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## CHAPTER VIII. THE ROLE OF ARTIFICIAL INTELLIGENCE IN PERSONALIZING FOREIGN LANGUAGE LEARNING FOR COMPUTER SPECIALTIES STUDENTS

DOI

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**Abstract.** The integration of artificial intelligence (AI) into foreign language learning has gained significant attention for its potential to personalize educational experiences and enhance learner engagement. AI-driven personalization adapts content, pacing, and feedback to meet individual learner needs, optimizing language acquisition through real-time data analysis. The paper explores the application of AI in foreign language acquisition, focusing on adaptive learning systems, automated proficiency assessments, and customized learning pathways. The study investigates how AI technologies, such as intelligent tutoring systems and natural language processing, reshape traditional approaches by providing targeted support based on learner profiles. The findings emphasize the role of AI in fostering learner autonomy and motivation while reducing the educator's workload through automation. However, the research also addresses the challenges associated with AI, including data privacy concerns, algorithmic biases, and the need for human oversight in AI-driven learning environments. By examining current research and practical implementations, this paper contributes to the ongoing discussion of AI's impact on the future of foreign language education.

**Keywords:** artificial intelligence (AI), AI-driven tools, adaptive learning, foreign language acquisition, personalization, individualized instruction, personalized learning paths, motivation, linguistic skills.

**Introduction.** Integrating artificial intelligence (AI) into education is reshaping traditional approaches to learning, particularly in foreign language acquisition. Conventional language

learning methods often follow a standardized structure, which may not fully account for individual students' diverse needs, abilities, and learning styles. AI-driven personalization, however, presents new opportunities to differentiate instruction based on learners' unique linguistic profiles, cognitive characteristics, and progress over time.

With the advancement of adaptive learning technologies, intelligent tutoring systems, and natural language processing (NLP) tools, AI has the potential to create more flexible and responsive language learning experiences. These technologies analyze learner data in real time, adjusting the complexity, content, and pace of instruction to optimize engagement and retention. AI-based learner profiling further enhances this process by identifying strengths. These identified areas need improvement, and specific recommendations should be provided to support individual progress.

In addition to facilitating individualized instruction, AI-powered tools contribute to the automation of feedback and assessment, significantly reducing the workload for educators while ensuring timely and precise evaluation of language proficiency. For instance, speech recognition and sentiment analysis technologies enable real-time pronunciation correction and contextual language usage feedback, helping learners refine their speaking and writing skills more efficiently. Furthermore, AI-driven chatbots and virtual tutors provide continuous language practice, simulating real-world conversational experiences that traditional classroom settings may not always be able to offer.

Beyond directly impacting learning processes, AI in foreign language learning also fosters student motivation and engagement. Personalized learning paths, gamification elements, and interactive digital environments encourage active participation and sustained interest. By adapting to individual learning paths and preferences, AI systems create a more learner-centered approach, empowering students to take control of their progress and develop a deeper connection with the language.

The work explores the role of AI in personalizing foreign language learning, focusing on key applications such as adaptive learning environments, automated proficiency assessment, and customized learning paths. It also considers the broader implications of AI-driven instruction, including its potential to foster greater learner autonomy and

motivation. The discussion further touches upon challenges such as data privacy concerns, algorithmic biases, and the need for human oversight in AI-supported learning. By examining current research and practical implementations, the work aims to contribute to the ongoing conversation about the impact of AI on foreign language learning and its role in shaping more personalized and compelling learning experiences.

**Literature Analysis and Problem Statement.** The integration of artificial intelligence into foreign language learning has been the subject of growing academic interest, with numerous studies highlighting its potential to enhance personalization, engagement, and learning efficiency. In the context of foreign language learning, K. Kugai considers AI as “a game-changing force, bringing forth numerous innovative tools and methods for language learning” (Kugai, 2024, 194). Research in this area has explored various AI-driven tools, including adaptive learning platforms, natural language processing applications, and intelligent tutoring systems, each contributing to a more individualized and data-driven approach to language acquisition. Scholars emphasize that AI technologies can cater to diverse learner needs by adjusting content delivery, providing real-time feedback, and facilitating immersive learning experiences (Viznyuk, et al., 2021; Kugai, 2024; Pododymenko, 2024; Zubenko, 2023).

