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THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN EFL INSTRUCTION ACROSS EUROPE: A CRITICAL REVIEW OF TOOLS, METHODS AND IMPACTS

ABSTRACT

The integration of Artificial Intelligence (AI) into English as a Foreign Language (EFL) education marks a significant transformation in pedagogical practices, particularly in higher education. In many European countries, such as Germany, Estonia, Finland, and Ukraine, this transformation is accelerating as education systems increasingly adopt AI technologies that replicate human cognitive processes like problem-solving and decision-making. They provide unprecedented opportunities for personalizing language learning based on individual student needs.

This study explores current trends, pedagogical models, and empirical findings related to the implementation of AI in EFL classrooms, with particular attention to its impact on the development of language skills, learner autonomy, and affective factors such as motivation and engagement. Within the European context, these issues are especially relevant due to the widespread status of English as a foreign language and the strategic emphasis on digital innovation in national education systems.

Drawing on both international and Ukrainian research, the study examines the application of widely used AI tools, such as chatbots, writing assistants, translation platforms, and intelligent tutoring systems, in language teaching. Empirical evidence, including findings from European-based studies, indicates significant improvements in students' receptive (reading, listening) and productive (speaking, writing) language skills, lexical acquisition, and intercultural competence. Furthermore, AI enhances the affective dimension of learning by boosting motivation, promoting engagement, and alleviating foreign language anxiety through personalized, adaptive feedback and autonomous learning pathways. Despite these benefits, the integration of AI into EFL education is characterized by some challenges, including students' over-reliance on technology, insufficient digital literacy among users, ethical concerns regarding data privacy, and a lack of comprehensive pedagogical frameworks. The study emphasizes the need for pre-service teacher training programs that effectively incorporate AI competencies.

Overall, the study results indicate a positive impact of integrating AI into the teaching of English as a foreign language in European counties (including Ukraine), demonstrating how technological innovations can complement traditional pedagogical approaches to support accessible, effective, and learner-centered foreign language education in the digital era.

Keywords**:** *Artificial Intelligence (AI), English as a Foreign Language (EFL), motivation, intelligent tutoring systems, pedagogical models, teacher training, Europe.*

ІНТЕГРАЦІЯ ШТУЧНОГО ІНТЕЛЕКТУ У ВИКЛАДАННЯ АНГЛІЙСЬКОЇ МОВИ ЯК ІНОЗЕМНОЇ В ЄВРОПІ: КРИТИЧНИЙ ОГЛЯД ІНСТРУМЕНТІВ, МЕТОДІВ ТА ВПЛИВУ

АНОТАЦІЯ

Інтеграція штучного інтелекту (*ШІ*) *у викладання англійської мови як іноземної вимагає суттєвого переосмислення педагогічних підходів у закладах вищої освіти. У низці європейських країн, зокрема в Німеччині, Естонії, Фінляндії та Україні, цей процес трансформації набирає обертів, оскільки освітні системи дедалі активніше впроваджують технології штучного інтелекту, що імітують людські когнітивні процеси, зокрема розв'язання проблем та прийняття рішень, відкриває нові можливості для персоналізованого навчання, орієнтованого на індивідуальні потреби студентів.*

У статті розглянуто сучасні тенденції, педагогічні моделі та наведено емпіричні дані щодо використання ШІ у процесі викладання іноземної мови, зокрема його вплив на розвиток мовленнєвих навичок, автономії та мотивації студентів.

