Chapter 6.
ARTIFICIAL INTELLIGENCE, NEURAL MACHINE TRANSLATION AND THEIR INTEGRATION INTO FOREIGN LANGUAGE TEACHING

Oleh Koliada

***Abstract**. The chapter examines the possibilities and limitations of using artificial intelligence, particularly neural machine translation, in foreign language teaching, as well as in the training of future translators. The aim of the article is to summarise the educational potential of the aforementioned technologies and to identify approaches to their integration into the educational process. To achieve the aim, the methods of analysis, synthesis, comparison, thematic systematization and theoretical generalization of academic sources have been widely applied. Consequently, the main areas of application for artificial intelligence are identified: personalization of learning content, adaptation of tasks, dialogue modeling, automated assessment and the provision of feedback. The potential of neural machine translation for the comparative analysis of texts, the identification of translation errors and post-editing has been methodically explored. The importance of machine translation tools, translation memory and terminology management systems for the development of professional skills among future translators has been substantiated. At the same time, the limitations of intelligent systems relating to contextual accuracy, interpretation of content, and the assessment of complex linguistic tasks have been outlined. It is concluded that the use of AI as a means of supporting learning activities is appropriate, provided that its results are critically evaluated and the teacher retains a leading role. Prospects for further research are identified, relating to the long-term impact of these technologies on the outcome of foreign language training and the development of translation skills.*

***Keywords**: artificial intelligence; neural machine translation; foreign language teaching; personalized learning; translation skills.*

© The Author(s) 2026
This work is licensed under the Creative Commons Attribution-NonCommercial 4.0 International License
DOI: 10.31110/LEMDE.06

Introduction

The digital transformation of language education is accompanied by a shift from using technology primarily as a means of accessing information and communicating to utilizing it in the analysis, design, and support of learning activities. Modern artificial intelligence systems are set to process natural language, generate and transform texts, perform automated translation, maintain dialogue, analyze written work, and recommend educational resources. Therefore, it provides new opportunities for personalized learning, but at the same time raises questions regarding reliability, educational appropriateness, confidentiality and accountability for the outcome.

One of the key areas of development in language technologies is neural machine translation (NMT). Its early models implemented the 'encoder-decoder' principle, whereby the source language sequence was converted into an internal representation, and the decoder used it to generate text in the target language. Subsequently, attention mechanisms made it possible to take into account different parts of the text in the source language depending on the generation's current stage, whilst the Transformer architecture significantly expanded the possibilities for modeling context.

At the same time, the quality of machine translation cannot be assessed solely on the basis of formal correctness. In real-world conditions, it is important to preserve the content, context, pragmatic meaning, terminological consistency, stylistic appropriateness and cultural specificity. Therefore, particularly challenging aspects, logically, include linguistic ambiguity, highly specialized terminology, non-standard dialectal language variants and texts for which there are insufficient representative examples in training corpora.

The research problem lies in determining the conditions under which the capabilities of artificial intelligence can be integrated into language education without replacing the teacher's core academic functions or fostering an indiscriminate dependence of learners on automated systems. Contextually, machine translation should be viewed not only as a service for obtaining an accomplished text, but also as a subject for educational analysis.

Comparing human translation with its automatically generated versions, identifying errors, and post-editing create the conditions for the development of linguistic sensitivity and a translator's mindset.

The issue of using artificial intelligence in foreign language teaching has become a widespread topic in both domestic and international academic discourse in recent years due to the rapid development of generative artificial intelligence models, intelligent dialogue systems, automated assessment technologies, machine translation, speech recognition, and adaptive learning. An analysis of recent scholastic and collegiate publications shows that contemporary research is gradually shifting from assessing the potential of individual digital tools to examining their impact on the results of foreign language learning.

Within the domestic academic community, one field of research involves determining the overall pedagogical potential of artificial intelligence in foreign language education. In particular, I. Grachova, L. Kolot, and O. Dubinina examine the significance of AI for foreign language learning in higher education institutions, emphasizing the possibilities for its use by lecturers and students, as well as the personalization and differentiation of learning (Grachova, Kolot, & Dubinina, 2024). Such an approach makes it possible to outline the main areas of application for intelligent technologies; however, it largely remains at the level of a general description of their didactic potential. The mechanisms for adapting the educational process to a learner's individual characteristics, as well as the principles of systematic interaction among the student, the teacher, and AI, are insufficiently specified.

A more applicable study within the field is that by O. Martyniuk to analyze AI tools in foreign language teaching, their advantages and limitations in Ukrainian and international practice (Martyniuk, 2024). The author examines large language models, AI-based learning systems, and natural language processing technologies. This approach broadens understanding of the technological tools available for foreign language education; however, the focus is predominantly on the capabilities of individual tools. Consequently, the issue of how to combine these elements into a single, pedagogically structured system remains

under-explored; within such a system, the results of assessing a learner's foreign language needs would determine the subsequent selection of learning content, types of activities, methods of interaction, and feedback.

O. Gerasimova investigates the issue of the transformative impact of AI on foreign language education. The work focuses on personalized and interactive learning, the use of virtual teachers, and the characteristics of human-machine interaction (Gerasimova, 2024). Theoretical generalization and the modeling of learning scenarios provide foundations for viewing artificial intelligence not merely as a separate technical tool, but as a factor in the transformation of the educational process. At the same time, the criteria and indicators that could be used to empirically assess the effectiveness of such a transformation, as well as the pedagogical conditions for the effective implementation of AI, remain insufficiently defined.

The study by T. Astapova and L. Izotova, which focuses on the use of artificial intelligence in the teaching of foreign languages at higher education institutions, has a practical vector. The authors analyze the areas of application of AI, the capabilities of digital platforms, and the technological aspects and risks of its integration into the educational process (Astapova & Izotova, 2025). An important novelty of the work is the emphasis on the need to consider not only the benefits but also the risks associated with the use of intelligent technologies. At the same time, the long-term impact of the systematic use of AI on foreign language competence, learners' autonomy, and the nature of pedagogical interaction remains unprobed.

A specific aspect of the issue is explored in a study by K. Savchenko and T. Golovatenko, who analyze teachers' use of AI when preparing English lessons, in particular the potential for prompt-based instruction and the creation of teaching materials (Savchenko & Golovatenko, 2024). The value of the work lies in its examination of the role of AI as a tool in teachers' professional practice. At the same time, the research focus is shifted towards the teaching activities, whilst the direct impact of AI-supported instructional design on learners' outcomes remains insufficiently researched. Furthermore, the specific nature of primary school education limits the possibility of directly applying the results to

foreign language teaching for students in higher education institutions.

The current state of domestic research is complemented by a study by T. Kalinichenko to systematize contemporary AI tools in foreign language teaching and examine personalization, assessment, development of written language skills, distance and blended learning, as well as the benefits and risks of using AI (Kalinichenko, 2026).

Therefore, the research initiated by Ukrainian scholars reveals a gradual broadening of the subject area: from a general characterization of AI capabilities to an analysis of specific tools, pedagogical scenarios, personalization, and risks. At the same time, a common problematic point of most of these works is the lack of a fully developed, essential academic model for the integration of various AI technologies, in which individual tools would function not in isolation but as system-interrelated elements of an adaptive educational process.

International studies have displayed a similar trend, although those, evidently, have a longer history of empirical research. One of the early works is a study by L. Fryer and R. Carpenter on the use of Chatbots as a tool for foreign language practice (Fryer & Carpenter, 2006). Using a sample of 211 students, the authors examine learners' attitudes towards interaction with bots and find that, overall, such a form of language practice is viewed positively. The significance of the aforementioned study lies primarily in documenting an early stage in the development of dialogue technologies in language education. At the same time, the technological capabilities of the systems available at that time were obviously limited in comparison to the current level of content generation, personalization, adaptability and intelligent feedback.

Further advances in this area are presented in a study by S. Bibauw, T. François and P. Desmet, focused on the dialogue-based interaction between learners and computers during foreign language practice (Bibauw et al., 2019). The authors summarise research on dialogical CALL service and offer a conceptual framework for systems that facilitate foreign-language communication with a computer. Further meta-analytical

development within this field is carried out by S. Bibauw, W. Van den Noortgate, T. François and P. Desmet, who systematize the results of the research into dialogue-based systems for language learning (Bibauw, 2022). The established trend indicates a gradual shift from studying the perception of the technology to assessing its educational effectiveness. However, even in this regard, the primary focus remains on dialogical interaction, whilst the comprehensive integration of diagnostics, content adaptation, assessment, and subsequent adjustment of the learning direction is not sufficiently addressed.

