred to as the Age of Information, can now be called as the Age of Intelligence due to the ongoing penetration of Generative Artificial Intelligence (GAI) not only into daily society's lives, but also into other significant areas of life, including education. Teachers from various disciplines were challenged to rapidly adapt to new methods of instruction due to the COVID-19 pandemic, and these days teacher education still keeps encountering uncertainties and challenges despite the fact that the significance of information and communication (ICT) technologies has been highlighted by different national and multinational authorities in various countries all

around the world (UNESCO ICT Competency Framework for Teachers, 2018). This uncertainty also arises as a result of ongoing changes in digitisation, especially, due to the recent emergence of GAI tools. Despite the fact that certain governments have established their digitisation policies that encourage teachers' early awareness and perception for GAI, there are still many doubts regarding the ways of GAI integration in educational processes (Salas-Pilco et al., 2022).

Even though the society had already been exposed to Artificial Intelligence (AI) for a long time, the worldwide buzz began with the emergence of GAI tools, such as DALL-E, Midjourney with the main function to generate images based on text descriptions or the most popular GAI algorithm known as Large Language Models (LLMs), exemplified by OpenAI's ChatGPT, and its release to the public in November 2022, which has enabled individuals to create cutting-edge content, including texts, graphics, speech, music, video and reached millions of users in a span of a few months (Warner, 2023). Such features create new possibilities for learning a language and might determine changes and the overall nature of foreign language learning, which can be referred to as multifaceted, unstructured, non-hierarchical and free rhizomatic learning (Kairienė & Mažeikienė, 2023). All these new capabilities that emerge due to the rising interest in GAI, which describes algorithms that create human-like content, have to be perceived by foreign language instructors whose responsibilities to create meaningful learning environments even increase (Lashari et al., 2023). As a result, foreign language teachers might experience even more pressure due to the rhizomatic development of students' GAI digital knowledge and skills that do not positively influence their foreign language levels, but at the same time place language instructors in questionable positions. Teachers may lack adequate technical knowledge related to GAI tool integration that would facilitate the process of instruction, not to mention developing students' digital capabilities related to the daily usage of GAI. It is fundamental to understand how GAI tool adoption can support teachers in educational processes, and especially how these tools can be pedagogically integrated for a linguistic content. Teacher preparation plays a vital role in developing educators that are able to ensure an innovative and meaningful learning and teaching process and there is an increasing need to develop sufficient digital competencies that would facilitate GAI tool adoption in teaching environments. Tondeur et al. (2019) and Ng et al. (2023) emphasized the importance of preparing future teachers for effective digital technology integration due to the rapid penetration not only of different digital technologies, but also of GAI.

In this context, the present study, which employs a systematic review methodology, aims to provide an overview of the research on GAI tool adoption in foreign language instruction with the objective to summarise the most novel studies in the field of foreign language instruction by identifying their main goals, research methods, participants, techniques, GAI tools employed, and pedagogical implications provided by the studies. It is crucial to understand the most novel practices of GAI tool adoption in language

instruction, which would guide teachers, policy makers, practitioners towards the enhancement of language teacher training programmes.

Theoretical Framework

Different countries establish their own policies for teacher preparation that ensure educator effectiveness, which is defined as of the utmost importance in education policy agenda in many nations (Darling-Hammond, 2017). For instance, Australia has set certain professional standards for teachers, which include the three main domains that are expected from teacher education programmes. The domains include such areas as professional knowledge of content and students, professional practice (planning, implementation, supportive learning environments, evaluation, feedback, reporting), and different stakeholders' (students', teachers', colleagues', parents', etc.) engagement (Buchanan, 2017). Nowadays, teacher education can be defined as the area that includes the previously mentioned three domains with an aim to develop knowledge and skills that would enable educators to deliver effective work results in order to meet the requirements established by a particular society (Baltynova et al., 2023). The current age of digitisation as well as the rise of GAI, especially the release of OpenAI's ChatGPT in November 2022, and its capabilities to produce human-like content, raises the need for a new skillset that greatly differs from the skills educators used to be required before. This poses pre-service teachers and teachers in general to educate future generations with the competencies related to digital technologies (Baltynova et al., 2023). In Lithuania, the significance of digital teachers' competencies is highlighted in The Regulation on Teacher Training (2018) that align with the importance to integrate digital technology into educational processes because, as stated in the European Commission's 2021–2027 in the Digital Education Action Plan; it is necessary to learn from the COVID-19 crisis and adapt the education system to the challenges of the Digital Age. Even though certain policies that encourage teachers' early awareness for AI have been established, different research studies show that there are barriers related to teachers' attitudes, skills, and abilities that hinder teachers' willingness to employ GAI tools into educational processes (Baltynova et al., 2023; Kildė, 2023; Salas-Pilco et al., 2022). Since technology integration into language teaching tends to be a prevalent practice, researchers "have been concerned about how language teachers represent linguistic content using proper technology in an appropriate pedagogical manner." (Tseng et al., 2022, p. 949). Thus, teacher education programmes where technical knowledge is limited only to technology courses should be replaced by the application of TPACK (Technological Pedagogical Content Knowledge) that would enable teachers to combine technology knowledge together with their field knowledge (Baltynova et al., 2023). This is confirmed by a number of other research studies, where

the importance of TPACK was highlighted throughout the whole teacher education curriculum (Kay, 2006; Koehler & Mishra, 2009; Niess, 2005; Tseng et al., 2022).

