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Artificial intelligence technologies in teaching and learning foreign languages: linguodidactic approach

Tecnologías de inteligencia artificial en la enseñanza y aprendizaje de lenguas extranjeras: enfoque linguodidáctico

Jukachuweetsenainjee jaa'in atüjalaa julü'u ekirajaa jee atüjaa anüikii naatajatü:
Jünakialu'ujee jütüjia apansaajia pütchi anakaralu'u.

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Abstract

This study examines the linguodidactic potential of AI technologies in teaching and learning Russian as a foreign language (RFL) focusing on their theoretical foundations, practical applications, and pedagogical implications. The research employs a systematic approach, integrating the PRISMA methodology for literature review, theoretical analysis, and empirical methods. From the linguodidactic point of view the authors have identified, analyzed, and described the following AI-based tools and technologies: adaptive learning and personalized learning materials, machine translation tools, text writing AI assistants, chatbots, AI-based software platforms and applications for language learning, intelligent learning systems, intelligent virtual reality. Finally, they come to the conclusion that these AI technologies enhance RFL teaching by enabling personalized, adaptive, and immersive learning. However, the successful integration of these technologies requires educators to develop AI literacy and critically assess ethical and practical challenges. AI's role in sustaining Russian as a global language is pivotal, particularly in non-native environments.

Keywords: Artificial Intelligence (AI), Russian as a foreign language (RFL) linguodidactics.

Resumen

Este estudio examina el potencial lingüodidáctico de las tecnologías de IA en la enseñanza y el aprendizaje del ruso como lengua extranjera (RLE) centrándose en sus fundamentos teóricos, aplicaciones prácticas e implicaciones pedagógicas. La investigación emplea un enfoque sistemático, integrando la metodología PRISMA para la revisión de la literatura, el análisis teórico y los métodos empíricos. Desde el punto de vista lingüodidáctico, los autores han identificado, analizado y descrito las siguientes herramientas y tecnologías basadas en IA: aprendizaje adaptativo y materiales de aprendizaje personalizados, herramientas de traducción automática, asistentes de IA para la redacción de textos, chatbots, plataformas de software basadas en IA y aplicaciones para el aprendizaje de idiomas, sistemas de aprendizaje inteligentes, realidad virtual inteligente. Finalmente, llegan a la conclusión de que estas tecnologías de IA mejoran la enseñanza de RLE al permitir un aprendizaje personalizado, adaptativo e inmersivo. Sin embargo, la integración exitosa de estas tecnologías requiere que los educadores desarrollen conocimientos de IA y evalúen críticamente los desafíos éticos y prácticos. El papel de la IA en el mantenimiento del ruso como idioma global es fundamental, especialmente en entornos no nativos.

Palabras clave: Inteligencia Artificial (IA), Ruso como Lengua Extranjera (RLE) Linguodidáctica.

Palitpüchiru'u

A'yatawaakat tüü erajaasü jütsüin jütüjia apansajaa pütchi anakaralu'u kachuweeralujutu ipalu'u jünain jikirajia jümaa jütüjia nanüiki ruusoirua maka jaa'in naata anüikii (RNA), eere jülüjain naa'in jüpütschin jee jikirajiapalaa. A'yatawaakaa ounajitsü wanee a'yataayapala kakotchajülesü, eere juuupatüin jukua'ipa a'yataawapülee KOMOLUSEYUUSU jüpüla asanawaa ashajuushikat, jülüjaa aa'in pütchikaa jee jü'yataayalu'u atuma'alaa. Jünanjialu'ujee jütsüin jütüjia apansajaa pütchi, na ka'yataalekan nantüipa anain, nasanaipa jee nakuipa achiki tü aküjüna achiki joolu'u jee jukachuweetsenain jüsalanainjee jipiapale ekirajawaa JE: atüjaa alate'eruushi jee juwahunkeerajia atüjalaapa waneewoikua, jukua'ipa jülate'eria jüpütschin wajaachonlu'u, jünüliamaajatü JE jüpüla jüshajiapala karalouta, achatijia, jüpülapüle anaajalee jukua'ipamaajatü JE jee jüpülapülee anaajale jütüjiajülee anüikiirua, jukua'ipa shiimainsükat jaa'in atüjülee rouyalujatkat. Jaakajaayamüin mapa, kanüikiru'usu jiain tü kachuweeralujutka julu'u JE anaate'erüin jikirajia RAN ja'ujee naapüin atüjia wane'ewoikua, alaturuushi jee julu'ushaana. Anuupaje'e jia, jüpüla anatatawalain akolochojiakat, cheujaasü nayain na ekirajuliikana amuloujuin jütüla tü JE nasakiiain anain juchuntaale wayuwaa. Jukua'ipa tü JE jünain ayatüinjatüin jikirajünüin ruusokat maka jaa'in wanee anüikii müleushana cheujaasü, jialeaja jüpüla na nnojoliikana yaaje'ewoliin.