Current research has been focusing particularly strongly on generative artificial intelligence and, in particular, ChatGPT. For example, S. Mahapatra investigates the use of ChatGPT as a tool for formative feedback to develop the academic writing skills of ESL students, using a mixed-method research approach (Mahapatra, 2024). The results confirm the potential of generative AI for developing a specific language skill. Meanwhile, the focus on academic writing limits the ability to extrapolate the results to comprehensive foreign language training, which involves the interrelated development of speaking, listening, reading, writing, and translation skills.

Similarly, F. Karataş, F. Abedi and other researchers have probed university students' experiences of using ChatGPT whilst learning a foreign language. For instance, over a four-week period, 13 students used ChatGPT, whilst the researchers analyzed their experiences and perceptions of the technology (Karataş et al., 2024). The most obvious positive effects relate to writing, grammar, vocabulary, motivation, and engagement. However, the small sample size, the short duration of the study, and the qualitative nature of the obtained data limit the ability to draw conclusions regarding long-term pedagogical effects and the advantages of different personalization models.

A much broader range of empirical research is systematized by C. Lo, P. L. H. Yu, S. Xu, D. T. K. Ng, M. S.-y. Jong, and other authors conducted a systematic review of studies on the use of ChatGPT in ESL/EFL (Lo et al., 2024). Their focus is on writing, feedback, students' perceptions, autonomy, and ethical issues. An important conclusion of their study is that, although the number of studies is growing rapidly, a significant proportion of them are

characterized by short duration, local scope, and relatively small sample sizes, which evidently highlights the need for long-term studies and academically designed models for integrating AI.

Similar results are reported in a systematic review of the early studies on ChatGPT in language education, which analyzed, in particular, 36 publications. The authors find out that research is predominantly focused on higher education and that there is significant attention paid to ethical aspects, whilst also highlighting the fragmented nature of the research field (Li et al., 2024). Similarly, an analysis of 44 studies on ChatGPT in second-language learning reveals a predominance of issues related to students' perception and the development of writing skills, whilst questions of personalization and the comprehensive organization of the learning process remain less explored (Yang & Li, 2024).

Of particular significance for identifying guidelines for further research is the systematic review by S. Qiao and others, who analyze 30 experimental studies on the use of AI in language learning between 2014 and 2023 (Qiao et al., 2025). The authors ascertain that speaking and writing competences are the most common subjects of study, whilst AI is predominantly used for intelligent learning, assessment and providing feedback. By contrast, learners' profiling, prediction, adaptive learning and personalization are represented to a significantly smaller extent. This identified tendency is of fundamental importance, as it indicates a shift in academic interest towards individual AI functions rather than its systematic integration into pedagogics.

The results of a meta-analytical study of AI interventions in second-language learning also confirm the generally positive impact of artificial intelligence on learning outcomes, whilst demonstrating that such an effect depends on contextual, instructional and socio-emotional factors, in particular on the duration of the intervention, learning environment, personalization, adaptability, motivation and language anxiety (Wu, 2024). Consequently, the mere existence of a positive effect of AI does not in itself answer the question of which specific components of the intelligent system produce this effect and how they should be academically integrated.

The conclusion is reinforced by the results of a study by L. Feng, who compares various strategies for AI-assisted language learning: personalized feedback and adaptive learning, interactive speech recognition exercises, and data-driven intelligent learning. The study involved 484 EFL learners, and the experiment employed a randomized pre-test–post-test design (Feng, 2025). Such an approach represents an important step towards the experimental comparison of different AI strategies; however, it also highlights the relevance of the next stage of research – studying not isolated strategies, but their functioning within a single adaptive learning cycle.

An important complement to technology-oriented research is the concept of distributed agency suggested by R. Godwin-Jones. The researcher examines the interaction between the learner, the teacher, and generative AI through the lens of distributed agency and an ecological approach to second language learning (Godwin-Jones, 2024). This approach makes it possible to move beyond the simplistic dichotomy of 'AI replaces the teacher' versus 'AI assists the teacher' and to view the digital system as a participant in the redistribution of functions within the educational process. Simultaneously, the conceptual principles of distributed agency require further empirical testing regarding their impact on specific results of second-language learning.

Summarising the above-mentioned Ukrainian and international research, six main areas of study can be identified (Table 1):

Table 1.

Areas of AI Research in Foreign Language Education (Contextual Review)

Area	What has already been researched	What has not been sufficiently researched
ChatGPT / Generative AI	perception, writing, motivation, feedback	long-term effects, integrated learning
Dialogue systems	speaking practice, interaction, reduction of anxiety	adaptation of dialogue to individual profiles
Automatic feedback	grammar, writing, error correction	pedagogical model for the use of feedback in a long-term cycle

Area	What has already been researched	What has not been sufficiently researched
Personalisation	adaptive tasks, individual approach	comprehensive student profiling and adaptive learning direction
AI in assessment	automatic checking of writing/speaking	combining AI assessment with pedagogical decision-making
AI + translation	machine translation, post-editing, comparison	integration of translation with other types of language activity

Source: developed by the author of the article based on a thematic analysis of the research papers by Bibauw (Bibauw et al., 2019, 2022), Lo (Lo et al., 2024), Qiao (Qiao et al., 2025), Wu (2024) and other studies discussed in the section above. The classification is based on the primary educational function of AI technologies and the extent to which their pedagogical applications have been researched.

Therefore, an analysis of domestic and international research forms the basis for identifying several key tendencies in the development within this field. Firstly, a significant percentage of the research is focused on the use of AI for the development of specific language skills, primarily writing and speaking. Secondly, considerable attention is paid to automated feedback, assessment, the generation of learning content, and learners' perception of AI. Thirdly, there is a gradually growing interest in personalization, adaptive learning and the use of educational analytics. At the same time, systematic reviews indicate that it is precisely these areas – learners' profiling, prediction, adaptability and personalization – that remain under-represented in comparison to the research into individual language skills (Qiao et al., 2025).

Unresolved research issues include the insufficient study of the long-term impact of artificial intelligence on students' foreign language learning outcomes, the potential for its use in developing all key competences of language activity, and ways of combining various AI tools within the educational process. Further research is needed to determine the effectiveness of such tools, their impact on students' independence and motivation to learn, and the role of the teacher in organizing foreign language training using artificial intelligence.

The rapid development of artificial intelligence technology has brought about a significant transformation in academic understanding of the potential of digital support for foreign language learning. Whilst early research into artificial intelligence in language education focused primarily on automated dialogue, intelligent learning systems and computer-assisted language learning, the current phase is characterized by the proliferation of generative artificial intelligence, large language models, automated assessment systems, speech recognition, adaptive learning platforms and intelligent analytics of educational data. Consequently, the focus of research is gradually shifting from the question of whether AI can be used in language education to the challenge of identifying pedagogically appropriate ways of integrating it into the educational process.

The **aim** of this chapter is to provide a theoretical overview of the possibilities, pedagogical conditions and limitations of using artificial intelligence, in particular, neural machine translation in foreign language and translation teaching, and to justify approaches to integrating these technologies in order to personalize learning, develop foreign language and translation skills, and improve feedback.

To achieve this aim, the following **objectives** have been identified: to describe the evolution of NMT; to identify the factors influencing its effectiveness; to systematize the educational functions of intelligent systems; to analyze the potential of machine translation for translation training; to define the role of the teacher in the context of AI-mediated learning; and to summarise the technological, pedagogical, and ethical limitations.