The penetration of GAI tools in people's daily lives creates favourable opportunities for learning in various environments. Such a rise of GAI establishes new features of the nature of foreign language learning, which can be described as multifaceted, unstructured, non-hierarchical, and free rhizomatic learning (Kairienė & Mažeikienė, 2023). Foreign language teachers might experience even more pressure as a result of rhizomatically developing students' digital proficiency that positively influences their foreign language levels. The spread of digital technologies creates favourable learning opportunities in different environments, as a result, foreign language teachers might find themselves in questionable positions. The findings by Kairienė and Mažeikienė (2023) align with the ones by Klimova et al. (2023), who confirm that a contemporary language learning environment does not solely rely on traditional classroom settings. Thus, language teacher education should set a goal for providing educators with possibilities to enrich their digital knowledge for GAI tool inclusion, so that they are appropriately prepared to effectively apply them in teaching environments of the current Age of Intelligence. The Age that highlights the importance of AI digital competencies, which is central in this systematic review. AI digital competencies can be referred to as the competencies that require not only an ability to be aware of and adopt GAI tools, but also as the competencies that include cognitive, motoric, and emotional skills that determine an effective use of digital AI environments (Rokenes & Krumsvik, 2014). Therefore, deep comprehension of what challenges teachers encounter when using different GAI tools is significant in order to enhance their digital competencies that would help them handle all the arisen difficulties (Ng et al., 2023).

In order to contribute to the body of knowledge in the field, this study has focused on providing state-of-the-art insights towards this systematic review of research into the use of GAI in language teaching and learning processes that is found in scientific journal articles between 2022 and February, 2024. The paper initially presents its introduction, followed by the research methodology and the results of the systematic review. Then, the findings and implications are discussed for the future of foreign language teacher education. Finally, the conclusions are drawn.

Methodology

The current systematic literature review is carried out to provide the most relevant information on GAI in foreign language teacher education with an attempt to gain a deeper understanding of questions related to the research area that have been under-researched. The study is conducted following the methods for systematic reviews. The processes, such as identification, screening, eligibility, inclusion, and exclusion, have been involved while conducting the review, as demonstrated in Table 1.

Table 1

Inclusion and Exclusion Criteria for Publications

Inclusion Criteria	Exclusion Criteria
Published 2022–February, 2024	Published before 2022
Published in WoS and Scopus	Published in other databases, except for WoS and Scopus
Written in English	Not written in English
Published in peer-reviewed journals	Not published in peer-reviewed journals
A thematic focus is on GAI in language instruction	A thematic focus is not on GAI in language instruction
Empirical, primary research	Not empirical, not primary research

Source: developed by the author.

Problem Formulation

The PICO methodology was employed for formulating the main question for the present systematic review (Table 2):

Table 2

Question Formulated Based on the PICO Methodology

P = Population	I = Intervention	C = Comparison intervention	O = Outcome
Foreign language teacher education/ foreign language instruction	GAI tools	Does not apply	Pedagogical implications and directions

Source: Schiavenato and Chu (2021).

As a result of the adoption of the PICO methodology, the question that the current systematic review aims to answer is: "What does the most novel empirical data show about GAI tool integration in the process of language instruction since the release of the most popular GAI tool, namely ChatGPT, in November 2022?" The following objectives to answer the main question were set:
1. To analyse the most novel practices and trends of GAI tool integration related to the process of foreign language learning and teaching;
2. To identify methodologies, techniques, emerged themes, and GAI tools selected for the empirical studies;
3. To reveal potential pedagogical implications.

Procedure

In order to find the related papers and resources included in this systematic literature review, two main databases that cover a wide range of educational journal articles, namely Web of Science (WoS) and Scopus, were referred to. Based on the guidelines for systematic literature review provided by Creswell (2012), the following steps of the systematic review were applied: 1) identifying of key terms to be applied in the search; 2) screening and locating literature about a researched topic by consulting two main databases; 3) critically assessing the eligibility of screened articles; 4) organising the literature by applying inclusion criteria; 5) composing a literature review. In addition, the current systematic review applies the Preferred Reporting Items for Systematic Reviews (PRISMA) and meta-analysis defined by Moher et al. (2015), and its application in the present review is shown in Table 3. The four-step procedure was implemented through identification, selection, eligibility and inclusion.

Data Extraction

The following diagram presents the process of data extraction.

Table 3
PRISMA Diagram for the Systematic Review

Identification	Articles identified through database search (n = 1013)	
Screening	Articles screened (n = 132)	Articles excluded (n = 78)
	Articles selected for retrieval (n = 54)	Articles not retrieved (n = 19)
Eligibility	Articles assessed for eligibility (n = 35)	Articles discarded by the set criteria (n = 23):
		Not in English (n = 7)
		Not related GAI in language instruction (n = 11)
		No empirical data (n = 5)
Inclusion	Studies included in the current review (n = 12)	

The search for articles was conducted in the English language. The following terms were applied for the search strings of the current systematic review: ("generative AI" OR "AI") AND ("language teacher education"). As it has been presented above, the following criteria were applied based on the PRISMA guidelines, which aided

the process of article inclusion for the final revision: 1) articles that were published from 2022 (when OpenAi's ChatGPT was launched to the public) to February, 2024; 2) articles that were published in WoS and Scopus; 3) articles that are written in the English language; 4) peer-reviewed articles presenting empirical research; 5) articles with a focus on GAI integration in foreign language teacher education and practice. The search generated 1013 articles, and after screening 132 potential articles were selected. 78 articles were excluded, which left 54 articles for retrieval. After that, after applying the eligibility criteria, 23 articles were discarded for irrelevance, which left 35 articles that were eligible for full screening. Finally, 12 articles were chosen to be thoroughly analysed. The following information was evaluated in order to code the information of the 12 selected articles: author (-s), publication year, objectives of a particular study, a sample size and participants, digital GAI tools employed in the study, and study outcomes. The process of induction and deduction was implemented to identify strategies and themes for the present analysis. It is worthwhile to mention that the main focus of the current systematic review was to explore only experimental studies, where GAI tools were applied in foreign language teaching. As a result, theoretical studies were not included with the aim to assess the outcomes that could be applied for practical instruction.