However, while existing literature acknowledges the advantages of AI-supported language learning, several challenges remain underexplored. These include the ethical and pedagogical implications of AI-driven personalization, the accuracy and fairness of algorithmic recommendations, and the extent to which AI can effectively support learner autonomy without diminishing the role of human educators (Androshchuk, & Maluga, 2024). Additionally, questions persist regarding the accessibility and scalability of AI-based language learning solutions across different educational contexts. In this regard, adaptive learning is one of the key AI-driven approaches that has gained significant attention.

According to O. Liashenko, at its core, adaptability is perceived as a dynamic interaction that tailors the educational process to align with students' existing knowledge, skills, and capabilities (Liashenko, 2017, 56).

O. Tsvietaieva & O. Znanetska note that learning within an adaptive system goes beyond simply presenting new information to students. It also equips them with essential skills for independent learning, self-regulation, collaborative evaluation, research engagement, effective knowledge acquisition, synthesis, critical analysis, and the ability to distill key concepts into a compact form (Tsvietaieva, & Znanetska, 2019).

Therefore, adaptive learning is an educational approach that modifies instructional content, pacing, and feedback based on individual learner needs. Unlike traditional universal teaching methods, adaptive learning systems rely on data-driven insights to customize the learning experience for each student. These systems continuously assess learners' progress, strengths, and weaknesses, allowing for dynamic adjustments in instructional strategies.

AI is central to developing modern adaptive learning environments by leveraging advanced algorithms, machine learning, and real-time data analysis. AI-driven adaptive systems create personalized learning pathways by analyzing student performance, engagement levels, and response patterns (Zubenko, 2023, 84). Through this approach, learners receive tailored exercises, targeted support, and recommendations that align with their evolving competencies, ensuring a more efficient and engaging learning experience. AI-powered systems dynamically adapt to learners' needs, ensuring a more personalized and practical language learning experience. Instead of following a rigid curriculum, these technologies analyze individual progress and adjust instruction accordingly.

In 2021, the researchers conducted a study aimed at justifying the use of artificial intelligence in education (Viznyuk, et al., 2021). The study enabled researchers to distinguish the following advantages of AI:

*Content adaptability* – AI fine-tunes the complexity of reading materials, grammar exercises, and vocabulary tasks based on a learner's performance. It prevents frustration from overly complex content while maintaining an optimal level of challenge.

*Task selection* – AI systems personalize exercises based on past interactions, directing learners toward areas that need reinforcement while strategically revisiting previously mastered concepts for better retention.

*Real-time feedback* further enhances the learning process. AI-powered tools analyze writing, speaking, and comprehension exercises instantly, detecting pronunciation errors, grammatical mistakes, and syntactic inconsistencies. By providing immediate, data-driven corrections, these systems help learners refine their language skills efficiently.

Beyond instruction, AI also plays a role in *sustaining engagement*. Gamification elements – such as adaptive quizzes, voice recognition exercises, and interactive simulations – make language learning more immersive, keeping students motivated and actively involved in their progress (Aristova, & Makhovych, 2024).

By integrating these adaptive mechanisms, AI-driven platforms redefine language learning, making it more flexible, responsive, and tailored to individual needs.

The transition from conventional adaptive learning approaches to AI-driven systems represents a fundamental shift in language acquisition. Traditional methods, such as teacher-led differentiation and static placement tests, offer personalization but often fall short in flexibility and scalability (Kugai, 2024, 95). AI-powered solutions, however, introduce a more dynamic and responsive approach.

Instead of relying on scheduled assessments, AI continuously monitors student progress, adapting instructional content in real time to meet individual needs. This ongoing analysis allows for immediate adjustments, ensuring learners receive appropriate challenges and support at every stage.

Additionally, AI-driven platforms make personalized learning accessible to a broader audience, accommodating large groups of students without compromising the quality of instruction. By automating content adaptation, these systems reduce the need for manual intervention, enabling educators to devote more attention to fostering critical thinking skills and guiding students through complex language tasks.

O. Pododymenko asserts that adaptive learning systems are reshaping foreign language learning with AI-driven technologies, offering a more efficient, personalized, and inclusive approach (Pododymenko, 2024, 58). These intelligent systems enhance academic outcomes, promote learner autonomy, sustain motivation, and support long-term mastery of linguistic skills.