The study is theoretical and analytical in nature and aims to summarise academic approaches to the use of artificial intelligence and neural machine translation in foreign language teaching and the training of future translators. The current data have been collected through reviewing academic publications on the application of intelligent systems in education, personalized learning, automated assessment of language skills, and the use of machine translation technologies. The analysis of such sources involves identifying the main areas of application for the aforementioned technologies, as well as their didactic potential and limitations. A range of theoretical **research methods** is

employed to analyse the material and achieve the objective: the analysis of academic sources (to examine contemporary approaches to the use of artificial intelligence in foreign language education, in particular intelligent learning and dialogue systems, automated assessment and neural machine translation); synthesis and generalisation (to identify the main educational potential of these technologies, systematise their functions and outline their pedagogical, technological and ethical limitations); a comparative method (to contrast traditional approaches to foreign language teaching and translation with the capabilities of intelligent systems, as well as to identify the advantages and limitations of automated checking of written work, dialogue-based practice and post-editing of machine translation); thematic systematisation (to identify the main areas of AI application: the personalisation of educational content, automated assessment, the organisation of speaking practice, the development of translation skills, and human–machine interaction).

Research results

Characteristics of Foreign Language Teaching in the Context of Digitalization of Education and Use of Artificial Intelligence Technologies.

One of the key prerequisites for effective foreign language learning is taking into account the individual differences among learners. These varieties manifest themselves in the level of development of language skills, aptitude for language acquisition, learning motivation, cognitive characteristics, prior experience, and strategies for independent study. Research into individual differences in second language acquisition shows that linguistic ability, motivation and learning strategies are linked to learning results; however, their impact depends on the nature of the learning tasks and the specific conditions of the educational process (Dörnyei, 2006; Skehan, 2009). Consequently, the organization of foreign language training requires both the definition of general learning objectives, a systematic analysis of learners' needs, and the selection of appropriate methods, resources, and forms of instruction.

An important stage in implementing an individualized approach is the initial assessment of foreign language proficiency.

Such diagnostics make it possible to determine the level of lexical, grammatical, and phonetic knowledge, as well as listening, reading, speaking, and writing skills. To achieve the goal, it is advisable to use entrance tests, communicative tasks, analysis of written work, and observation of learning activities. The results of the assessment should constitute the foundations for setting learning objectives, selecting materials of appropriate complexity, and planning further work. In particular, for learners who struggle with basic language structures, it is recommended to provide additional exercises and a step-by-step approach to the material, whilst for those demonstrating a higher level of proficiency, more complex communicative tasks, analytical work with texts and productive forms of language use should be provided. This approach is consistent with the provisions of the Common European Framework of Reference for Languages (CEFR), which defines six levels of language proficiency and descriptors of communicative skills that can be used for planning teaching and assessing learning outcomes (Council of Europe, 2020).

At the same time, the differentiation of teaching should not be reduced solely to the grouping of learners according to their levels of language proficiency. It is equally important to take into consideration the specific development of individual language skills. For example, a learner may demonstrate a sufficient level of grammatical knowledge and reading comprehension, but experience difficulties in oral communication. Conversely, fluency in spoken language may be combined with a lack of written competence. Accordingly, learning tasks should be directed towards developing specific skills that require improvement, without unnecessary revision and repetition of material already mastered. The importance of a differentiated approach is confirmed by research into language abilities, which has established that diverse components of these abilities are linked to varying degrees with performance on specific types of language tasks (Li, 2016).

The personalization of foreign language teaching also involves diversifying learning activities and creating conditions for learners to participate actively in communication. To guarantee a positive result, role-plays, simulations of professional situations, discussions, project-based activities, and pair and group work may

be used. The practice of applying such methods makes it possible to create situations in which the foreign language serves as a means of solving communicative tasks, exchanging information, and facilitating interaction between participants in the educational process. At the same time, the teacher must ensure a variety of ways of engaging learners in the work, so that every learner has the opportunity to practice speaking, express their views, and receive feedback. The appropriateness of this approach is consistent with the communicative focus of modern language education and the broader interpretation of communicative interaction set out in the CEFR (Council of Europe, 2020).

A requirement for improving teaching is the systematic collection and analysis of feedback. Sources of feedback may include the results of formative assessment, self-assessment, peer assessment, surveys of learners, and the analysis of common errors. The information collected makes it possible to identify difficulties that occur in the process of learning a foreign language, specify learning objectives, and adjust the content and teaching methods. For example, if assessment results indicate insufficient vocabulary acquisition, it is advisable to include systematic revision of words in various contexts, tasks designed to encourage their active use, and checks on long-term retention. If difficulties relate to the construction of written expression, attention should be focused on text structure, the logical flow of argumentation, linguistic presentation and editing. Thus, feedback serves both as a monitoring function and a regulatory one, ensuring a link between assessment, the adjustment of learning activities and the achievement of planned results.

The development of digital technologies expands the scope for implementing these approaches. Digital educational resources provide access to authentic texts, audio and video materials, interactive exercises and communication tools, enabling foreign language learning to take place both during classroom seminars and as part of independent study. Adaptive and personalized learning technologies are of particular importance, because they provide the selection of learning content, practical tasks, and overall support based on the needs and results of individual learners. In a systematic review of research on technology-supported adaptive and personalized learning, Xie (Xie et al.,

2019) examined trends in the development of this field, the characteristics of how learning support is organized, and issues relating to the assessment of results. This provides grounds for viewing digital tools as a means of expanding the possibilities for differentiated learning, when they are used in accordance with specific pedagogical objectives.

Certain opportunities for improving foreign language training are linked to the use of artificial intelligence technologies. These can be used to generate learning materials, create tasks of varying levels of difficulty, explain linguistic structures, simulate dialogues, analyze written work and provide immediate feedback. In particular, intelligent language learning systems can support automated assessment, intelligent tutoring and the personalization of learning activities. Conversely, a systematic review of research in the field of intelligent computer-assisted language learning shows that the effectiveness of such an environment depends not only on technological capabilities, but also on the quality of its educational design and the organization of learning tasks (Huang et al., 2022).

Contextually, large language models (LLMs), which form part of generative artificial intelligence technologies, play a particular role. They can be used to generate dialogues according to a specific communicative situation, explain grammatical phenomena, select vocabulary, edit texts, and imitate professional communication in a foreign language. For example, a learner may ask the system to simulate an interview in a foreign language, suggest questions for discussing a specialist topic, or explain the differences between words with similar meanings. By varying the task requirements and level of difficulty, a teacher can use such tools to prepare differentiated materials and organize additional speaking practice.

By contrast, the results generated by language models require critical evaluation. The system may provide inaccurate grammatical explanations, suggest unnatural linguistic constructions, misinterpret contexts, or generate, in fact, incorrect information. Therefore, the use of AI should not replace the teacher’s assessment, the learner’s independent language activity, or work with verified sources. Definitive UNESCO recommendations on the use of generative AI in education and

academic research emphasize the need for a human-centered approach, the protection of personal data, the ethical use of technology, and taking full responsibility for educational decisions (Miao & Holmes, 2023).

The use of AI can help to extend foreign language practice beyond the classroom environment. Intelligent language assistants enable learners to practice dialogues, drill their ability to construct sentences, receive explanations of mistakes, and revise learning material at a time that suits them. When combined with digital platforms, speech recognition tools and multimedia resources, such technologies create additional opportunities for developing receptive and productive language skills. However, the mere availability of a digital tool does not in itself guarantee improved results. It is essential that interaction with such tools is aimed at completing specific learning tasks, involves active use of the foreign language, and concludes with an assessment of the results achieved.

Consequently, the use of artificial intelligence technologies in foreign language teaching should be regarded as a component of an academically solid digital transformation of foreign language training. Their potential is based on expanding opportunities for speaking practice, creating multiple-level teaching materials, providing immediate feedback, and supporting independent study. At the same time, the effectiveness of the technologies used should be aligned with learning goals, the quality of the content generated, the level of digital literacy among those involved in the educational process, and compliance with ethical requirements.

Therefore, improving foreign language training in the context of digitalization involves a combination of assessing individual educational needs, differentiating learning tasks, employing communication-oriented methods, providing systematic feedback, and the didactically appropriate use of digital technologies. Among others, a promising area for further research within the field is the identification of the conditions under which the use of large language models ensures the convenience of completing learning tasks and also a genuine improvement in the foreign-language communicative competence of higher education students.

Use of Artificial Intelligence Technologies in Teaching Activities

Intelligent learning systems are capable of personalizing educational content and making learning more targeted. In the traditional model of foreign language teaching, teachers often adopt a standardized approach, uniforming all learners with the same content and pace of studying, whilst ignoring their individual differences in prior knowledge, learning styles, and needs. Intelligent learning systems can collect and analyze data based on students' education, including learning behavior, academic results, knowledge proficiency levels, and so forth, to create individual learning portfolios and knowledge guidelines for learners, thereby providing personalized recommendations and delivery of educational content (Weng & Chiu, 2023).