Здійснено аналіз наукових досліджень зарубіжних та українських вчених, та зосереджено увагу на використанні найпоширеніших інструментів ШІ, зокрема чат ботів, асистентів, перекладацьких платформ та інтелектуальних навчальних систем. Результати статистичних досліджень (*європейських та вітчизняних*) *засвідчують суттєве покращення рецептивних* (*читання, аудіювання*) *та продуктивних* (*говоріння, письмо*) *мовних умінь студентів ЗВО. Окрім того, ШІ позитивно впливає на розвиток мотивації студентів завдяки адаптивному зворотному зв'язку та автономним шляхам навчання. Водночас впровадження ШІ в освітній процес супроводжується низкою викликів, серед яких – надмірна технологічна залежність студентів, недостатній рівень цифрової грамотності, етичні питання академічної доброчесності, а також брак цілісних педагогічних моделей. Зокрема, відсутні інтегровані модулі, що поєднують лінгвістичні, когнітивні, емоційно-мотиваційні та оцінювальні аспекти навчання із використанням ШІ.*

У статті наголошується на необхідності підготовки викладачів до ефективного використання інструментів ШІ у процесі викладання іноземної мови. Загалом результати дослідження свідчать про позитивний вплив інтеграції ШІ у процес викладання англійської мови як іноземної в Європейських країнах, що поєднує технологічні інновації з класичними педагогічними підходами для забезпечення якісної та доступної мовної освіти у цифрову епоху.

Ключові слова: *штучний інтелект, викладання англійської як іноземної, мотивація, інтелектуальні навчальні системи*, *педагогічні моделі, підготовка викладачів, Європа.*

INTRODUCTION

The integration of Artificial Intelligence (AI) into English as a Foreign Language (EFL) classes represents a pivotal shift in pedagogical approaches within higher education. This trend is especially relevant in European countries, such as Germany, Estonia, Finland, and Ukraine, where English is taught as a foreign language and AI-supported innovations are increasingly promoted in national education systems. These countries were chosen based on several criteria: the widespread status of English as a foreign language in their

national curricula, growing institutional support for educational technology, and the presence of empirical and theoretical research on AI-assisted language learning.

AI – defined as the development of programs that mimic human cognitive processes such as problem-solving and decision-making – offers transformative potential by enabling personalized language learning tailored to diverse learner needs, thereby creating optimal educational opportunities (AlTwijri, & Alghizzi, 2024). This shift represents a paradigm change where AI is no longer merely a teaching tool but emerges as a distinct subject in the educational process itself. The widespread adoption of AI across educational domains highlights the urgent need for fundamental reforms in teaching methods, management of information environments, and the preparation of future foreign language teachers.

In this context, the integration of AI into EFL classes requires re-examining traditional methodologies and developing new pedagogical models aligned with advancing technologies. This transformation involves not only the use of intelligent tools – such as AI-driven writing assistants, virtual conversation agents, and adaptive learning platforms – but also a reconceptualization of teacher roles, learner autonomy, and assessment strategies (Pokrivcakova, 2019).

As AI systems increasingly participate in instruction, providing immediate feedback, tracking learner progress, and adapting content in real time, educators are faced with the dual challenge of harnessing these innovations effectively while addressing ethical, cognitive, and professional implications. This evolving landscape calls for a comprehensive analysis of current research, methodologies, and best practices to ensure AI integration enhances, rather than replaces, human-centered language learning.

THE AIM OF THE STUDY

The purpose of the article is to examine the current trends, pedagogical models, and practical implementations of Artificial Intelligence (AI) in English as a Foreign Language (EFL) education, with a particular focus on its impact on language skill development, learner autonomy, and affective factors such as motivation and engagement. The study also seeks to identify the benefits and limitations of widely used AI tools, explore ethical and methodological challenges, and propose directions for integrating AI into teacher training and curriculum design in a balanced, human-centered manner.

THEORETICAL FRAMEWORK AND RESEARCH METHODS

The integration of Artificial Intelligence (AI) into English as a Foreign Language (EFL) teaching and learning has become a significant area of investigation among both domestic and international researchers. In particular, researchers from European countries – including Germany, Estonia, Finland, and Ukraine – have contributed to the development of context-specific models that align AI tools with EFL objectives. The application of AI in EFL contexts is multifaceted and includes areas such as personalized language learning, automated feedback and assessment, intelligent tutoring systems, and virtual conversational agents (chatbots).

