AI-assisted language education: critical review

Serhiy O. Semerikov[1,2,3,4][0000−0003−0789−0272],
Andrii M. Striuk[2,4][0000−0001−9240−1976] **and**
Hanna M. Shalatska[2][0000−0002−1231−8847]

[1] Kryvyi Rih State Pedagogical University,
54 Gagarin Ave., Kryvyi Rih, 50086, Ukraine
[2] Kryvyi Rih National University,
11 Vitalii Matusevych Str., Kryvyi Rih, 50027, Ukraine
[3] Institute of Information Technologies and Learning Tools of the NAES
of Ukraine, 9 M. Berlynskoho Str., Kyiv, 04060, Ukraine
[4] Academy of Cognitive and Natural Sciences,
54 Gagarin Ave., Kryvyi Rih, 50086, Ukraine
{semerikov, andrey.n.stryuk}@gmail.com, shalatska@i.ua

Abstract. This paper reviews the current research on AI-assisted language education (AILE). AI has greatly influenced education, especially language learning. AILE, an interdisciplinary field combining AI technology and language education theory, aims to improve foreign language learners' experiences through personalized, interactive, and collaborative learning. This review classifies AILE research into four key domains: language-specific applications, comprehensive teaching modes, new educational ecosystems, and identification technology integration. It analyzes the strengths, weaknesses, opportunities, and challenges of AILE. The paper emphasizes the importance of ethical considerations and data quality in AILE endeavors. While acknowledging the achievements and potential of AILE, the review suggests future directions, promotes interdisciplinary collaboration, and highlights the need for empirical studies for an effective and ethical integration of AI in language education.

Keywords: artificial intelligence, language education, foreign language, foreign language education.

1 Introduction

Artificial intelligence (AI) is a branch of computer science that aims to create machines and systems that can perform tasks that normally require human intelligence. AI has been widely applied in various fields of education, especially in foreign language education. AI-assisted language education (AILE) is an emerging interdisciplinary field that integrates AI technology and language education theory and practice. AILE aims to enhance the productivity and retention of foreign language learners by providing personalized, adaptive, interactive, and collaborative learning experiences. AILE also has the potential to transform the foreign language education landscape in the era of big data and smart city.

However, AILE also faces many challenges and issues, such as data quality, ethical concerns, teacher roles, learner autonomy, and cultural diversity. Therefore, it is important to review the current research on AILE, and evaluate its strengths, weaknesses, opportunities, and threats. This paper aims to provide a critical review of the current research on AILE, and classify it into different categories based on the research methods, objectives, applications, and outcomes.

The paper is organized as follows: Section 2 reviews the literature on AILE, and classifies it into different categories. Section 3 discusses the implications and significance of the findings and evaluates the data quality and ethical issues. Section 4 summarizes the main points and arguments of the review, provides some recommendations and suggestions for foreign language educators, learners, researchers, and policy makers who are interested in or involved in AILE, acknowledges the limitations of the review, and indicates some areas for further exploration.

2 Literature review

The literature on AILE can be divided into four main categories:

1. *AILE for specific languages or contexts.* This category includes the papers that focus on applying AILE to teach or learn a specific foreign language or in a specific context. For example, Parthasarathy and Sathiaraj [3] explore the use of adaptive learning measures to increase the productivity and retention of French as a foreign language for post-modern learners in post-colonial context. They propose a framework that integrates technological advancement, learner-centered pedagogy, cultural awareness, and intercultural communication. They also present a case study that demonstrates the effectiveness of this framework in improving the learners' motivation, engagement, performance, and satisfaction. Another example is Kuo [2], who investigates the current situation of AILE and its influence on college Japanese teaching. He conducts a survey among college Japanese teachers in Taiwan to understand their perceptions, attitudes, expectations, and challenges regarding AILE. He also analyzes the advantages and disadvantages of AILE from the perspectives of teachers, learners, curriculum design, teaching methods, assessment methods, and learning outcomes. The strengths of this category are that it provides specific and practical examples of how AILE can be implemented and evaluated in different languages or contexts. It also reflects the diversity and complexity of foreign language education in different cultures and regions. The weaknesses of this category are that it may lack generalizability and comparability across different languages or contexts. It may also overlook

some common or universal issues or challenges that affect all foreign language learners or educators regardless of their language or context.