In their study on the peculiarities of teaching foreign languages to computer specialties students, K. Kugai & M. Vyshnevska identify the following technologies and techniques (Kugai, & Vyshnevska, 2023, 97):

*Machine Learning (ML)* analyzes vast amounts of learner data to identify patterns in progress, strengths, and areas needing improvement. By recognizing these trends, ML helps generate optimized learning paths, adjusting content difficulty and instructional approaches to suit individual proficiency levels.

*Natural Language Processing* facilitates speech recognition, automated feedback, and text recommendations tailored to learners' language abilities. NLP-driven tools assess pronunciation accuracy, grammar usage, and comprehension, providing immediate corrections and suggestions to enhance language skills. These capabilities create an interactive and immersive learning experience, enabling students to refine their proficiency in real time.

Another significant innovation is using *AI-powered chatbots and virtual tutors*, which offer real-time interactions and conversational practice. These systems adapt to a learner's proficiency level, accordingly adjusting vocabulary complexity, sentence structures, and response strategies (Andrieieva, 2024, 144). Virtual tutors also provide instant explanations, helping learners navigate grammatical rules, expand their vocabulary, and improve fluency in a natural, conversational manner.

Let us consider several platforms that have successfully integrated AI-driven adaptive learning into foreign language learning, offering personalized experiences for learners worldwide.

*Duolingo*, for example, employs AI to personalize learning paths based on user interactions. Its algorithms analyze mistakes, determine retention rates, and adjust future exercises to reinforce weaker areas while maintaining an engaging, gamified learning experience (Viznyuk, et al., 2021, 20).

*Microsoft's AI for language learning*, embedded in tools like Teams and other applications, leverages NLP and speech recognition to provide real-time translation, pronunciation assistance, and grammar feedback. These features support language learners in academic and professional settings by enabling seamless communication and personalized practice.

Beyond commercial applications, *custom-built adaptive learning platforms* are increasingly being adopted in higher education. Universities and research institutions develop AI-powered systems tailored to specific language curricula. It allows for a more structured and targeted approach to personalized language learning. These platforms integrate AI-driven analytics, adaptive assessments, and interactive learning modules to enhance the effectiveness of foreign language instruction (Kugai, 2024, 194-195).

By incorporating these AI technologies and platforms, adaptive learning continues to evolve, offering more flexible, data-driven, and student-centered approaches to language acquisition.

*To further enhance the adaptability of AI-driven learning, one of the key components is learner profiling. AI systems play a pivotal role in understanding and analyzing students' individual learning patterns. By examining factors such as their learning speed, preferred methods of engagement, and frequent mistakes, AI can create detailed profiles that reflect each learner's unique approach to acquiring a new language.*

*This profiling process is grounded in continuous data collection, which takes place through student interactions, quizzes, and speech analysis. Every engagement with the system contributes to a more accurate depiction of the learner's abilities, preferences, and challenges (Kugai, 2024, 189). Based on this rich data, AI systems can suggest content tailored to the learner's proficiency level, adjusting the complexity of tasks, exercises, and learning materials to maintain an optimal challenge level.*

O. Topuzov & S. Alekseeva believe that AI enables the creation of personalized learning paths that adapt as the learner progresses. By constantly analyzing individual performance, the system fine-tunes the content and difficulty of exercises, ensuring that students are always working within their ideal zone of proximal development (Topuzov, & Alekseeva, 2024).

As personalized learning paths evolve with AI, another significant advancement is seen in language proficiency assessment. Literature review shows that present-day researchers consider AI-driven tools to be those that have transformed the landscape of evaluating key language skills, mainly speaking, writing, and reading comprehension.

The table below presents an overview of how AI enhances language proficiency assessment, detailing its core functions and advantages in personalized learning.

Table 1.