One of the promising areas for the use of artificial intelligence technologies in teaching is the generation and recommendation of personalized learning content, taking into account the individual needs, level of preparation, and academic achievements of learners. Intelligent learning systems ensure the adaptive organization of the educational process based on the modeling of subject knowledge, the analysis of learning activities, and the application of recommendation algorithms. The operation of such systems involves several interrelated stages: structuring learning material in the form of a knowledge network, creating individual profiles for learners based on learning outcomes and the characteristics of their learning activities, as well as selecting appropriate educational resources and tasks. This enables the teacher to organize differentiated teaching, identify gaps in knowledge in a timely manner, and adjust individual learning pathways.

In particular, when teaching foreign languages, intelligent systems can use lexical knowledge graphs that reflect semantic relationships, collocations, and the frequency of word usage. Based on an analysis of test results and learners' engagement, recommendation algorithms generate personalized selections of vocabulary and exercises aimed at addressing identified difficulties and expanding vocabulary. A similar approach is applied when studying grammar, where the system offers tasks of an

appropriate level of difficulty, taking into account the material already learned and typical mistakes.

An important condition for the effective use of such technologies is taking into account cognitive load, motivation, and individual learning pace. Adaptive adjustment of the complexity and methods of presenting material makes it possible to create learning situations that correspond to the current capabilities of learners and contribute to their gradual development. An additional means of maintaining learning motivation can be the integration of elements of gamification and interactive engagement.

In teaching practice, artificial intelligence technologies should be regarded primarily as a pedagogical support tool that expands the teacher's capabilities in terms of developing differentiated tasks, personalizing learning materials, monitoring learning outcomes, and providing individualized feedback.

The use of natural language processing technologies in checking assignments has significantly improved teachers' efficiency. Traditionally, checking foreign language assignments takes a great deal of work. Teachers need to carefully review each assignment, identify mistakes, and provide feedback, which is time- and effort-consuming. Natural language processing technologies can automatically analyze students' work, quickly identify grammatical, spelling, lexical, and other mistakes, and provide appropriate suggestions for correction, significantly reducing the checking burden on teachers' behalf and improving the timeliness and relevance of feedback.

Intelligent checking systems can quickly and accurately diagnose language mistakes and provide detailed feedback. Based on machine learning and deep learning algorithms, intelligent checking systems can identify linguistic patterns and usage characteristics from a large corpus of texts, creating a powerful database of linguistic knowledge and mistake detection models. When students submit their work, the system can quickly analyze the text, check for errors in terms of vocabulary, grammar, semantics, discourse, and other aspects, and provide detailed correction recommendations, including mistake types, correct ways of expressing ideas, example sentences, etc.

Modern automated systems for checking written work can utilize natural language processing and machine learning techniques to identify spelling, grammatical, lexical, and stylistic errors. The effectiveness of such systems depends on the language pair, the text genre, the characteristics of the training sample, the type of mistakes, and the marking method. At the same time, automatically generated recommendations do not always take into account the author's communicative intent, the logic of their argumentation or the contextual appropriateness of linguistic choices. It is therefore advisable to use the results of automated checking as a supplementary source of formative feedback, whilst leaving the final pedagogical assessment to the teacher.

Personalized checking reports can encourage students to actively correct mistakes, identify gaps and address weaknesses, fostering a positive learning interaction. Feedback reports generated by intelligent checking systems are usually presented in a clear and visual format, such as highlighting the location of mistakes, listing mistake types, providing suggestions for corrections, and so on, which enables pupils to quickly identify problems. Some systems can also recommend personalized exercises and learning resources based on learners' tendencies to make mistakes.

On such a basis, students can actively review tasks and focus on consolidating practice within areas where their knowledge requires improvement. Teachers, in turn, can identify common issues faced by learners by analyzing the system data, provide targeted explanations for language difficulties, and fill gaps in their knowledge. In-depth interaction and discussion between teachers and learners regarding assignment feedback reports help to create an effective mechanism for improvement.

To illustrate the potential applications of intelligent marking systems for written work, let us consider a hypothetical teaching scenario. Whilst completing an assignment to write an essay in English, a student receives automated feedback on the grammatical accuracy, lexical appropriateness and logical coherence of the text. By analyzing the system's recommendations, the student systematically checks the errors identified, particularly in the use of prepositions, articles and

grammatical structures, makes corrections and justifies their rejection of incorrect suggestions. Such activities lay the foundations for the development of self-monitoring skills, critical thinking and the conscious editing of one's written work.

At the same time, the teacher can use the summarised results of the automated analysis to identify typical language difficulties among learners, adapt the content of lessons, provide additional explanations and develop differentiated exercises. In this way, artificial intelligence systems can serve as a supporting tool for formative assessment, contributing to the individualization of learning and the improvement of pedagogical support. However, the final assessment of the quality of written work and the appropriateness of the suggested corrections remain the teacher and the learners' prerogative.

Automated checking facilitates formative assessment and personalized learning, but obviously requires the necessary involvement of teachers. With the help of natural language processing technologies, teachers can monitor learners' task completion and progress at any time, adjust lesson plans and the pace of learning in a timely manner, and carry out formative assessment and provide individual guidance.

However, current intelligent checking systems still have limitations in understanding semantic logic, analyzing the structure of arguments, assessing originality and other aspects, and continue to require teachers' involvement in the overall assessment of assignments. The complementary advantages of both approaches can indisputably facilitate the teaching of writing skills in a foreign language.

Within the framework of the suggested teaching scenario, the teacher can combine the capabilities of artificial intelligence systems for the automated checking of written work with their expert assessment of the content and communicative qualities of the work. In particular, when teaching students to write argumentative essays in English at the initial stage, it is advisable to use artificial intelligence tools to analyze students' drafts, identify potential grammatical, lexical, and stylistic mistakes, and provide recommendations on how to correct them. At the same time, students should analyze the feedback received

independently, critically assess its validity, and make the appropriate changes to their texts.

In the next stage, the teacher carries out a content analysis of the written work, focusing on the logical sequence of the presentation, the persuasiveness of the argumentation, the applicability of the conclusions, the originality of the author's ideas, and the extent to which the text meets the set communicative task. The combination of automated and pedagogical feedback allows for the repeated editing and refinement of written work. This approach to organizing learning activities lays the foundations for the development of foreign-language writing competence, the formation of critical self-assessment skills, and the enhancement of learners' independence in the process of producing texts in a foreign language.

At the same time, the focus of the teacher's checking routine shifts from linguistic details to the logic of reasoning; the amount of work is crucially reduced, whilst the focus and effectiveness of teaching are greatly enhanced.

Natural language processing technologies hold great promise in the field of automated assignment checking, but still require further optimization. At present, intelligent checking systems still have deficiencies in detecting complex errors, understanding the semantics of discourse, adapting to the characteristics of different specialties, and other aspects; therefore, technological modernization and the adaptation of disciplines remain the main areas of focus for the future.

Furthermore, the vast amount of data on tasks and feedback generated by the system also requires further development and utilization, and can be used for the intelligent formulation of questions, recommendations for writing learning resources, precise analysis of the learning situation, ultimately forming a comprehensive solution for instruction in intelligent writing skills formation.

As artificial intelligence technologies continue to advance, foreign language teachers will be able to free up their schedule considerably and devote more time and energy to developing teaching materials, teacher-student interaction, and other valuable areas requiring a more human-centered approach,

thereby comprehensively advancing the reform of foreign language teaching.

The application of natural language processing technologies to the automated checking of foreign language assignments can quickly and accurately identify language mistakes and provide detailed feedback, reducing workload and improving the efficiency of teachers' checking, whilst also providing students with a powerful tool for correcting mistakes, identifying gaps and addressing shortcomings.

The use of intelligent systems for checking written work facilitates formative assessment and the individualization of learning, as well as fostering effective interaction between teachers and learners based on the analysis of checking results and the refinement of feedback. Despite existing limitations and the need for further improvement of such systems, they hold significant potential for the development of writing skills. Further optimization of the technologies, their adaptation to the specific requirements of individual academic disciplines, and in-depth analysis of assessment data could form the basis for the creation of comprehensive intelligent solutions aimed at developing writing skills. In this context, it is recommended for foreign language teachers to integrate intelligent assessment tools into the educational process, using them to automate routine tasks and free up time for individual work with learners, to provide detailed recommendations, and to refine teaching methods. This approach lays the ground for improving the quality of foreign language teaching and introducing innovative pedagogical practices.