Pütchi katsüinsükat: Jaa'in Atüjalaa (JA), Ruuso maka jaa'in Anüikii Naatajatü (RAN) Jütsüin jütüjia apansajaa pütchi.

Introduction

The widespread adoption of AI technologies, as well as the incessant public interest in them, has led to the fact that today we are not only witnessing, but also participating in those transformations where the digital age and its new technologies, including the latest advances in AI and big data processing, have an

unprecedented impact on various spheres of human activity, including pedagogy in general, as well as educational approaches and technologies related to teaching and learning foreign languages.

The analysis of the scientific literature on the subject of the use of AI technologies in teaching and learning a foreign language represented by theoretical, descriptive, observational, analytical, statistical and experimental scientific publications in recent years demonstrates the growing interest of scientists and researchers, an increase in the number of published works on the use of AI technologies in the educational process, as well as the versatility and multipolarity of assessments and interpretations of the prospects for further development of the studied phenomena, This is confirmed by the unanimous opinion of a number of scientists [Chen et al., 2020].

Today, the scientific community's attention is focused on the following key aspects:

- 1) theoretical understanding of the role and place of digitalization and AI technologies in human life in general and in education as one of its areas [Baryshnikov, 2023; Baryshnikov et al., 2024; Zawacki-Richter et al., 2018];
- 2) research on the use and impact of AI technologies in teaching/learning various languages as foreign languages [Lyutova et al., 2024; Sysoyev et al., 2024; Liang et al., 2023; Nga, 2023; Ruzikulov, 2024];
- 3) studying the results of the implementation of certain AI technologies into the educational process of teaching foreign languages [Jeon, 2022; Ji et al., 2024; Liu et al., 2024];
- 4) assessment of the positive and negative effects, advantages and disadvantages, as well as the ethical issues of using AI in the educational process in general and in teaching foreign languages in particular [Divekar et al., 2021; Kolegova et al., 2024; Rebolledo Font de la Vall et al., 2023], as well as further prospects, opportunities, challenges, risks and dangers of the development, implementation and dissemination of these technologies [Baker et al., 2019; Warschauer et al., 2024; Yang, 2024].

Nevertheless, we note the fact that most scientists agree that AI is currently a tool for improving the quality of education, and a significant increase in the investment in AI has led to the creation of electronic resources with great educational potential due to the development, implementation and widespread dissemination of AI technologies such as machine learning, neural networks, natural language processing and advanced image processing.

Modern linguodidactics is expected to take into account the fact that AI technologies have become an integral part of our lives, as well as the fact that the modern field of language learning is no longer limited to the traditional or formal educational environment.

In this regard, foreign language teachers face a difficult task of introducing various types of technologies into the academic process in order to meet the needs of their students. In order to keep up with the digital-savvy students and involve them in the

learning process, it is necessary to use modern AI technologies when learning a foreign language. And it is up to the individual educator and the academic community as a whole to determine which of these technologies can have a positive impact on the educational process, assess their potential and take advantage of all the benefits they offer. In addition, they should assess the potential risks and dangers that these technologies pose. This is not an easy task, since the research on the practical application of AI with certain pedagogical goals is still quite insufficient and does not demonstrate fully convincing results, which is often due to the objective time constraints associated with the novelty and innovativeness of the use of these technologies.