Ukrainian researchers have begun exploring the pedagogical potential of AI for developing foreign language competence at various educational levels, reflecting a broader European trend of embedding AI into national language education strategies. For example, the use of AI-driven tools to individualize learning and improve learner engagement is analyzed by O. Holovko and L. Konoplytska (2023); the didactic functions of AI in foreign language instruction are investigated by S. Onopriienko (2022), while I. Yashchuk (2024) addresses methodological challenges of using AI for formative assessment in online EFL environments.

The theoretical basis for integrating AI into language education has been developed through international research frameworks. Key contributions include the concept of Intelligent Computer-Assisted Language Learning (ICALL) as proposed by M. Holland, J. Kaplan, and M. Sams (1995), which laid the foundation for the use of natural language processing in EFL tools. The development of AI-based adaptive learning systems has also been studied by S. Bull and J. Kay (2016), who emphasized the importance of learner modelling in personalized language instruction.

Further, scholars such as H. Li and C. Ni (2021) investigate how deep learning algorithms contribute to automated writing evaluation systems, while P. Godwin-Jones (2022) critically reviews emerging AI-based technologies in language learning, highlighting both their pedagogical affordances and ethical considerations.

Recent research identifies two main scientific approaches to the integration of AI in EFL:

– *Technological-pedagogical approach*, which focuses on how AI tools (e.g., chatbots, text generators, adaptive learning platforms) align with pedagogical objectives (e.g., speaking fluency, writing accuracy). This approach is reflected in the work of B. Zou, M. Li, and C. Li (2023), who explore the efficacy of AI-driven speaking practice applications;

– *Data-driven approach*, which emphasizes learning analytics, user modeling, and personalization. Representative studies include those by V. Pérez-Paredes (2021), who analyzes AI-enhanced corpora for data-informed vocabulary acquisition, and T. Reinders and M. Benson (2023), who explore learner autonomy through AI recommendation systems.

A comprehensive overview of the intersection of AI and language learning is presented by researchers such as K. Beatty (2020), who provides a systematic classification of AI-based technologies in second language acquisition (SLA), and M. Wang & D. Warschauer (2022), who propose a socio-cognitive framework for AI use in EFL classrooms, emphasizing human-AI interaction and the development of critical digital literacies.

In the European context, studies conducted in Germany, Estonia, and Finland indicate growing institutional support for integrating AI-based tools in both secondary and tertiary EFL education, with a focus on developing teachers' digital competence and ethical awareness (A. Kohnke et al., 2023).

Overall, recent studies indicate a growing trend toward integrating AI as a collaborative tool in language learning, with more emphasis being placed on its ethical, educational, and cognitive impacts. The field continues to evolve toward more learner-centered, adaptive, and interactive modes of instruction, informed by interdisciplinary insights from applied linguistics, cognitive science, and computer science.

The research was carried out using a combination of general scientific methods, including: study, analysis, and synthesis of contemporary scientific literature on AI in language education; overview and classification of AI tools and frameworks in current EFL practice; systematization and generalization of approaches to identify prevailing trends, benefits, challenges, and potential directions for the use of AI in EFL settings; comparative analysis of national and international methodologies and pedagogical models involving AI-based tools.

RESULTS

The application of Artificial Intelligence (AI) in English as a Foreign Language (EFL) teaching has brought significant advantages in both language development and students' emotional engagement. Empirical findings demonstrate that AI-based tools can

significantly enhance students' receptive (reading and listening) and productive (speaking and writing) skills, foster lexical development, and promote intercultural competence (Poláková & Klímová, 2023; Hejab & Alotaibi, 2023). Furthermore, AI tools have been found to positively influence affective factors such as motivation, learner engagement, attitude toward language learning, and reduction in foreign language anxiety – a result attributed to AI's ability to offer personalized, immediate feedback, interactive and adaptive learning environments, and flexible, autonomous learning pathways (AlTwijri & Alghizzi, 2024; Wulandari et al., 2024).