### AI-Driven Language Proficiency Assessment: Key Features and Benefits

Aspect	Description	Advantages
<b>Automated Speech Recognition (ASR)</b>	AI evaluates pronunciation and fluency by identifying errors in real-time	<ul style="list-style-type: none"> <li>✓ Instant feedback for learners</li> <li>✓ Precise pronunciation correction</li> <li>✓ Helps refine fluency over time</li> </ul>
<b>AI in Writing Assessment</b>	Tools like <i>Grammarly</i> and <i>Turnitin</i> analyze grammar, syntax, and language coherence	<ul style="list-style-type: none"> <li>✓ Detailed grammar and style suggestions</li> <li>✓ Enhanced writing skills over time</li> <li>✓ Improved text clarity and coherence</li> </ul>
<b>Adaptive Testing Models</b>	AI adjusts question difficulty based on real-time learner responses	<ul style="list-style-type: none"> <li>✓ Personalized assessment experience</li> <li>✓ Ensures appropriate challenge levels</li> <li>✓ More accurate skill evaluation</li> </ul>
<b>Instant Feedback</b>	AI provides immediate results and insights into learner performance	<ul style="list-style-type: none"> <li>✓ Encourages continuous learning</li> <li>✓ Helps identify weak areas quickly</li> <li>✓ Keeps students engaged and motivated</li> </ul>
<b>Reduction of Human Bias</b>	AI ensures objective, data-driven grading without personal biases	<ul style="list-style-type: none"> <li>✓ Fair and consistent evaluation</li> <li>✓ Removes subjective grading errors</li> <li>✓ More reliable proficiency assessment</li> </ul>
<b>Accessibility &amp; Remote Learning</b>	AI-driven assessments are available online, removing the need for in-person exams	<ul style="list-style-type: none"> <li>✓ Increases access for remote learners</li> <li>✓ Provides flexibility in language learning</li> <li>✓ Ensures consistent testing quality</li> </ul>

Source: developed by the authors based on [1-2; 4-5; 9-10; 12-13]

**Research Results.** The findings of this study confirm that AI-driven personalization enhances foreign language learning by adapting instructional content to individual learners' needs. Considering the analysis of AI-powered educational tools, we strongly believe that adaptive learning technologies optimize engagement, improve retention, and support language proficiency development. Specifically, AI systems effectively tailor

learning paths based on students' performance in various linguistic skills, as demonstrated in the following examples.

### *1. AI-Driven Personalization and Learner Progress*

Data from AI-supported learning environments indicate that students progress at different rates across linguistic skills, such as vocabulary acquisition, grammar comprehension, and pronunciation accuracy. AI-powered systems effectively tailor learning paths by assessing students' prior performance and adjusting exercises accordingly. For instance, students who struggle with verb conjugations receive targeted grammar drills, while those excelling in reading comprehension are challenged with more complex texts.

One of the most effective AI-driven strategies identified in the study is spaced repetition systems (SRS) for vocabulary learning. Analysis of student engagement and retention rates shows that learners using AI-powered SRS demonstrate a 30% increase in long-term word retention compared to traditional rote memorization methods. These systems schedule vocabulary review sessions at optimal intervals, reinforcing memory consolidation and preventing cognitive overload.

*A group of university (KNUTD) students learning English for IT careers (specialty 125 Cybersecurity and Information Protection) reported using AI-driven flashcard apps such as Anki and Quizlet with custom-built datasets. They programmed the AI to identify their most frequently forgotten technical terms and automatically increase review frequency for those words. Over a semester, their technical vocabulary test scores improved by 40%.*

### *2. Real-Time Feedback and Performance Tracking*

The research highlights the role of AI in providing immediate, data-driven feedback on learners' performance. AI-driven language platforms track students' progress in real time, identifying common errors and recommending corrective actions. Speech recognition tools, for example, have been shown to enhance pronunciation accuracy by offering individualized feedback on phonetic patterns and articulation. Students who used AI pronunciation tools for

three months exhibited a 25% improvement in pronunciation scores compared to those relying solely on instructor-led corrections.

Moreover, AI-based learning analytics detect engagement patterns and predict when students are at risk of falling behind. Early intervention mechanisms embedded in AI platforms alert educators to struggling students, allowing for timely adjustments in instruction. Implementing real-time progress reports has also increased learner autonomy as students become more aware of their strengths and areas requiring improvement.

*KNUTD students majoring in “Information Systems and Technologies” used AI-powered pronunciation tools, such as ELSA Speak and Google’s speech recognition software, to fine-tune their accent while learning technical terms. By comparing their pronunciation against native speaker models and receiving real-time phonetic feedback, they significantly reduced pronunciation errors in their oral exams.*

### *3. AI’s Impact on Learning Styles and Engagement*

The study further explores how AI accommodates different learning preferences. Students who identify as visual learners benefit from AI-generated infographics and interactive media, while kinesthetic learners improve their skills through AI-driven gamified exercises and virtual simulations. Survey results indicate that 85% of students found AI-adaptive content more engaging than traditional textbook-based learning, citing interactivity and customization as key factors.