In addition, teachers should have a positive attitude towards the use of these technologies in foreign language classes and possess appropriate subject, technological and pedagogical knowledge in order to motivate students to use these technologies in learning a foreign language.

For the above reasons, the aim of this research is to study and analyze the linguodidactic peculiarities of the use of various AI technologies in teaching and learning a foreign language (using the example of Russian as a foreign language (RFL)), based on advanced theoretical and practical research on the use of modern AI technologies in the educational process.

It is necessary to note that according to the results of the survey “Russian Language Index in the Modern World” prepared in 2024 by the experts of the Pushkin State Institute of the Russian Language, Russian continues to hold the fifth place in the world in the index of global competitiveness of languages. In addition, it ranks seventh in terms of prevalence being one of the twelve leading languages of the planet [Emelianenko, 2024].

Russian is spoken or studied in 66 countries. According to the experts of the reference publication “Ethnologue: Languages of the World” [Ethnologue, 2025], in 2025 more than 253 million people worldwide speak Russian. In terms of popularity, it gives way only to English, Spanish, French, Chinese, Hindi (the latter two occupy high rating positions due to the population in China and India) and German.

Today, Russian is one of the six official languages of the United Nations [United Nations], and according to experts [Statista, 2024], in 2024 it became the fourth most widely used language on the Internet.

It is worth mentioning that the Russian language has adapted perfectly to the digital environment and is one of the most in demand for creating digital content (seventh in the ranking of localization of applications; third in popularity on digital platforms; second in the number of services on the Internet in Russian; first place (along with English, Portuguese and Spanish languages) - among the most popular digital applications) [Emelianenko, 2024]. Moreover, AI actively and extensively communicates with people in Russian today.

The most unstable position of the Russian language is its being seventh in terms of prevalence. This parameter is weakened by the negative trend that the number of

Russian speakers has decreased from 257 million in 2020 to (according to various estimates) 255-253 million in 2024. Nevertheless, due to the foreign policy efforts undertaken in accordance with the developed by order of the President of the Russian Federation V.V. Putin comprehensive state program of supporting and promoting the Russian language abroad there is observed a positive tendency: Russian is becoming more popular in the BRICS countries (Brazil, Russia, India, China, South Africa, the United Arab Emirates, Iran, Ethiopia, Egypt and Indonesia), as well as in the official BRICS partner countries (Belarus, Cuba, Bolivia), Kazakhstan, Malaysia, Thailand, Uganda, Uzbekistan, Nigeria) and in several African countries. The above-mentioned State Program is a strategic planning document in the field of promoting the Russian language, expanding the Russian-speaking cultural, educational and information space.

Undoubtedly, one of the dominant aspects of supporting and promoting the Russian language abroad, as well as ensuring its functioning within the country as the language of the international labor market, is the active development of a special section of linguodidactics - "Russian as a foreign language" (RFL) [Baryshnikov, 2002] which studies the Russian language in order to develop methods, techniques, and technologies for teaching it to native speakers of other languages, living in the territories where Russian is not a language of communication or is not widely spoken.

It should be noted that teaching (RFL) in such a non-linguistic environment has a number of peculiarities: limited language environment; cultural barriers; lack of motivation; influence of a native language; lack of educational materials. To overcome the above difficulties in the context of the formation of an innovative educational paradigm, a special transformative role today is assigned to digital technologies, and those developed on the basis of AI can be considered of prior importance in this regard.

Methodology and methods

The present study uses a comprehensive research procedure that integrates the PRISMA methodology (*Preferred Reporting Items for Systematic reviews and Meta-Analyses*), theoretical methods of scientific research (induction, deduction, analysis, synthesis), empirical methods of scientific research including observation, description, experiment, document research, and the method of content analysis. PRISMA is a generally accepted methodology for conducting systematic reviews in various fields, including education and language learning. It includes a systematic and detailed step-by-step process for identifying, selecting, and critically evaluating relevant researches on a given topic.