Several AI applications have gained widespread adoption in EFL contexts, including chatbots (e.g., ChatGPT, Duolingo Bots, SIRI), AI-powered writing assistants and translation tools (e.g., DeepL, Grammarly, QuillBot), voice assistants (e.g., Google Assistant, Amazon Alexa), and intelligent tutoring systems. Specifically, platforms such as Grammarly and QuillBot have demonstrated measurable improvement in academic writing performance, particularly in terms of sentence structure, grammatical accuracy, and stylistic refinement. Poláková & Klímová (2023) report that students using DeepL for translation improved their understanding of formal syntax by 65%, while Hejab and Alotaibi (2023) observed a 52 % reduction in grammatical errors following consistent Grammarly use. A number of empirical studies (Bakri et al., 2024; Poláková & Klímová, 2023; Reinders, 2023; Xu et al., 2022) have examined the specific impact of AI tools on different language skills in EFL contexts. An overview of selected AI tools and their associated learning outcomes is presented in Table 1.

Table 1

AI Tool Impact on EFL Learner Performance

AI Tool	Skill Area	Reported Improvement (%)
DeepL	Academic writing	+65 % in sentence structure understanding
Grammarly	Grammar and editing	−52 % in grammatical errors
QuillBot	Paraphrasing & rewriting	Improved structure; struggles with nuance
ChatGPT	Vocabulary, grammar, speaking	Higher accuracy and fluency reported
Eduaide.ai	Lesson planning and content gen.	Improved planning efficiency, teacher support
RIPPLE (UQ)	Pronunciation and vocabulary	Personalized feedback, faster acquisition

Although the AI tools listed in Table 1 are globally accessible, the reported outcomes are particularly relevant to European EFL education. Despite these advances, the integration of AI into EFL education remains in its early developmental stages, highlighting the need for more comprehensive and longitudinal studies. Current research tends to focus on narrow, tool-specific interventions, particularly in writing instruction, while systematic pedagogical frameworks for integrating AI into pre-service teacher training curricula are largely absent. AlTwijri and Alghizzi (2024) emphasize the scarcity of meta-analytical or systematic review studies on AI's influence on affective learning dimensions. Wulandari et al. (2024) confirm the effectiveness of tools such as Grammarly and QuillBot but also raise concerns about overdependence on such tools and limited digital competencies among users.

There is an evident gap in research addressing the long-term pedagogical impacts, ethical considerations (including data privacy, algorithmic bias, and digital equity), and the psychological effects of persistent AI exposure. These dimensions are underrepresented in the current body of literature and warrant urgent scholarly attention. Furthermore, there is consensus that AI should serve as a complementary aid, not a replacement for human educators, particularly in areas requiring emotional intelligence, contextual sensitivity, and complex interpersonal communication, such as intercultural dialogue (Reinders & Benson, 2023).

The pedagogical efficacy of AI in EFL is grounded in its ability to perform complex tasks such as learner modeling, real-time feedback delivery, and dynamic content generation. AI-powered systems personalize instruction by analyzing individual performance patterns and tailoring content to match learners' proficiency levels, pace, and preferences. Intelligent Computer-Assisted Language Learning (ICALL) environments, such as those described by Bull & Kay (2016), adaptively provide learning materials and guidance, thereby increasing learner autonomy.

AI applications in content generation and task design further illustrate its utility in education. For example, tools like ChatGPT, Eduaide.ai, and Twee can automatically generate vocabulary tasks, grammar exercises, dialogues, quizzes, and authentic texts contextualized to specific learner needs. Chatbots simulate spoken interaction, allowing learners to develop fluency and pronunciation skills in low-anxiety, asynchronous settings (Bakri et al., 2024). In addition, platforms such as RIPPLE (University of Queensland) deliver adaptive vocabulary instruction and pronunciation feedback, while Eduaide.ai supports teachers in designing gamified and personalized learning plans. Despite these capabilities, the teacher's role remains central in making instruction, offering social-emotional support, and developing learners' critical thinking and intercultural competence – aspects that AI cannot adequately replicate (Holland et al., 2023). The most frequently observed benefits and limitations of AI applications in EFL education are summarized in Table 2, structured according to key areas of language learning (Wulandari, 2024; Yuliani et al., 2024; Yun, 2024). A balanced perspective on AI's pedagogical potential is provided by the overview, while aspects requiring human facilitation or critical intervention are highlighted.