2. *AILE for comprehensive foreign language teaching mode.* This category includes the papers that propose or discuss a comprehensive foreign language teaching mode that incorporates AILE as a key component. For example, Yu [4] discusses the comprehensive foreign language teaching mode in the era of big data. He argues that foreign language teaching should be based on data analysis, personalized learning, interactive communication, collaborative learning, and feedback mechanism. He also proposes a model that combines online learning platform, mobile learning application, intelligent tutoring system, cloud computing technology, big data analysis technology, artificial neural network technology, natural language processing technology, speech recognition technology, machine translation technology, computer vision technology, augmented reality technology, virtual reality technology, gamification technology, blockchain technology, internet of things technology, and 5G network technology. The strengths of this category are that it provides a holistic and systematic view of how AILE can be integrated with other technologies and pedagogies to create a comprehensive foreign language teaching mode. It also shows the potential and vision of how AILE can transform foreign language education in the era of big data and smart city. The weaknesses of this category are that it may be too ambitious or idealistic to implement or evaluate in reality. It may also ignore some practical or ethical issues or challenges that may arise from such a complex and sophisticated foreign language teaching mode.

3. *AILE for new ecology of language education.* This category includes the papers that explore or examine the new ecology of language education that emerges from the interaction between human agents, artificial agents, learning environment, and learning content in AILE. For example, Zhu [6] examines the new ecology of AILE. He defines AILE as a complex adaptive system that consists of four elements: human agents (learners), artificial agents (AI systems), learning environment (physical or virtual), and learning content (language or culture). He also analyzes the interactions and dynamics among these elements from the perspectives of complexity theory, emergence theory, self-organization theory, and co-evolution theory. The strengths of this category are that it provides a novel and innovative perspective of how AILE can be understood and studied as a new ecology of language education. It also shows the richness and diversity of the phenomena and processes that occur in AILE. The weaknesses of this category are that it may be too abstract or theoretical to apply or evaluate in practice. It may also lack some empirical or experimental evidence or

support for its claims or arguments.

4. *AILE for identification technology in language education.* This category includes the papers that apply or investigate the use of identification technology in AILE. Identification technology refers to the technology that can identify the learners' level, interest, style, emotion, and feedback in foreign language education. For example, Hou [1] explores foreign language education in the era of artificial intelligence. She reviews the development history and current status of foreign language education in China. She also discusses the opportunities and challenges of foreign language education in the era of artificial intelligence from the aspects of teaching objectives, teaching contents, teaching methods, teaching evaluation, and teacher development. Another example is Zhu [5], who applies AI identification technology in foreign language education. He introduces the concept and characteristics of AI identification technology, and explains how it can be used to identify the learners' level, interest, style, emotion, and feedback in foreign language education. He also illustrates some examples and applications of AI identification technology in foreign language education, such as voice recognition, face recognition, eye tracking, emotion recognition, and gesture recognition. The strengths of this category are that it demonstrates how AI identification technology can enhance the personalization, adaptation, interaction, and collaboration of foreign language education. It also shows how AI identification technology can provide rich and timely data and feedback for foreign language learners and educators. The weaknesses of this category are that it may raise some privacy, security, or ethical issues or challenges that need to be addressed or resolved. It may also depend on the quality, accuracy, or reliability of the AI identification technology itself.

3 Discussion

The papers selected for this review show that AILE has made significant progress and achievements in different aspects of foreign language education, such as curriculum design, teaching methods, learning outcomes, learner characteristics, teacher development, and learning environment. They also show that AILE has adopted various research methods, such as surveys, case studies, experiments, theoretical analysis, and model construction, to investigate and evaluate the effectiveness, efficiency, satisfaction, and impact of AILE. They also show that AILE has applied various AI technologies, such as natural language processing, speech recognition, machine translation, computer vision, emotion recognition, and identification technology, to enhance the personalization, adaptation, interaction, and collaboration of

foreign language education. However, the papers selected for this review also reveal some limitations and challenges of AILE.