Identification

Two main databases, namely Web of Science (WoS) and Scopus, were referred to for initiating the first stage of the present systematic review, which was identification. All in all, 1013 articles were identified through a database search. The concepts related to GAI and language teacher training were composed in order to obtain the articles of high relevance for the current analysis.

Screening

The following criteria were applied for screening the most recent literature: articles that were published in the English language from 2022 until February, 2024; full-text access; paper. The terms "generative AI" OR "AI"AND "language teacher education" were used for the search strings. The search for the most relevant literature was implemented within all fields of publications. Then, the articles were evaluated and selected according to the inclusion and exclusion criteria, which resulted in three phases. The first phase included thorough reading of abstracts and conclusions, where the attention was paid to excluding papers that did not consist "Generative Artificial Intelligence" and "language teacher training" in their summary. The second phase of screening was related to the analysis of research methodology, and empirical research full-text open access papers in English emphasising the integration of GAI were selected. The final phase of screening consisted of a thorough text analysis of the selected articles.

Eligibility

The stage of eligibility was applied for 35 papers. As it had already been mentioned previously, the focus of the present systematic review was dedicated for GAI integration in foreign language teacher education. The process of eligibility ensured that all the selected papers were of a significant importance. As it has been stated by Moola et al. (2020), it is significant to apply critical appraisal tools while evaluating the methodological quality. As a result, 23 papers were discarded due to their irrelevance and 12 studies remained to be included in the current systematic review.

Inclusion

The data chosen to be analysed for the systematic review after applying all the inclusion and exclusion criteria and removing duplicates was obtained from 12 selected papers from 2022 to February, 2024. An overview of the final sample is provided in Table 4.

Table 4
Selected Articles for the Systematic Analysis (n=12)

| No.	Author (-s)
	An et al. (2022)
	Du & Gao (2022)
	Huang (2023)
	Jeon & Lee (2023)
	Li et al. (2023)
	Liao et al. (2023)
	Kohnke et al. (2023)
	Kostka & Toncelli (2023)
	Kushmar et al. (2022)
	Moorhouse (2024)
	Qutub et al. (2023)
	Yuan (2023)

Source: developed by the author.

Results

The aim of the present systematic review was to gather relevant information on research trends and potential directions that would establish knowledge about empirical research on GAI tool integration in language instruction, which would also be applicable in foreign language teacher training. Even though the initial search generated 1013 articles, only 12 articles remained of high relevance after a thorough implementation of screening and

eligibility processes. A high number of other studies had to be abandoned due to the fact that the aim of the current review was to analyse only the studies related to the role of GAI particularly in foreign language education. The current analysis showed that the area of GAI tool adoption in language learning and teaching is relatively new, and, to the author's knowledge, empirical research conducted on integrating GAI tools in foreign language classes remains limited. As a result, out of these 12 selected research works, six of them were conducted in China, two were published in the USA, one was published in Saudi Arabia, one was conducted in Ukraine, one was published in South Korea, and one was published in the UK. The twelve selected studies adopted qualitative, including case studies, quantitative research methodology, experimental research, and a mixed methods approach. The qualitative research methodology was applied in six studies, two of the studies included cases studies, the mixed strategy was applied in three papers, and the quantitative study was adopted in three studies. The number of participants involved in the selected studies ranged from 11 to 470, including novice and expert language teachers. In the selected research works, quantitative data were collected with the help of surveys and experiments, whereas qualitative data were collected by conducting interviews and employing a qualitative methodology, including case studies. The distribution of the methodologies and countries is presented in Figure 1.

Figure 1

Distribution of the Methodologies and Countries
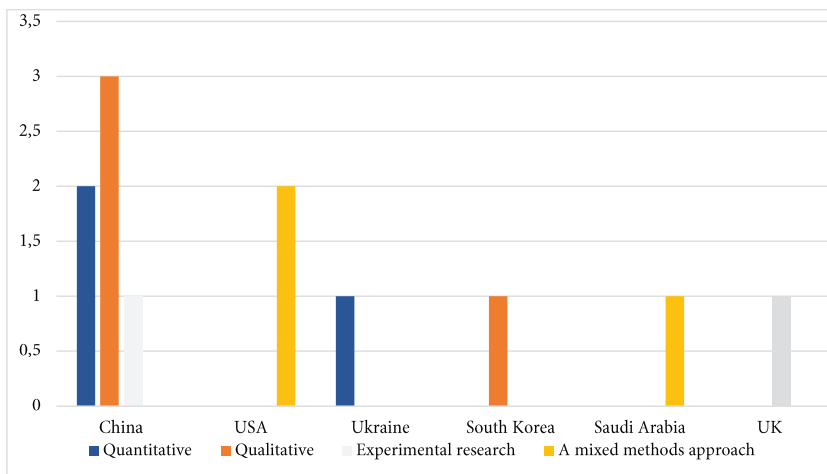
Five studies conducted in Saudi Arabia and China explored teachers' approaches, behavioural intention and readiness to adopt AI digital technologies in language instruction. By employing both quantitative and qualitative methodologies, it was attempted to gain perception of teachers' preparedness towards GAI tool integration. The aim of

these studies to analyse teachers' perceptions, intention, and preparedness to use AI in language instruction was supported by the fact that the field is evolving rapidly, thus, it is significant to perceive language instructors' current readiness. The participants of these studies reported relatively positive attitudes towards GAI tool adoption for language teaching and learning, which was directly related to the use of ChatGPT on a daily basis. However, it was found that language instructors were not prepared to use different GAI tools for teaching purposes due to insufficient pedagogical knowledge as well as a lack of digital AI competencies. The studies conducted by Moorhouse (2024) and Koknke et al. (2023) provide implications for teachers' professional development programmes, which should be designed in a way that would combine content knowledge together with their pedagogical knowledge. This aligns with the results and recommendations provided by Baltynova et al. (2023) who aimed to evaluate different pedagogical frameworks in order to enhance future teachers' competencies necessary for digital education technology adoption.