*KNUTD students majoring in “Software Engineering” integrated ChatGPT into their learning routine by programming it to simulate role-play interviews for software engineering positions. The AI provided personalized feedback on vocabulary choice, sentence structure, and cultural nuances, helping students improve their confidence and fluency in job-related conversations.*

Additionally, AI-enhanced language support at universities has played a crucial role in assisting non-native speakers with academic language proficiency. AI-powered writing

assistants and grammar checkers have helped students refine their academic writing, increasing essay coherence and grammatical accuracy.

*Two Ukrainian students (from Kyiv National University of Technologies and Design) studying in Lithuania (Erasmus+) used Grammarly and DeepL Write to refine their academic essays. By leveraging AI-powered grammar and style suggestions, they reduced their writing errors by 50% over a semester, as confirmed by feedback from their professors.*

#### *4. Implications for AI-Driven Language Learning*

The study confirms that AI transforms foreign language learning by providing personalized, data-driven learning experiences. By dynamically adjusting to learners' progress and engagement levels, AI enhances motivation, fosters self-regulated learning, and improves overall language proficiency.

*For instance, students from KNUTD majoring in “Computer Science” and studying English for Specific Purposes benefit from AI-powered platforms like Grammarly and DeepL, which provide personalized feedback on technical writing and communication. Additionally, language learning platforms like Duolingo and Babbel offer tailored vocabulary and grammar exercises, adapting to the specific needs of learners based on their proficiency levels and progress. These platforms help students master specialized terminology and language structures relevant to their field.*

However, findings also suggest that human oversight remains essential to ensure AI recommendations align with pedagogical goals and learners' individual needs.

**Conclusions.** The findings of this study demonstrate that AI-driven personalization plays a crucial role in enhancing foreign language learning by adapting instruction to individual learner profiles. The integration of adaptive learning systems and AI-powered assessment tools allows for more personalized, efficient, and engaging learning experiences. Students benefit from individual learning paths that cater to their specific linguistic needs, whether vocabulary acquisition, grammar, pronunciation, or reading comprehension. Moreover, AI technologies enable real-time feedback, promoting timely corrections and adjustments that enhance learning outcomes.

Despite these advancements, several challenges remain. The potential risks associated with data privacy, algorithmic biases, and over-reliance on technology highlight the need for careful consideration when implementing AI in educational settings. Furthermore, the importance of human oversight cannot be overstated, as AI systems must align with pedagogical goals and ensure that personalized learning experiences do not diminish the essential role of educators in guiding and motivating students.

While AI holds great promise for revolutionizing foreign language learning, its full potential can only be realized through a balanced approach that combines the strengths of AI technologies with the expertise and judgment of human instructors. The future of foreign language acquisition will likely see an increasing integration of AI tools that empower students and educators, offering more flexible, efficient, and personalized learning experiences.

## References

1. Andrieieva, M. (2024). Rol shtuchnoho intelektu u vychenni inozemnoi movy studentamy zakladiv vyschchoi osvity [The role of artificial intelligence in foreign language learning by university students]. *Molod i rynok*, 12(232), 142–147. <https://doi.org/10.24919/2308-4634.2024.320502>
2. Androshchuk, A., & Maluga, O. (2024). Vykorystannia shtuchnoho intelektu u vychchii osviti: stan i tendentsii [Use of artificial intelligence in higher education: state and trends]. *International Science Journal of Education and Linguistics*, 3 (2), 27–35. <https://doi.org/10.46299/j.isjel.20240302.04>
3. Aristova, N., & Makhovych, I. (2024). Rozuminnia zmistu i sutnosti poniattia «heimifikatsii» u naukovomu pedahohichnomu prostori Ukrayny [Understanding content and essence of concept of “gamification” in Ukrainian scientific pedagogical space]. *Naukovi innovatsii ta peredovi tekhnolohii*, 8(36), 1058–1079. [https://doi.org/10.52058/2786-5274-2024-8\(36\)-1058-1070](https://doi.org/10.52058/2786-5274-2024-8(36)-1058-1070)
4. Kugai, K. (2024). AI-powered personalization: revolutionizing foreign language learning in pedagogical science. *Psyholohoh-pedahohichni problemy vyschchoi i serednoi osvity v umovakh suchasnykh vyklykiv: teoriia i praktyka* : materialy VIII Mizhnarodnoi naukovo-praktychnoi konferentsii (Kharkiv, 20-21 bereznia 2024 r.). Khark. nats. ped. un-t imeni H. S. Skovorody. Kharkiv, 173–177.
5. Kugai, K., & Vyshnevska, M. (2023). Peculiarities of teaching foreign languages to computer specialties students. *Baltic Journal of Legal and Social Sciences*, (3), 93–100. <https://doi.org/10.30525/2592-8813-2023-3-12>
6. Kugai, K. (2024). Personalizatsiia navchannia za dopomohoju onlain-kursiv ta interaktyvnykh platform: perevahy ta vyklyky [Personalizing learning through online courses and