Intelligent dialogue systems create additional opportunities for the practical use of a foreign language in interactive communication. Within the framework of the traditional teaching arrangements, learners often have limited opportunities for regular speaking practice, which can slow down the development of their communication skills. The use of intelligent dialogue systems makes it possible to expand opportunities for communication in a foreign language, simulate communicative situations, and improve language skills through interaction with the system (Bibauw et al., 2022; Huang et al., 2022).

Intelligent dialogue systems can contribute to the development of learners' linguistic thinking, as learning a foreign language involves not only acquiring linguistic knowledge but also developing the ability to formulate thoughts independently, select appropriate linguistic means of expression, and construct meaningful utterances. Interaction with such systems encourages learners to actively use the foreign language, formulate questions, justify their viewpoints, and maintain a dialogue, thereby creating additional opportunities for the development of communicative skills.

Furthermore, intelligent dialogue systems expand the temporal and spatial boundaries of foreign language learning. Unlike traditional teaching methods, where speaking practice depends largely on the timetable and opportunities for classroom interaction, the use of the aforementioned systems allows learners to practice the foreign language outside classroom hours regardless of their location. It helps to ensure the continuity of learning, increase the amount of speaking practice, and create conditions for the independent improvement of foreign-language communication skills.

The use of intelligent dialogue systems must be aligned with learning objectives. Although intelligent dialogue systems offer broad prospects for application in foreign language teaching, their operation must be in line with learning objectives and requirements, and they must be sensibly designed and utilized, whilst avoiding excessive reliance on technology and neglecting the essence of learning (Huang et al., 2022).

Intelligent dialogue systems offer the following advantages in foreign language teaching: they provide authentic linguistic interaction, a personalized learning experience, the development of linguistic thinking skills, and the expansion of learning time and space, which, in common, can effectively enhance learners' ability to use a foreign language. At the same time, the application of intelligent dialogue systems must also be aligned with learning objectives, be rationally designed and utilized, and make use of technological advantages to facilitate the development of foreign language learning.

However, unlike general dialogue-based and adaptive artificial intelligence systems, neural machine translation technologies have specific didactic potential, linked to the possibility of using automatically generated translations as a subject for critical analysis, comparison and editing. The use of NMT in the learning process makes it possible to organize learners' activities aimed at identifying lexical, grammatical, semantic, stylistic and pragmatic discrepancies between the original and translated texts, justifying translation decisions and developing post-editing skills. In this context, the development of a typology of mistakes in neural machine translation, the identification of methodological approaches to post-editing, and the application of criteria and metrics for assessing translation quality are of particular significance. It is precisely these aspects that form the subject of further consideration.

The Educational Potential of Neural Machine Translation in Developing Translation Competence among Higher Education Students

The development of artificial intelligence technologies and their integration into the educational process necessitate a re-evaluation of traditional approaches to foreign language teaching and translation. Neural machine translation (NMT) technologies are of particular significance in this context, as they enable the automated conversion of textual information from one language to another based on neural network models. Their use in an educational setting creates the conditions for the development of translation competence, critical thinking, linguistic reflection, and the ability to apply digital technologies in a conscious manner.

Unlike the traditional use of electronic dictionaries and reference resources, NMT systems enable users to work with complete texts, analyze contextual relationships, compare alternative translation options and assess their suitability for the communicative task at hand. At the same time, the educational value of such systems lies not so much in the speed with which a translation is produced, but rather in the ability to transform automatically generated text into a subject for educational analysis, critical evaluation and post-editing.

One area of application for NMT in the professional training of future translators is the creation of synthetic bilingual data, consisting of source text segments and automatically generated translation equivalents. However, such data should not be equated with verified parallel translation corpora: automatically generated segments may contain semantic, grammatical, terminological and pragmatic inconsistencies. Their use in the educational process requires verification of segment correspondence, completeness of content rendering, terminological accuracy, and suitability for a specific teaching task.

In traditional translation teaching practice, selecting authentic parallel texts of an appropriate level of difficulty can require considerable effort. Synthetic bilingual pairs generated using machine translation can supplement teaching materials and provide a variety of examples for comparing the source and target languages. It is important, however, that learners regard the machine-generated translation not as an unquestionable benchmark, but as a translation hypothesis that requires verification.

A critical analysis of automatically generated translations helps students to recognize the differences between linguistic systems and to develop sensitivity to context, polysemy, idioms, and culturally determined meanings. Through the process of comparison, students learn to justify their own translation decisions and to recognize the limitations of automation (Liu et al., 2023). An additional learning outcome may be an understanding of the general principles of natural language processing and deep learning, without these replacing the analysis specific to translation studies.

Human-machine collaborative translation occupies a special place in modern translation training; it combines the speed of automated draft generation with expert human assessment, editing, and responsibility for the final result. As part of the learning process, students can generate an initial translation using machine translation, check its accuracy against the original, correct any errors found, and justify the changes made (Yang & Mustafa, 2022).

The use of systems such as Google Translate or Baidu Translate makes it possible to quickly obtain preliminary translations for further analysis. However, reducing the time spent on the initial processing of the text does not automatically guarantee an improvement in the quality of the final product: this depends on the complexity of the material, the quality of the machine translation output, and the level of competence of the person carrying out the post-editing. Under the right conditions, collaborative approaches can optimize individual stages of the translation process (Peng et al., 2024).

Post-editing is regarded as a targeted review and correction of machine translation in accordance with requirements for accuracy, linguistic correctness, terminological consistency, and communicative appropriateness. It is advisable to distinguish between light post-editing, which focuses primarily on eliminating errors that hinder a correct understanding of the content, and full post-editing, which aims to produce a text that meets the established quality requirements for the final translation. The choice of editing level should be determined by the purpose, target audience, and function of the text.

A methodologically sound approach to working with machine translation involves a sequence of interrelated steps: preliminary analysis of the source text and the translation task; obtaining a machine-translated version; comparing it with the source text; identifying and classifying errors; post-editing; justifying the changes made; and a final quality check. Organizing the work in this way helps both to develop the skills required to correct mistakes and to develop the ability to assess the appropriateness of using machine translation in the first place.

To systematize the analysis of teaching, it is advisable to apply a didactic typology of machine translation errors. This can be correlated with the MQM (Multidimensional Quality Metrics) approach; however, the classification proposed below is a simplified adaptation by the author for educational purposes, rather than a complete reproduction of the MQM taxonomy.

Table 2.
Didactic Typology of Machine Translation Errors

Type of error	Characteristic	Example
Semantic	Distortion of meaning	Incorrect interpretation of a polysemantic word
Omission	Loss of some information	Absence of negation
Addition	Inclusion of information not present in the original	Unjustified clarification
Terminological	Incorrect technical equivalent	Inappropriate technical term
Grammatical	Breach of grammatical rules	Incorrect agreement
Stylistic	Inconsistency with genre or register	Colloquial expression in a formal text
Pragmatic	Inconsistency with communicative intent	Inappropriate polite formula
Inconsistency	Inconsistent rendering of units	Different translations of a term in a document

Source: systematized and adapted by the author of the article on the basis of approaches to assessing the quality of machine translation, in particular the MQM (Multidimensional Quality Metrics) taxonomy.

The practical significance of the typology becomes apparent when analyzing specific translation situations. The examples given below (Tables 3–7) are specially modeled educational illustrations, rather than recorded results from a particular NMT system; accordingly, they cannot serve as empirical evidence of the frequency of the errors mentioned.

Table 3.
Example 1. Ambiguity and Terminological Clarification

Component	Meaning
Original	The bank approved the loan.
Provisional machine translation (into Ukrainian)	Банк схвалив позику.
Analysis	No semantic error; terminological clarification may be required depending on the context.
Post-editing (Ukrainian)	Банк схвалив надання кредиту.
Teaching note	Students determine whether editing is actually necessary and compare the usage of ‘loan’ and ‘credit’ in a financial context.

Source: developed by the author

Table 4.