Two studies conducted in the USA and Ukraine drew their focus towards the challenges GAI brings in educational processes. It was found that language teachers were mostly afraid of students' plagiarism that would also result in their lack of creativity, which means that students might not compose their own writing assignments anymore. Moreover, cyber-attacks, which would negatively affect data privacy and result in a loss of personal information, a lack of human interaction, and critical thinking were the concerns highlighted by Kostka and Toncelli (2023) and Kushmar et al. (2022). These concerns align with the ones defined in the study conducted by Moorhouse (2024) who highlighted the need for the enhancement of critical thinking skills, which, if not mastered, might result in language teachers' misconception towards GAI tool adoption. Such a misconception could affect teachers' incorrect use of prompting that would result in wrong generation of texts. In terms of pedagogical implications, it was suggested that systematic upgrading on digital educational tools is necessary in order to prepare teachers and learners to achieve successful learning outcomes for this Digital AI Age.

Three studies adopted experimental research designs, and they were conducted in the UK, the USA, and South Korea. Such GAI tools as ChatGPT, Youtube Content Creation, and the Mondly chatbot were chosen as the experimental instruments in these studies. It was found that AI chatbots were effective in language instruction classes as they contributed to the improvement of students' oral proficiency and communicative skills (Yuan, 2023). It is worthwhile to mention that the experiment conducted by Yuan (2023) adopted the AI-chatbot Mondly that is specifically designed for language learning. Moreover, Jeon and Lee (2023) analysed language educators' chatbot-use logs by conducting the experiment where teachers were asked to integrate ChatGPT for language instruction. Teachers' experiences revealed that ChatGPT served as a content provider, teaching assistant, and evaluator. However, the study emphasizes the need for pre-service education and professional development programmes, which would consequently aid teachers in aligning technological resources with their pedagogical purposes.

The case study conducted by Liao et al. (2023) in China revealed that GAI tools can certainly bring new directions in language instruction. It was found that the integration of ChatGPT for the function of "instruction-reply" on the development of four language skills (listening, speaking, reading, writing) resulted in "auxiliary capabilities" (Liao et al., 2023, p. 45). However, due to the new topic and its rapid evolvement, there is still a lack of sufficient empirical research that could further confirm efficient enhancement of foreign language skills as a result of digital AI adoption. Another case study conducted by Kostka and Toncelli (2023) in the USA confirmed that the employment of ChatGPT in language instruction can contribute to conversation practice, grammar and syntax correction, writing practice, reading comprehension, pronunciation guidance, and personalised learning. However, the authors warned that ChatGPT should not replace a qualified human educator, which further confirms and encourages the need for the development of critical skills.

A summary of the research studies is presented in Table 5.

Table 5

An Overview of the Studies and Findings of Research Included in the Analysis

Study and Country of Origin	Objective of the Study	Research Methods, Participants	Findings	Pedagogical Implications
An et al. (2022) China	To investigate EFL teachers' perceptions and behavioral intention to adopt AI in the process of teaching and learning English in middle schools.	Quantitative (survey), 470 middle school EFL teachers.	EFL teachers held positive approaches towards using AI for language teaching, which confirms that using AI in EFL is supported and welcomed by teachers when they are facilitated to develop the necessary knowledge.	To confirm the causes of teachers' intention to apply AI tools in instruction, an experimental design is needed in the future.
Du & Gao (2022) China	To identify the factors affecting teachers' adoption of AI-based applications in EFL context.	Qualitative, 17 expert lecturers from different universities in China.	The results indicated effectiveness and complexity as the most influential elements resulting in teachers to use AI-based applications in EFL context, whereas perceived fee and rewards are less concerned. Perceived time, flexibility and pleasure are elements of intermediate importance that influence teachers' adoption.	The creation of AI- powered teaching solutions, improvement of teachers' technological competence, and remedy of the imbalance between teacher, machine, and student are important issues for future research.

Study and Country of Origin	Objective of the Study	Research Methods, Participants	Findings	Pedagogical Implications
Huang (2023) China	To explore Chinese university foreign language teachers' digital AI competencies and explore the most influential factors.	Quantitative, 214 foreign language teachers from 72 Chinese universities.	This study approved the importance of digital nativity and technology training in improving foreign language teachers' digital competences that would positively affect their willingness to integrate AI digital technologies in the study process.	Designers of teacher training programs should provide adequate trainings for foreign language teachers to improve their digital competences necessary for the current information-savvy language instruction environment.
Jeon & Lee (2023) South Korea	To identify the effect of ChatGPT in language education and how it may influence teachers' roles.	An exploratory qualitative approach, 11 English language teachers from ten elementary schools.	Study results highlight the fact that teachers may need to assume more critical and professional roles to integrate the technology in a way that best benefits students.	The study states that aligning technological resources with pedagogical purposes will be another significant issue.
Li et al. (2023) USA	To investigate the variety of content creators who gained many followers, viewers, or subscribers on YouTube for their discussions and demonstrations of generative AI tools like ChatGPT for language learning and instruction.	A mixed methods netnographic approach combining qualitative and quantitative techniques.	This study highlights the benefits, drawbacks, and concerns associated with the integration of AI tools in language learning.	A systematic investigation into the pedagogical implications and practical benefits of integrating ChatGPT as an instructional tool in language classrooms would provide empirical evidence and guidance for educators.