Table 2

Benefits and Limitations of AI in EFL Context

Area	Benefits	Limitations
Writing	Enhanced accuracy, structure, and vocabulary	Over-reliance, limited contextual understanding
Speaking	Fluency development via chatbots and pronunciation tools	Lack of human emotional feedback
Vocabulary	Personalization and spaced repetition via intelligent tutors	Algorithmic bias in content generation
Motivation & Engagement	Interactive, gamified learning with real-time feedback	Disengagement due to repetitive patterns or technical issues
Teaching & Assessment Design	Automated content generation, analytics	Requires teacher training; lacks nuance in creativity

Effective integration of AI into English as a Foreign Language (EFL) teaching should focus on using mixed methods. This means combining quantitative data (like test scores before and after using AI, or reduced error rates) with qualitative insights from students and teachers about their experiences. It's especially important to conduct long-term studies that follow learners over time to understand how AI affects their language skills and cognitive growth (Pokrivcakova, 2019). In addition, research should compare how AI is used in different countries, languages, and educational settings (Aryanti, 2024). Meta-analyses and studies focused on policy can also help identify best practices and develop ethical standards for using AI in language education.

Although AI brings exciting possibilities to EFL teaching, its use must be thoughtful and well-planned. Relying too heavily on AI, lacking digital skills, or facing unequal access to technology could actually increase educational gaps. To prevent this, institutions need to invest in teacher training, set clear ethical rules, and ensure all students have access to the necessary technology. In countries like Ukraine, Estonia, and Finland, national educational reforms are already aligning digital policy with AI integration goals, offering useful models for other European EFL contexts.

CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

The integration of Artificial Intelligence into English as a Foreign Language (EFL) education represents a paradigm shift in both pedagogical philosophy and instructional practice. This study has highlighted the transformative potential of AI tools in enhancing linguistic competencies, fostering learner engagement, and supporting personalized and adaptive learning environments. Empirical evidence suggests that AI can effectively develop receptive and productive skills, improve writing accuracy, support vocabulary acquisition, and contribute to positive affective outcomes such as reduced anxiety and increased motivation.

Research has focused on the European context, particularly countries such as Germany, Estonia, Finland, and Ukraine, where English is taught as a foreign language and where educational systems are increasingly investing in the digitalization of language instruction. These countries provide a representative spectrum of policy initiatives, teacher training practices, and AI integration strategies that reflect broader continental trends. Ukraine, in particular, demonstrates a growing commitment to embedding AI into EFL instruction through academic research, adaptive technologies, and curriculum modernization, despite facing structural and infrastructural challenges.

However, the findings also underscore several critical challenges. These include over-reliance on AI technologies, insufficient digital literacy among educators and learners, and ethical concerns related to data privacy, algorithmic bias, and digital inequality. Moreover, the lack of comprehensive, longitudinal research limits our understanding of the long-term pedagogical impacts of AI integration.

AI should not be seen as a replacement for the human teacher, but rather as a powerful supplementary tool that must be strategically and ethically embedded within the broader educational ecosystem. Human educators remain irreplaceable in fostering emotional intelligence, facilitating intercultural communication, and guiding learners through complex cognitive processes.

Future research should explore the development of unified pedagogical models that incorporate AI into pre-service teacher training, promote digital inclusion, and address the ethical dimensions of AI use. Cross-contextual studies – particularly those comparing implementation across different European countries – are essential for understanding the

sustained effects of AI on language learning. A balanced approach that combines technological innovation with human-centered pedagogy will ensure that AI becomes an effective component of 21st-century language education.

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