Example 2. Idiomatic Expression

Component	Meaning
Original	The new policy opened a can of worms.
Provisional machine translation (into Ukrainian)	Нова політика відкрила банку черв'яків.
Error	Literal rendering of an idiomatic expression.
Post-editing (Ukrainian)	Нова політика спричинила низку складних проблем.
Teaching note	Analysis of figurative meaning, selection of a functional equivalent, assessment of stylistic appropriateness.

Source: developed by the author

Table 5.

Example 3. Industry-Specific Terminology

Component	Meaning
Original	The circuit breaker must be disconnected before maintenance.
Provisional machine translation (into Ukrainian)	Перериває ланцюга повинен бути від'єднаний перед обслуговуванням.
Error	Unnatural terminology and insufficient alignment with the technical context.
Post-editing (Ukrainian)	Перед проведенням технічного обслуговування необхідно вимкнути автоматичний вимикач.
Teaching note	Working with terminology databases, checking technical documentation and distinguishing between the terms 'switch off' and 'disconnect' depending on the procedure.

Source: developed by the author

Table 6.

Example 4. Pragmatic Adaptation

Component	Meaning
Original	We regret to inform you that your application was unsuccessful.
Provisional machine translation (into Ukrainian)	Ми шкодуємо повідомити вам, що ваша заявка була неуспішною.
Shortcoming	Unnatural phrasing in the official notification
Post-editing (Ukrainian)	На жаль, змушені повідомити, що вашу заявку не було схвалено.
Teaching note	Studying politeness, formal business style and the communicative purpose of translation

Source: developed by the author

Table 7.
Example 5. Critical Loss of Negation

Component	Meaning
Original	Do not operate the device unless the safety guard is installed.
Provisional machine translation (into Ukrainian)	Використовуйте пристрій, якщо встановлено захисний кожух.
Error	The explicit prohibition has been removed; the nature of the instruction has been amended.
Post-editing (Ukrainian)	Заборонено використовувати пристрій без установленого захисного кожуха.
Teaching note	Identification of critical errors, assessment of safety risks and prioritization of post-editing.

Source: developed by the author

The examples given demonstrate that post-editing training should not be reduced to the mechanical correction of every difference between the machine-translated and human-translated versions. Students must learn to distinguish between a factual mistake and acceptable translation variation, to determine the extent to which it affects the meaning and function of the text, and to explain the rationale behind the suggested changes.

To assess the results of post-editing, it is advisable to combine an analysis of the quality of the final text with an evaluation of the reasoning behind the translation decisions. For this purpose, an original analytical rubric based on a 100-point scale may be offered. This is intended for teaching and methodological purposes and does not claim to be an empirically validated tool.

Table 8.
Original Rubric on the Assessment of Educational Post-Editing

Criterion	Maximum Score (Points)
Accuracy of content rendering	30
Terminological consistency	20
Linguistic accuracy	20
Style and communicative appropriateness	15
Justification of translation choices	15
Total	**100**

Source: developed by the author

Each criterion can be assessed on a five-point scale: 0 – criterion not met; 1 – significant shortcomings; 2 – partial fulfillment; 3 – largely correct fulfillment; 4 – full fulfillment. To obtain an overall score, the level of fulfillment for each criterion is multiplied by its maximum score and divided by four; the results are then totaled. In particular, level 3 for the criterion of linguistic accuracy corresponds to 22.5 points out of 30.

The use of such a rubric ensures transparency in educational assessment and facilitates formative feedback. At the same time, before using it within the framework of an empirical pedagogical study, it is necessary to verify the content validity, reliability and consistency of the assessments made by independent experts. Where necessary, the rubric should be adapted to the genre, the subject area, the students' level of preparation and the nature of the translation task.

The use of NMT in translation teaching also carries a number of risks. Machine translation systems may fail to accurately render semantic ambiguity, pragmatic implications, culture-specific elements and specialized terminology. Over-reliance on ready-made machine translations can limit independent research by translators and undermine their motivation to analyze the source text in depth. It is therefore important for teachers to structure tasks in such a way that technology remains a supporting tool, whilst responsibility for the accuracy of content and the communicative adequacy of the translation lies with the human translator.

Teaching collaborative translation must be grounded in the principles of translation theory, in particular an understanding of equivalence, adequacy, the function of the target text and its target audience. Analyzing machine-generated translations in relation to these categories helps students realize why formal similarity between linguistic constructions does not always guarantee an adequate translation outcome. Post-editing work can also contribute to professional readiness for the use of digital tools in translation practice (Pisanski Peterlin & Mikolič Južnič, 2026).

Consequently, the educational potential of neural machine translation lies, first and foremost, in its ability to facilitate

analytical, reflective and practice-oriented activities amongst higher education students. The creation of synthetic bilingual data, the critical comparison of the original text with the machine translation, the classification of errors, post-editing, and reasoned quality assessment all contribute to the development of translation competence. The effectiveness of these approaches depends on a methodologically sound selection of materials, clearly defined learning objectives, proper quality control, and the preservation of the leading role of human translation judgment.

The Integration of Machine Translation (MT) and Computer-Assisted Translation (CAT) Systems into Translator Training

Teaching students to use automated translation tools can effectively improve translation efficiency. With the development of artificial intelligence technologies, an increasing number of automated translation tools have emerged, such as machine translation systems, translation memory databases, terminology management systems, and so forth, which provide translators with powerful supplementary functions and significantly improve the efficiency and quality of translation.

Therefore, when teaching translation, lecturers should focus on developing students' skills in using machine translation tools and help them master the methods and techniques for using these tools to improve translation efficiency (Olkhovska, 2017).

As part of a practical session on specialized translation, students may be asked to translate a technical document using a CAT tool, such as Trados Studio. At the initial stage, students create a translation project, specify the source and target languages, import the document, and set up a terminology database. Whilst translating, they use the translation memory to search for previously translated segments, check for terminological consistency, and, where relevant integration is available, analyze machine-translation suggestions.

In the final stage, students carry out post-editing, check the translation fidelity to the source text, and produce a brief report on the translation decisions made. Assessment involves analyzing the accuracy of content rendering, terminological consistency, linguistic correctness, and the justification of corrections.

The example provided is the article author's methodological scenario and does not constitute a description of an experimental study that has been carried out.

At the same time, the effectiveness of technical training for future translators should be assessed not only by their mastery of software but also by their ability to critically evaluate its results and apply relevant tools in real-world translation tasks (Su & Li, 2023).

Another example of the use of neural machine translation technologies in the educational process could be the organization of learning activities aimed at a comparative analysis of translation results produced by different automated systems. As part of such a teaching scenario, higher education students are asked to translate a single text using two neural machine translation tools, compare the results with the original, identify semantic, lexical, grammatical, terminological, and stylistic discrepancies, and determine the reasons for these discrepancies. The next stage involves post-editing the automatically generated translations using terminology resources, translation memory, and relevant quality assessment criteria. Particular attention is paid to justifying translation decisions, analyzing the limitations of automated assessment, and defining the role of the human translator in ensuring the accuracy of meaning and communicative appropriateness of the translation. Implementing such a teaching scenario can lay the foundations for the development of critical thinking, the acquisition of post-editing skills, and the enhancement of translation competence among higher education students.

In parallel, the tool also features various built-in translation quality metrics that can assess speed, accuracy, terminological consistency, and other aspects of the translated text in real time, helping translators to identify and correct errors in the translation. During the learning process, teachers guide students in using such a tool for translation practice, whilst also assessing and providing feedback on their translations, helping students to master translation skills and strategies. Students can also use the tool's learning function to identify their strengths and patterns in translation, thereby developing their individual translation style.

An important aspect of using digital technologies in translation teaching is distinguishing between the functional purposes of automated translation tools and those of quality assessment tools. In modern translation practice, neural machine translation (NMT) enables the automatic generation of text in the target language, whilst large language models (LLMs) have a broader range of functionalities; in particular, they can be used for translation, paraphrasing, explaining translation decisions and post-editing. Computer-Assisted Translation (CAT) systems constitute a digital environment for organizing translation work, within which Translation Memory (TM), terminology databases and quality control tools can be utilized. Translation memory ensures the storage and reuse of previously translated segments, whilst terminology databases help to maintain consistency in specialist terminology. The mere presence of such resources does not in itself indicate the use of artificial intelligence technologies.