Study and Country of Origin	Objective of the Study	Research Methods, Participants	Findings	Pedagogical Implications
Liao et al. (2023) China	To investigate the potential of integrating ChatGPT into the learning and practice of non-native English speakers' four language skills.	Qualitative (a case study).	It showed that generative pre-training AI leads to auxiliary capabilities for ESL instruction.	The need to enrich the field of empirical research related to the application of GAI to English teaching.
Kohnke et al. (2023) Hong Kong, China	To explore higher education English language instructors' perspectives towards GAI tool adoption, their intentions to use them, the institutional support, and professional development needed to teach and learn with them.	A qualitative interpretive study (twelve language instructors).	The launch of ChatGPT influenced the increased language instructors' awareness of AI and made them think about it more productively and critically. However, the skills needed to use AI tools for teaching were insufficient.	Professional development programmes can resolve instructors' challenges and concerns related to AI tool integration.
Kostka & Toncelli (2023) USA	To explore the role of ChatGPT in English Language Teaching (ELT).	Qualitative (a case study) and a quantitative questionnaire.	It revealed ChatGPT's usefulness for enhancing both students' and teachers' critical thinking skills.	The study highlights the need to experiment with AI tools while maintaining a critical point of view.
Kushmar et al. (2022) Ukraine	To explore the potential risks and fears of AI in language teaching and learning.	A quantitative questionnaire (418 respondents).	Losing a natural environment with speakers and their real emotions was the biggest fear stated in the questionnaire.	There is a necessity for future research about AI in language learning, which includes conflicting objectives, assessment and evaluation, incentives and motivation; building learning networks, diversity, and fairness.

Study and Country of Origin	Objective of the Study	Research Methods, Participants	Findings	Pedagogical Implications
Moorhouse (2024) Hong Kong, China	To explore teachers' readiness for using GAI tools in their professional work and their perceptions of GAI in language instruction.	A qualitative study (ten beginning teachers and seventeen first-year English language teachers).	The findings showed novice teachers do not feel ready nor have awareness of GAI tools for English language instruction. However, the easy accessibility of ChatGPT positively affected first-year teachers' adoption of GAI tools.	It is essential that pre-service and in-service teachers receive sufficient professional development related to the use of GAI tools.
Qutub et al. (2023) Saudi Arabia	To investigate the future of EFL teaching and learning as a result of the emergence of digital AI tools.	A quantitative and qualitative study (70 English language teachers).	Teachers' awareness seems to positively affect their willingness towards digital AI tool adoption.	The findings suggest revising the curriculum since the resources are frequently assessed as outdated.
Yuan (2023) UK	To examine the effectiveness of using chatbots in English as a Foreign Language (EFL) classrooms.	An experimental research (74 students, experimental and control groups).	The study results showed that chatbot integration significantly improved oral English proficiency in the experimental group compared with the control group.	Teachers can enhance instruction by adopting chatbots to refine teaching methods.

Source: developed by the author.

Discussion and Conclusions

The conducted systematic analysis shows that the use of GAI tools in language instruction is becoming of the utmost importance despite the fact that the amount of research related to their practical implications still remains limited. The present review identifies research trends and potential directions that contribute to the body of knowledge about existing empirical research on GAI integration in language instruction.

This review found that the integration of different GAI tools, for instance, ChatGPT and the Mondly, positively contribute to the improvement of foreign language skills as well as positive instructors' approaches. The results of the studies conducted by An et al. (2022), Kohnke et al. (2023), Moorhouse (2024) and Qutub et al. (2023) show that language instructors evaluate AI technology as helpful tools with a potential to

be applied in professional practice. As it was stated by Moorhouse (2024), language instructors' readiness for the integration of GAI tools in their professional practice was mainly due to daily exposure to ChatGPT. Even though the study results defined by Kushmar et al. (2022) and Kostka and Toncelli (2023) highlight certain challenges of GAI, such as academic integrity, a lack of critical thinking, a bigger amount of cyber-attacks, the need to inform both students and teachers about the limitations of AI digital tools was emphasized by Moorhouse (2024). As the results of many research studies have confirmed, teachers' approaches, beliefs, and preferences play a fundamental role in the success of digital methodology (Lord & Lomicka, 2011; Pokrivcakova, 2010; Williams et al., 2014).

Generally, the current analysis indicates that language instructors' willingness to adopt AI technology in their classroom was determined by the key factors, which have been summarized as follows:

- Effectiveness and efficiency that result in a comfortable, engaging, and interactive GAI tool adoption (Du & Gao, 2022);
- Support and technology training for the enhancement of digital nativity required to create novel instruction practices for AI tool integration (Du and Gao, 2022; Huang, 2023; Kohnke et al., 2023);
- Time and effort needed to master technical AI skills (Du & Gao, 2022).

The above summarised factors that determine successful digital technology integration are compatible with the study conducted by Kay (2006), who stated that technology integration is hindered by such factors as a lack of time, a lack of comprehension about appropriate technology integration, technological skills of faculty of education members. It is worth noting that in order to support teachers and ensure their self-confidence and opportunities for ongoing professional improvement, such countries as Finland, Singapore, Canada, and the USA offer a "multi-year induction programme for new teachers, which includes intensive mentoring and professional development" (Darling-Hammond, 2017, p. 295). It aligns with the previously mentioned Australian professional standards for teachers, including professional knowledge, practice and various engagements that foster effective teacher education. In this respect, digital AI technology adoption can be facilitated by upgrading teacher training programmes, which, as a result, would enhance the quality of the teaching force in terms of digital competencies. This could be achieved by re-designing lesson plans and activities that would best support teaching and learning objectives (Ng et al., 2023). As it has already been mentioned previously, digital competencies related to AI do not only require comprehension of GAI tools, but they also include cognitive, motoric, and emotional skills that result in an effective application of digital AI environments (Rokenes & Krumsvik, 2014). Furthermore, Ng et al. (2023) created a category of AI digital competencies that was divided into four domains, including: 1) know and understand; 2) use and apply; 3) evaluate and create; 4) ethical issues. These four cognition domains

might help teachers comprehend the pedagogies that have to be designed in order to adopt GAI technologies successfully.