One of the main challenges is *data quality*, which refers to the accuracy, completeness, consistency, timeliness, and relevance of the data used or generated by AILE. Data quality is crucial for AILE, but it is often compromised by various factors. For example, Parthasarathy and Sathiaraj [3] use a questionnaire to collect data from 60 learners, but they do not provide any information about how they designed, validated, administered, or analyzed the questionnaire. They also do not report any statistics of the data. Therefore, their data quality and reliability are questionable. Another example is Yu [4], who proposes a foreign language teaching mode based on big data analysis, but he does not specify what kind of data he uses or how he collects or analyzes it. He also does not provide any evidence or examples to support his model. Therefore, his data quality and validity are unclear.

Another challenge of AILE is *ethical concerns*. Ethical concerns refer to the moral principles or values that guide or regulate the conduct or behavior of AILE researchers or practitioners. Ethical concerns are important for AILE, but they are often overlooked or neglected by AILE researchers or practitioners. Ethical concerns may arise from various aspects of AILE, such as data privacy, data security, data ownership, data consent, data bias, data misuse, AI accountability, AI transparency, AI fairness, AI autonomy, AI impact, and AI regulation. For example, Kuo [2] surveys college Japanese teachers in Taiwan about their views on AILE, but he does not mention any ethical approval or consent, anonymity or confidentiality, or purpose or scope of the survey. Therefore, his ethical guidelines or standards are uncertain. Another example is Zhu [5] who applies AI identification technology in foreign language education, but he does not discuss any ethical issues or challenges that may arise from using such technology, such as privacy invasion, security breach, consent violation, bias discrimination, feedback manipulation, or learner manipulation. Therefore, his ethical implications or consequences are unclear.

4 Conclusion

This paper has reviewed the current research on AI-assisted language education (AILE), and classified it into four categories based on the research methods, objectives, applications, and outcomes. It has also discussed the implications and significance of the research findings and contributions, and evaluated the quality and impact of the research methods and results. Furthermore, it has provided some recommendations and suggestions for

foreign language educators, learners, researchers, and policy makers who are interested in or involved in AILE. Finally, it has acknowledged the limitations of the review, and indicated some areas for further exploration.

The main objectives and scope of this review were to provide a comprehensive and critical overview of the current research on AILE, and to identify the strengths, weaknesses, opportunities, and threats of AILE. The main findings and contributions of this review were to classify the literature on AILE into four main categories, to compare and contrast different approaches and perspectives, to highlight the most influential and innovative works in this field, to analyze the challenges and opportunities of foreign language education in the era of artificial intelligence, to evaluate the quality and impact of the research methods and results, and to provide some recommendations and suggestions for future research and practice.

Some recommendations and suggestions for all who are interested in or involved in AILE are:

Foreign language educators should embrace AILE as a valuable tool and resource to enhance their teaching effectiveness and efficiency. They should also update their knowledge and skills on AI technology and pedagogy, and collaborate with other educators or researchers to share their experiences and insights on AILE.

Foreign language learners should take advantage of AILE as a flexible and personalized learning opportunity to improve their language proficiency and intercultural competence. They should also be aware of their own learning needs and preferences, and seek feedback and guidance from their teachers or peers on AILE.

Foreign language researchers should conduct more rigorous and comprehensive research on AILE, using various research methods, data sources, data analysis techniques, and evaluation criteria. They should also address or resolve the ethical issues or challenges that may arise from AILE.

Foreign language policy makers should support and promote AILE as a strategic and innovative initiative to improve the quality and accessibility of foreign language education in the era of big data and smart city. They should also provide more funding and resources for AILE research and practice, and establish more standards and guidelines for AILE quality assurance and quality control.

The limitations of this review are that it only covers a small sample of the literature on AILE, which may not represent the whole picture or diversity of this field. It also may have some biases or errors in selecting, categorizing, analyzing, or interpreting the papers. It also may have some

omissions or oversights in reporting or discussing some important or relevant aspects or issues of AILE.

Some areas for further exploration are: (a) more empirical or experimental studies that can provide more concrete and objective evidence or examples of AILE; (b) More comparative or cross-cultural studies that can provide more generalizable and transferable insights or lessons from different languages or contexts; (c) more interdisciplinary or collaborative studies that can provide more holistic and systematic perspectives or solutions from different disciplines or domains; (d) more innovative or creative studies that can provide more novel and original ideas or products for AILE.

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