Of particular importance in the educational process is familiarising higher education students with automated metrics for assessing the quality of machine translation, in particular Bilingual Evaluation Understudy (BLEU), Character n-gram F-score (chrF), Translation Edit Rate (TER) and Crosslingual Optimized Metric for Evaluation of Translation (COMET). These metrics are based on different approaches to evaluating translated text: BLEU determines the degree of overlap between word sequences and the reference translation; chrF takes into account the correspondence of character sequences; TER characterizes the amount of editing required to bring the machine translation into line with the reference translation; whilst COMET uses neural models to predict translation quality. At the same time, the results of automated evaluation cannot fully reflect the semantic accuracy, stylistic appropriateness, pragmatic adequacy and cultural characteristics of the translated text; they therefore need to be supplemented by expert analysis.

During the course, the lecturer may organize practical tasks involving the comparison of machine translation outputs, the analysis of quality indicators, the identification of semantic, grammatical and terminological inconsistencies, and the performance of post-editing. It is advisable to involve students in discussing discrepancies between automated assessments and

expert judgments, justifying the corrections made, and determining optimal translation strategies in line with the text's communicative purpose. This approach lays the groundwork for developing the skills to critically evaluate machine translation, make informed use of digital translation resources, and develop professional translation competence.

Results Discussion

The enclosed theoretical and analytical review demonstrates that the pedagogical potential of neural machine translation is determined not only by the technical quality of automatically generated texts, but above all by the way in which they are integrated into the learning activities of trainee translators. Using machine translation merely as a means of obtaining a ready-made result does not automatically lead to the development of translation competence. Instead, its use in comparative analysis, error identification, post-editing, and the reasoned evaluation of translation decisions creates opportunities for the development of critical thinking and professional reflection.

Unlike approaches that focus primarily on the speed of automated translation or the general advantages of using artificial intelligence, this study proposes treating machine translation as the subject of a targeted didactic analysis. This approach involves the sequential implementation of five interrelated stages: defining the communicative task, analyzing the machine translation, classifying the identified shortcomings, post-editing, and reflective evaluation of the decisions made.

It is particularly important to distinguish between neural machine translation technologies, large language models, CAT tools, translation memories and terminology databases. Their functional differences determine how they are used in the educational process and necessitate the development of appropriate digital and professional competences.

The teaching scenarios offered demonstrate the possibilities for combining automated tools with the activities of the teacher and the student. At the same time, they are illustrative in nature and cannot be regarded as empirical confirmation of the effectiveness of the proposed approach.

The limitations of the study are primarily related to its theoretical and analytical nature, the lack of experimental testing of the developed learning tasks and assessment criteria, as well as the rapid changes in the technological characteristics of machine translation systems and generative artificial intelligence.

A promising field for further research is the experimental testing of the suggested methodological model within the context of the professional training of trainee translators. It would be useful to compare the learning outcomes of students who undertake traditional translation tasks with those of students who systematically apply comparative analysis of machine translation, post-editing and quality assurance tools. Particular attention should be paid to investigating the impact of such practices on the independence of translation decisions, terminological competence and the ability to critically evaluate automatically generated texts.

Conclusions

The chapter provides a theoretical overview of contemporary approaches to the use of artificial intelligence technologies, in particular neural machine translation in foreign language teaching and the training of future translators. The analysis of academic sources has shown that research interest is gradually shifting from identifying the general capabilities of digital tools to studying their impact on learning perspectives, methods of organizing speaking practice, and the nature of the interaction between the teacher and the learner.

It has been established that the main areas of application for artificial intelligence in foreign language education are the personalization of learning content, the adaptation of tasks to learners' proficiency levels, the simulation of dialogues, the automated analysis of written work, the identification of language mistakes, and the provision of immediate feedback. Intelligent learning systems can utilize data on task performance and learning activities to select appropriate materials and exercises. Dialogue systems, in turn, expand the opportunities for practical use of a foreign language outside the classroom. At the same time, the effectiveness of these tools depends on their alignment with learning objectives, the quality of educational design, and the active participation of students in learning activities.

It has been determined that automated assessment and natural language processing technologies can facilitate the checking of written work, assist in identifying grammatical, lexical and spelling mistakes, and contribute to the organization of formative assessment. Analyzing the results of automated checking enables learners to identify their difficulties and work purposefully to overcome them, whilst allowing teachers to identify common mistakes and adjust their teaching practices. However, automated systems do not always provide an adequate assessment of semantics, the logic of argumentation, the coherence of content, and the originality of expression. It is therefore advisable to use them as a supplement to teacher assessment, rather than as a complete replacement for it.

Particular attention has been paid to the potential of neural machine translation in translation training. Its use makes it possible to compare texts in the source and target languages, analyze methods of conveying meaning, identify inaccuracies, and assess the translated text's appropriateness to the context. An important aspect is the post-editing of machine-translation results, which involves checking and refining the automatically generated text with regard to accuracy of meaning, grammatical correctness, terminological consistency, and stylistic relevance. Such activities provide opportunities to develop translation skills, linguistic sensitivity, critical thinking, and the ability to justify translation decisions. At the same time, machine translation does not ensure the accurate reproduction of contextual, pragmatic, and cultural features of a text, and therefore requires critical analysis on the user’s behalf.

An examination of automated translation technologies – in particular translation memory, terminology management systems and specialized software – has highlighted the importance of technological training for future translators. Mastering these tools should involve not only learning technical procedures, but also the ability to assess the quality of the results obtained, ensure terminological consistency and select appropriate tools depending on the nature of the translation task. Combining machine translation with human editing makes it possible to utilize the benefits of automation whilst maintaining the translator’s responsibility for the final text.

A synthesis of the sources reviewed has made it possible to identify issues requiring further research. The latter include the long-term impact of artificial intelligence technologies on the outcome of foreign language training, their application for the comprehensive development of listening, speaking, reading, writing and translation skills, as well as the impact of automated feedback on learners' independence, motivation and engagement in the learning process. It also remains important to identify the educational conditions under which the combination of various AI tools will ensure not only the simplification of task completion but also a genuine improvement in foreign-language communicative competence.

Artificial intelligence and neural machine translation technologies therefore hold significant potential for improving foreign language learning and translation; however, their use requires a pedagogically substantial approach. Its key conditions include ensuring that digital tools align with learning objectives, taking into account the individual needs of learners, critically reviewing automatically generated results, complying with confidentiality requirements, and maintaining the teacher's leading role. With such an approach, artificial intelligence can serve as a means of expanding language practice, supporting self-education and developing professional translation skills.

Therefore, the educational potential of neural machine translation lies primarily in the possibility of organizing learning activities aimed at the comparative analysis of original and translated texts, the identification and classification of translation errors, and the development of skills in post-editing and the critical assessment of a translation's compliance with requirements relating to content, terminology, style and pragmatics. The pedagogically sound use of NMT involves combining automated tools for assessing translation quality with expert analysis, and developing learners' ability to justify translation decisions and recognize the limitations of digital technologies. It is important, in this context, to maintain the teacher's leading role in organizing the educational process, defining assessment criteria, and ensuring that translation activities align with learning objectives. The suggested didactic approaches lay the foundations for the development of

professional translation competence; however, their effectiveness requires further empirical testing, particularly regarding the impact of the systematic use of CAT tools on translation quality, the development of post-editing skills, and students' ability to independently and critically evaluate translation decisions.

Prospects for further research lie in experimentally testing the effectiveness of artificial intelligence technologies in foreign-language training for future professionals, particularly translators. It would be worthwhile to investigate the impact of various AI tools on the development of foreign-language communicative competence, translation skills, and machine translation post-editing skills. Particular attention should be paid to defining the teacher-training conditions for integrating such technologies into the educational process, their impact on learners' autonomy and critical thinking, and the development of criteria for assessing the quality of task performance with AI. Another important area for further research is studying the means to combine automated feedback with teacher assessment, and the determination of the long-term impact of intelligent tools on the results of foreign language learning.

Author Declarations

Competing Interests. The author declares that there is no conflict of interest that could influence the content, results, or conclusions of the study.

Funding. The study was carried out without any specific external funding.

Declaration of AI Use. No generative artificial intelligence tools were used during the writing of the manuscript.