Taking the obtained results of the present systematic review into consideration, it can be concluded that GAI integration in language instruction brings benefits to the stakeholders of the process, especially teachers and learners. This aligns with a number of research studies, where the significance of Technological Pedagogical Content Knowledge (TPACK) was emphasised throughout the whole teacher education curriculum (Niess, 2005; Kay, 2006; Koehler & Mishra, 2009). The adoption of different GAI tools in language teaching and learning leads to an augmented learning process, which can contribute to the facilitation of the composition of vocabulary building, writing tasks, test preparation, and can enhance learners' motivation as well as efficiency in a learning process (Li et al., 2023). This highlights the need to design language teacher training programmes, where TPACK is employed.

On the contrary, drawbacks and concerns have been highlighted in the analysed studies, which include limited creative and critical skills, generation of inappropriate information, a loss of data privacy, a replacement of human workforce, and risks of plagiarism (Du & Gao, 2022; Kushmar et al., 2023; Li et al., 2023). Therefore, it is recommended to treat digital technology as only a supplementary and supportive tool in teaching and learning processes (Klimova & Pikhart, 2021; Klimova et al., 2023).

In conclusion, the current systematic review raises understanding of the current situation in language education by revealing language instructors' approaches towards GAI tool adoption, encouraging and hindering factors, as well as challenges. Language teachers' perspectives reveal what is needed for an effective GAI integration in terms of technology knowledge, support, and professional development. As the results of the analysed studies confirm, language instructors are more willing to adopt AI in professional practice when their digital nativity is higher. Thus, language teacher training programmes should incorporate the use of these GAI digital technologies that would ensure student teachers receive necessary subject-specific professional development on the adoption of GAI tools. This aligns with the recommendations provided by Chiu et al. (2023), Baltynova et al. (2023), Niess (2005) that emphasize the importance of Technological Pedagogical Content Knowledge (TPACK) in teacher education programmes. When governments or schools establish regulations on the integration of GAI tools, teachers should be provided with adequate support and encouraged to understand the benefits of GAI to teaching and learning processes. When educators perceive the usefulness of digital GAI technology for their teaching, it has more potential to boost their intention to apply GAI in instruction.

The findings of the present review study should be of interest to language instructors, language learners, and language teacher educators who aim at improving language teacher training programmes. Teacher education should be the area where technology skills are improved throughout the teacher education curriculum, so that student teachers would

obtain the digital competencies necessary to apply different technology to their specific content areas. Moreover, student teachers would learn how to select certain digital GAI tools in line with their pedagogical knowledge and instructional strategies that are suitable for their existing educational values and beliefs. However, more experimental studies in the field are needed in order to prove the usefulness of GAI tool adoption in language teacher training programmes that would later bring benefits in teachers' professional paths.

Limitations and Implications

The current systematic review has certain limitations related to the creation of the search strings with the following terms: ("generative AI" OR "AI") AND ("language teacher education"). Since there are other popular acronyms related to GAI and language teacher training, the application of the applied search string in the present review may be considered as a limitation. Therefore, future research should thoroughly consider the establishment of the search strings that would meet the most novel applications and trends. Another limitation is related to the inclusion of different levels of education, such as primary education, general education, and higher education, which resulted in a generalized view of GAI tool integration in language instruction. Thus, when the amount of empirical data increases in the future, it would be worthwhile to conduct analyses only in foreign language teacher education and assess how the inclusion of GAI tools in foreign language teacher training programmes boosts not only future language teachers' willingness and intention to apply different GAI tools in professional practice but also the efficiency and success of learning outcomes. Lastly, when addressing the implications for practice and policy, it is fundamental that more teachers, practitioners, and educational authorities, are involved and develop their comprehension towards teachers' approaches and their current behavioural intentions to adopt GAI technologies, opportunities, challenges that the integration of GAI technologies could bring to teacher education.

References

An, X., Chai, C. S., Li, Y., Zhou, Y., Shen, X., Zheng, C., & Chen, M. (2023). Modeling English teachers' behavioral intention to use artificial intelligence in middle schools. *Education and Information Technologies*, *28*(5), 5187–5208. https://doi.org/10.1007/s10639-022-11286-z

Baltynova, A., Kamariyash, K., Muzdbaeva, T., Bolat, Y., Beleukhanova, K., Zharikova, D., & Mollakuqe, E. (2023). Pedagogical conditions for the training of future teachers based on digital educational technologies. *International Journal of Emerging Technologies in Learning (iJET)*, *18*(18), 121–137. https://doi.org/10.3991/ijet.v18i18.43209

Bibauw, S., François, T., & Desmet, P. (2019). Discussing with a computer to practice a foreign language: Research synthesis and conceptual framework of dialogue-based CALL. *Computer Assisted Language Learning*, 828–867. http://www.doi.org/10.1080/09588221.2018.1535508

Biletska, I. O., Paladieva, A. F., Avchinnikova, H. D., & Kazak, Y. Y. (2021). The use of modern technologies by foreign language teachers: Developing digital skills. *Linguistics and Culture Review*, *5*(S2), 16–27. https://doi.org/10.37028/lingcure.v5nS2.1327

Buchanan, J. (2017). How do the standards stand up? Applying quality teacher frameworks to the Australian professional standards. In J. Nuttall, A. Kostogriz, J. Martin, (Eds.), *Teacher education policy and practice– vvidence of impact, impact of evidence* (pp. 115–128). Springer.

Butler, D., Leahy, M., Twining, P., Akoh, B., Chtouki, Y., Farshadnia, S., Moore, K., Nikolov, R., Pascual, C., Sherman, B. (2018). Education systems in the digital age: The need for alignment. *Technology Knowledge and Learning*, *23*, 473–494.