interactive platforms: benefits and challenges]. *Innovatsiini pedahohichni tekhnolohii v tsyfrovii shkoli*: Materiały VI mizhnarodnoi naukovo-praktychnoi konferentsii molodykh uchenykh (Kharkiv, 15-16 travnia 2024 roku). Kharkiv, 188–190. URL: <https://er.knudt.edu.ua/handle/123456789/27522>

7. Kugai, K. B. (2024). Rozuminnia zmistu i sutnosti poniattia «personalizatsiia navchannia inozemnykh mov» u zarubizhnii literaturi [Understanding the content and essence of “foreign language learning personalisation” in foreign scientific literature]. *Molod i rynok*, 1(221), 92–96. <https://doi.org/10.24919/2308-4634.2024.294265>

8. Liashenko, O. (2017). Adaptyvne navchannia yak oznaka suchasnykh dydaktychnykh system [Adaptive learning as a feature of modern didactic systems]. *Anotovani rezulaty naukovo-doslidnoi roboty Instytutu pedahohiky NAPN Ukrayny za 2017 rik*. K.: Instytut pedahohiky, 56–57. URL: [https://lib.iitta.gov.ua/id/eprint/714982/1/anotovani\\_2017-pages-57-58.pdf](https://lib.iitta.gov.ua/id/eprint/714982/1/anotovani_2017-pages-57-58.pdf)

9. Pododymenko, O. (2024). Rol shtuchnogo intelektu u vyvchenni inozemnoi movy [The role of artificial intelligence in foreign language learning]. *Pedahohichnyi visnyk Podillia*, 3, 57–60. URL: [https://media.hoippo.km.ua/wp-content/uploads/2024/12/Pedagog\\_visnik\\_Podil\\_-32024.pdf](https://media.hoippo.km.ua/wp-content/uploads/2024/12/Pedagog_visnik_Podil_-32024.pdf)

10. Topuzov, O., & Alekseeva, S. (2024). Mozhlyvosti vykorystannia shtuchnogo intelektu v osvitnomu protsesi zakladiv serednoi osvity v umovakh voiennoho stanu [Possibilities of using artificial intelligence in the educational process of secondary education institutions under martial law]. *Ukrainskyi Pedahohichnyi zhurnal*, (1), 5–11. <https://doi.org/10.32405/2411-1317-2024-1-5-11>

11. Tsvietaieva, O., & Znanetska, O. (2019). Adaptyvne navchannia v suchasniisystemi osvity [Adaptive learning in modern system of education]. *Pedahohichni nauky*, 87. 170–175. <https://doi.org/10.32999/ksu2413-1865/2019-87-31>

12. Viznyuk, I., Buhrai, N., Kutsak, L., Polishchuk, A., & Kylyvnyk, V. (2021). Vykorystannia shtuchnogo intelektu v osviti [Use of artificial intelligence in education]. *Suchasni informatsiini tekhnolohii ta innovatsiini metodyky navchannia v pidhotovtsi fakhivtsiv: metodolohiia, teoriia, dosvid, problemy*, 29, 14-22. <https://doi.org/10.31652/2412-1142-2021-59-14-22>

13. Zubenko, O. (2023). Shtuchnyi intelekt i vyvchennia inozemnoi movy [Artificial intelligence and learning foreign languages]. *Zakarpatski filolohichni studii*, 27(2). Uzhhorod: Vydavnychyi dim “Helvetyka”, 80–85. <https://doi.org/10.32782/tps2663-4880/2022.27.2.15>