References

Astapova, T. O., & Izotova, L. I. (2025). Vykorystannia shtuchnoho intelektu u vykladanni inozemnykh mov u zakladakh vyshchoi osvity [The use of artificial intelligence in foreign language teaching in higher education institutions]. *Profesiino-prykladni dydaktyky, (1)*, 34–38. https://doi.org/10.37406/2521-6449/2025-1-5

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, 32*(8), 827–877. https://doi.org/10.1080/09588221.2018.1535508

Bibauw, S., Van den Noortgate, W., François, T., & Desmet, P. (2022). Dialogue systems for language learning: A meta-analysis. *Language Learning & Technology, 26*(1), 1–24. https://doi.org/10.64152/10125/73488

Council of Europe. (2020). *Common European framework of reference for languages: Learning, teaching, assessment – Companion volume*. Council of Europe Publishing. https://www.coe.int/en/web/common-european-framework-reference-languages/cefr-companion-volume-and-its-language-versions

Dörnyei, Z. (2006). Individual differences in second language acquisition. *AILA Review, 19*, 42–68. https://doi.org/10.1075/aila.19.05dor

Feng, L. (2025). Investigating the effects of artificial intelligence-assisted language learning strategies on cognitive load and learning outcomes: A comparative study. *Journal of Educational Computing Research, 62*(8), 1741–1774. https://doi.org/10.1177/07356331241268349

Fryer, L., & Carpenter, R. (2006). Bots as language learning tools. *Language Learning & Technology, 10*(3), 8–14. https://doi.org/10.64152/10125/44068

Godwin-Jones, R. (2024). Distributed agency in language learning and teaching through generative AI. *Language Learning & Technology, 28*(2), 5–30. https://doi.org/10.64152/10125/73570

Herasymova, O. I. (2024). Transformatsiinyi vplyv shtuchnoho intelektu na navchannia inozemnykh mov: Vyklyky ta mozhlyvosti [The transformative impact of artificial intelligence on foreign language learning: Challenges and opportunities]. *Intelekt. Osobystist. Tsyvilizatsiia, 29*(2), 5–12. https://doi.org/10.33274/2079-4835-2024-29-2-5-12

Hrachova, I. Ye., Kolot, L. A., & Dubinina, O. V. (2024). Znachennia shtuchnoho intelektu u vyvchenni inozemnykh mov [The role of artificial intelligence in foreign language learning]. *Pedahohichni nauky: teoriia ta praktyka, (1)*, 21–27. https://doi.org/10.26661/2786-5622-2024-1-03

Huang, W., Hew, K. F., & Fryer, L. K. (2022). Chatbots for language learning – Are they really useful? A systematic review of chatbot-supported language learning. *Journal of Computer Assisted Learning, 38*(1), 237–257. https://doi.org/10.1111/jcal.12610

Kalinichenko, T. M. (2026). Vykorystannia shtuchnoho intelektu u vykladanni inozemnykh mov [The use of artificial intelligence in foreign language teaching]. In Ya. Sazonova (Ed.), *Shtuchnyi intelekt u metodytsi navchannia mov i metodolohii suchasnykh linhvistychnykh doslidzhen* (pp. 61–75). Kharkiv National H. S. Skovoroda University. https://dspace.hnpu.edu.ua/handle/123456789/22019

Karataş, F., Abedi, F. Y., Ozek Gunyel, F., Karadeniz, D., & Kuzgun, Y. (2024). Incorporating AI in foreign language education: An investigation into ChatGPT's effect on foreign language learners. *Education and Information Technologies, 29*, 19343–19366. https://doi.org/10.1007/s10639-024-12574-6

Li, B., Lowell, V. L., Wang, C., & Li, X. (2024). A systematic review of the first year of publications on ChatGPT and language education: Examining research on ChatGPT's use in language learning and teaching. *Computers and Education: Artificial Intelligence, 7*, Article 100266. https://doi.org/10.1016/j.caeai.2024.100266

Li, S. (2016). The construct validity of language aptitude: A meta-analysis. *Studies in Second Language Acquisition, 38*(4), 801–842. https://doi.org/10.1017/S027226311500042X

Liu, K., Su, Y., & Li, D. (2023). How do students perform and perceive parallel corpus use in translation tasks? Evidence from an experimental study. In J. Pan & S. Laviosa (Eds.), *Corpora and translation education: Advances and challenges* (pp. 135–157). Springer Nature Singapore. https://doi.org/10.1007/978-981-99-6589-2_7

Lo, C. K., Yu, P. L. H., Xu, S., Ng, D. T. K., & Jong, M. S.-y. (2024). Exploring the application of ChatGPT in ESL/EFL education and related research issues: A systematic review of empirical studies. *Smart Learning Environments, 11*, Article 50. https://doi.org/10.1186/s40561-024-00342-5

Mahapatra, S. (2024). Impact of ChatGPT on ESL students' academic writing skills: A mixed methods intervention study. *Smart Learning Environments, 11*, Article 9. https://doi.org/10.1186/s40561-024-00295-9

Martyniuk, O. (2024). AI tools in foreign language teaching: Pros and cons of Ukrainian and foreign practices. *Comparative Professional Pedagogy, 14*(2), 65–73. https://doi.org/10.31891/2308-4081/2024-14(2)-7

Miao, F., & Holmes, W. (2023). *Guidance for generative AI in education and research*. UNESCO. https://doi.org/10.54675/EWZM9535

Olkhovska, A. (2017). Testing efficiency of the methodology of teaching students majoring in philology to translate texts using CAT-tools: A pilot study. *Advanced Education, 4*(8), 87–92. https://doi.org/10.20535/2410-8286.91680

Peng, X., Wang, X., & Li, X. (2024). When student translators meet with machine translation: The impacts of machine translation quality and perceived self-efficacy on post-editing performance. *SAGE Open, 14*(4), 1–16. https://doi.org/10.1177/21582440241291624

Pisanski Peterlin, A., & Mikolič Južnič, T. (2026). Addressing MT literacy in a specialized translation class: An experimental study. *Across Languages and Cultures, 27*(1), 1–16. https://doi.org/10.1556/084.2025.01340

Qiao, S., Gu, M. M., & Lu, C. (2025). Artificial intelligence for language learning: A systematic review of its design, theoretical foundations, implementation, and impact. *International Journal of Applied Linguistics*. Advance online publication. https://doi.org/10.1111/ijal.70034

Savchenko, K. Ya., & Holovatenko, T. Yu. (2024). Vykorystannia shtuchnoho intelektu vchyteliamy u pidhotovtsi urokiv anhliiskoi movy u pochatkovykh klasakh [The use of artificial intelligence by teachers in preparing English lessons for primary school]. *Vidkryte osvitnie e-seredovyshche suchasnoho universytetu, (17)*, 124–136. https://doi.org/10.28925/2414-0325.2024.179

Skehan, P. (2009). *Individual differences in second language learning*. Routledge. https://doi.org/10.4324/9780203776436

Su, W., & Li, D. (2023). The effectiveness of translation technology training: A mixed methods study. *Humanities and Social Sciences Communications, 10*, Article 595. https://doi.org/10.1057/s41599-023-02066-2

Weng, X., & Chiu, T. K. F. (2023). Instructional design and learning outcomes of intelligent computer assisted language learning: Systematic review in the field. *Computers and Education: Artificial Intelligence, 4*, Article 100117. https://doi.org/10.1016/j.caeai.2022.100117

Wu, X.-Y. (2024). Artificial intelligence in L2 learning: A meta-analysis of contextual, instructional, and social-emotional moderators. *System, 126*, Article 103498. https://doi.org/10.1016/j.system.2024.103498

Xie, H., Chu, H.-C., Hwang, G.-J., & Wang, C.-C. (2019). Trends and development in technology-enhanced adaptive/personalized learning: A systematic review of journal publications from 2007 to 2017. *Computers & Education, 140*, Article 103599. https://doi.org/10.1016/j.compedu.2019.103599

Yang, L., & Li, R. (2024). ChatGPT for L2 learning: Current status and implications. *System, 124*, Article 103351. https://doi.org/10.1016/j.system.2024.103351

Yang, Z., & Mustafa, H. R. (2022). On postediting of machine translation and workflow for undergraduate translation program in China. *Human Behavior and Emerging Technologies, 2022*, Article 5793054. https://doi.org/10.1155/2022/5793054