Chernysh, V. V., Vaseiko, Y., Kaplinskiy, V., Tkachenko, L., & Bereziuk, J. (2020). Modern methods of training foreign language teachers. *International Journal of Higher Education*, *9*(7), 332–344. https://doi.org/10.5430/ijhe.v9n7p332

Chiu, T. K. F., Xia, Q., Zhou, X., Chai, C. S., & Cheng, M. (2023). Systematic literature review on opportunities, Challenges, and future research recommendations of artificial intelligence in education. *Computers and Education: Artificial Intelligence*, *4*, 100118. https://doi.org/10.1016/j.caeai.2022.100118

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Pearson.

Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? *European Journal of Teacher Education*, *40*(3), 291–309. https://doi.org/10.1080/02619768.2017.1315399

Digital Education Action Plan (2021–2027). https://ec.europa.eu/education/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf [in English].

Du, Y., & Gao, H. (2022). Determinants affecting teachers' adoption of AI-based applications in EFL Context: An analysis of analytic hierarchy process. *Education and Information Technologies*, *27*(7), 9357–9384. https://doi.org/10.1007/s10639-022-11001-y

Gough, D., Oliver, S., Thomas, J. (2017). Introducing systematic reviews. In D. Gough, S. Oliver, J. Thomas (Eds). *An Introduction to Systematic Reviews*, *2*, 1–18. Sage.

Huang, F. (2023). Examining foreign language teachers' information literacy: Do digital nativity, technology training, and fatigue matter? *The Asia-Pacific Education Researcher*, 205–216. https://doi.org/10.1007/s40299-023-00797-z

Jeon, J., & Lee, S. (2023). Large language models in education: A focus on the complementary relationship between human teachers and ChatGPT. *Education and Information Technologies*, *28*(12), 15873–15892. https://doi.org/10.1007/s10639-023-11834-1

Kay, R. H. (2006). Evaluating strategies used to incorporate technology into pre-service education: A review of the literature. *Journal of Research on Technology in Education and Information Technologies*, *38*(4), 383–408.

Kairienė, A., & Mažeikienė, N. (2023). The cartography of rhizomatic learning of English: Unravelling students' nomadic wanderings. *Pedagogika / Pedagogy*, *150*(2), 191–211. https://doi.org/10.15823/p.2023.150.10

Kaminskienė, L., Järvelä, S., & Lehtinen, E. (2022). How does technology challenge teacher education? *International Journal of Educational Technology in Higher Education*, *19*(1), 1–9. https://doi.org/10.1186/s41239-022-00375-1

Kildė, L. (2023). ESL teachers' approaches towards the acceptance of educational technology integration in non-formal education: A Case from Kenya. *Journal of Education Culture and Society*, *14*(1), 634–649.

Klimova, B., Pikhart, M. (2021). New advances in second language Acquisition methodology in higher education. *Education Sciences*, *11*, 128, 1–9.

Klimova, B., Pikhart, M., Polakova, P., Cerna, M., Yayilgan, S. Y., Shaikh, S. A systematic review on the use of emerging technologies in teaching English as an applied language at the university level. *Systems2023, 11*(42), 1–15. https://www.doi.org/10.3390/systems11010042

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education*, *9*(1), 60–70.

Kohnke, L., Moorhouse, B. L., & Zou, D. (2023). Exploring generative artificial intelligence preparedness among university language instructors: A case study. *Computers and Education: Artificial Intelligence, 5*(100156), 1–8. https://doi.org/10.1016/j.caeai.2023.100156

Kostka, I., & Toncelli, R. (2023). Exploring applications of ChatGPT to English language teaching: Opportunities, challenges, and recommendations. *Teaching English as a Second or Foreign Language--TESL-EJ*, *27*(3). https://doi.org/10.55593/ej.27107int

Viktorivna, K. L., Oleksandrovych, V. A., Oleksandrivna, I. K., & Oleksandrivna, N. K. (2022). Artificial intelligence in language learning: What are we afraid of. *Arab World English Journal*, *8*, 262–273. https://doi.org/10.24093/awej/call8.18

Lashari, A. A., Munawar, I., Mastoi, M., Niaz, P., Buriro, S. A., & Golo, M. A. (2023). Unlocking the potentials of ChatGPT: The efficacy of ChatGPT in ESL learning outcomes. *PalArch's Journal of Archaeology of Egypt/Egyptology*, *20*(1), 1135–1143.

Li, B., Kou, X., & Bonk, C. J. (2023). Embracing the disrupted language teaching and learning field: Analyzing YouTube content creation related to ChatGPT. *Languages*, *8*(3), 1–18. https://doi.org/10.3390/languages8030197

Liao, H., Xiao, H., & Hu, B. (2023). Revolutionizing ESL teaching with generative artificial intelligence—Take ChatGPT as an example. *International Journal of New Developments in Education*, *5*(20), 39–46. https://doi.org/10.25236/IJNDE.2023.052008

Lietuvos Respublikos švietimo, mokslo ir sporto ministro įsakymas „Dėl pedagogų rengimo reglamento patvirtinimo". Nr. V-54 (2018-05-29).

Lord, G., & Lomicka, L. (2011). Calling on educators: Paving the way for the future of technology and CALL. In N. Arnold & L. Ducate (Eds.), *Present and future promises of CALL: From theory and research to new directions in language teaching*, 441–469.

Ma, S., & Lei, L. (2024). The factors influencing teacher education students' willingness to adopt artificial intelligence technology for information-based teaching. *Asia Pacific Journal of Education*, 1–18. https://doi.org/10.1080/02188791.2024.2305155

Meirovitz, T., Russak, S., & Zur, A. (2022). English as a foreign language teachers' perceptions Regarding their pedagogical-technological knowledge and its implementation in distance learning during COVID-19. *Heliyon*, *8*(4), 1–7. https://doi.org/10.1016/j.heliyon.2022.e09175

Moher, D., Shamseer, L., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L. A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P). *Systematic Reviews*, *4(*1), 1–9. https://doi.org/10.1186/2046-4053-4-1

Moorhouse, B. L. (2024). Beginning and first-year language teachers' readiness for the generative AI age. *Computers and Education: Artificial Intelligence*, *6*(100201), 2–8. https://doi.org/10.1016/j.caeai.2024.100201

Ng, D. T. K., Leung, J. K. L., Su, J., Ng, R. C. W., & Chu, S. K. W. (2023). Teachers' AI digital competencies and twenty-first century skills in the post-pandemic world. *Educational Technology Research and Development*, *71*(1), 137–161. https://doi.org/10.1007/s11423-023-10203-6

Niess, M. L. (2005). Preparing teachers to teach science and mathematics with technology: Developing a technology pedagogical content knowledge. *Teaching and Teacher Education*, *21*, 509–523. https://doi.org/10.1016/j.tate.2005.03.006

Petrova, M., Pinigina, O., Xu, B., & Xie, B. (2021). Digital skills of a modern language teacher. *INTED2021 Proceedings*, 5475–5481.

Pokrivcakova, S. (2019). Preparing teachers for the application of AI-powered technologies in foreign language education. *Journal of Language and Cultural Education*, *7*(3), 135–153. https://www.doi.org.10.2478/jolace-2019-0025

Qutub, M. M. T., Bukhari, S. S. F., Fadel, S. A., & Aljuhani, H. S. A. (2023). The future of English as a foreign language teaching and learning in view of the fourth industrial revolution in the MENA region. *Arab World English Journal (AWEJ) Special Issue on CALL*, *9,* 67–86. https://www.doi.org/10.24093/awej/call9.5

Rodrigues, A. L. (2020). Digital technologies integration in teacher education: the active teacher training model. *Journal of E-Learning and Knowledge Society*, *16*(3), 24–33. https://doi.org/10.20368/1971-8829/1135273

Salas-Pilco, S., Xiao, K., & Hu, X. (2022). Artificial intelligence and learning analytics in teacher education: A systematic review. *Education Sciences*, *12*(8), 1–19. https://doi.org/10.3390/educsci12080569

Schiavenato, M., & Chu, F. (2021). PICO: What it is and what it is not. *Nurse Education in Practice*, *56*(103194), 1–3. https://doi.org/10.1016/j.nepr.2021.103194

Tondeur, J., Scherer, R., Baran, E., Siddiq, F., Valtonen, T., Sointu, E. (2019). Teacher educators as gatekeepers: Preparing the next generation of teachers for technology integration in Education. *British Journal of Educational Technology*, *50*, 1189–1209.

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. *Computers & Education*, *59*(1), 134–144. http://dx.doi.org/ 10.1016/j. compedu.2011.10.009

Tseng, J. L., Chai, C. S., Tan, L., & Park, M. (2022). A critical review of research on technological pedagogical and content knowledge (TPACK) in language teaching. *Computer Assisted Language Learning*, *35*(4), 948–971. https://www.doi.org/10.1080/09588221.2020.1868531

UNESCO ICT Competency framework for teachers. (2018). UNESCO, Paris: France. https:// unesdoc.unesco.org/ark:/ 48223/pf0000265721

U.S. Department of Education. Advancing educational technology in teacher preparation: Policy Brief. (2016). https://tech.ed.gov/files/2016/12/Ed-Tech-in-Teacher-Preparation-Brief. pdf (accessed on 23 January 2024).

Warner, B. (2023). 4 ways to use AI to build laser-focused custom content for your students. TESOL International Association. https://www.tesol.org/blog/posts/4-ways-touse-ai-to-build-laser-focused- custom-content-for-your-students/

Williams, L., Abraham, L., & Bostelmann, E. (2014). A discourse-based approach to CALL training and professional development. *Foreign Language Annals*, *47*(4), 614–629. https:// doi.org/10.1111/flan.12119

Yuan, Y. (2023). An empirical study of the efficacy of AI Chatbots for English as a foreign language learning in primary education. *Interactive Learning Environments*, 1–16. https:// doi.org/10.1080/10494820.2023.2282112

Generatyvinio dirbtinio intelekto integravimas į užsienio kalbų mokytojų rengimo programas: sisteminė literatūros apžvalga

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Santrauka

Šia sistemine apžvalga buvo siekiama atskleisti atliktų empirinių tyrimų tendencijas ir galimas kryptis, kurios pagilintų žinias apie generatyvinio dirbtinio intelekto įrankių integracijos galimybes rengiant užsienio kalbų mokytojus. Straipsnyje nagrinėjamos naujausios DI modelių taikymo tendencijos ir praktikos mokant ir mokantis kalbų nuo 2022 m. lapkričio mėn., kai buvo paleistas „OpenAI" pokalbių robotas „ChatGPT", iki 2024 m. vasario mėn. Sisteminė literatūros analizė atlikta, remiantis PRISMA (angl. *Preferred*

Reporting Items for Systematic Reviews and Meta-Analyses) rekomendacijomis. Paiešką sudarė 12 straipsnių, kurie buvo paskelbti *Web of Science* ir *Scopus* duomenų bazėse. Šiuo tyrimu taip pat buvo išanalizuoti atliktų empirinių tyrimų tikslai, uždaviniai, metodikos ir priemonės ir buvo atskleisti užsienio kalbų mokytojų požiūriai, kurie skatina arba slopina generatyvino DI įrankio integraciją, galimybės bei iššūkiai, kurie, plėtojant būsimų užsienio kalbos pedagogų skaitmenines DI kompetencijas, gali būti naudingi tyrėjams, mokytojų rengėjams bei švietimo institucijoms.