This study uses a thematic restriction on the use and analysis of the theoretical, descriptive, observational, analytical, statistical and experimental scientific publications of recent years which focus on the use of modern AI technologies in the process of language teaching and learning in order to identify the theoretically sound and empirically proven results that have the potential for the development of the linguodidactic theory and application in the practice of teaching foreign languages.

The study uses only scientific literature in Russian and English which is available in the public domain. In order to find and identify the exclusively relevant materials on the subject under consideration, the search in the titles, annotations and keywords of articles was carried out using special terms and parameters to identify the studies that meet the established criteria for inclusion and exclusion. The following search queries formulated on the basis of the stated topic were sent to the search engines Yandex and Google: *"artificial intelligence in education and language learning"*, *"artificial intelligence technologies in teaching and learning foreign languages"*, *"artificial intelligence/AI technologies in teaching and learning foreign languages"*.

The identified materials were checked and selected based on their compliance with the aim of the study and the criterion of the scientific relevance, i.e. journalistic, popular science articles, as well as various kinds of quasi-scientific materials were excluded. The selected studies were further studied through the application of content analysis, classified and summarized to obtain relevant data and conclusions.

The empirical research methods (observation, description, and document research) were applied during the experimental implementation of various AI technologies in the educational process of teaching and learning (RFL) at Pyatigorsk State University (Russia) while working with international students.

Results and Discussion

The importance of learning with the use of AI is growing rapidly in all areas of the educational process, but this article makes an accent on the use of AI in teaching and learning RFL. Due to the latest advances in natural language processing, advances in deep and network learning, as well as the growth of technological capabilities for processing large amounts of data, modern AI is widely used in the study of languages, foreign languages and RFL, in particular. The transition from the computer-based foreign language teaching to teaching a foreign language using AI computer technologies was evolutionarily inevitable and led to significant changes in the qualitative characteristics of students' interaction with a computer and the features of language acquisition.

The expected benefits of such learning are conditioned by the fact that AI is able to make digital language learning truly individualized for each student which, in its turn, can lead to saving time and costs, reduction and even complete elimination of student frustration and dissatisfaction that may arise when completing assignments without the immediate teacher's feedback. All this is made possible by processing large amounts of data and using machine learning algorithms that adapt to student behavior in real time calculating the strengths and weaknesses of each student and creating fully personalized educational content consisting of a specific set of educational materials for each lesson and course. Moreover, and this is no less important, the algorithm is able to learn from both individual and collective behavior of students which further increases its predictive potential.

Other expected advantages of learning a foreign language using AI computer technologies include the following: independent pace and dynamics of student learning; instant feedback as a powerful motivating factor; individual repetition and revision of topics and focusing on those activities in which students show lower results; prompt and objective assessment of student progress; better understanding of student preferences and learning strategies; predicting student performance with a high degree of probabilistic accuracy; a quick and independent assessment of learning tools (educational texts, lectures, assignments, tests, etc.).

The analysis made it possible to identify the most relevant and currently in demand forms of AI application in teaching and learning RFL. These include:

Adaptive learning and creation of personalized learning materials

Adaptive learning is an educational technology based on building an individual learning trajectory for a student taking into account his current knowledge, abilities, motivation and other characteristics. And in this regard, AI is a fairly high-quality and effective tool. So, actively developing AI resources today offer, in particular, automatic pronunciation verification (for example, the pronunciation simulator with AI analysis "Elsa Speak" or the language platform "Speechling", focused on developing conversational skills through feedback controlled by AI).

Taking into account and analyzing student responses during learning, adaptive educational systems form an individual educational trajectory with the help of specially selected educational and didactic materials. Specific tools developed using AI technologies are able to adapt educational materials to a certain student, certain course, or a certain educational institution and create, for example, personalized textbooks. Personalized learning materials act as an alternative to conventional textbooks and educational materials in the traditional format representing the so-called "universal" approach to learning, in which teachers provide all students in each class, in each group, or in the entire course with only one type of learning materials.

Machine translation tools

Machine translation is a technological process in which computer software is used to translate written or oral texts from one natural language into another. For quite a long time, the use of machine translation tools for language learning was limited due to the questionable quality of their results. AI technologies, such as neural machine translation, have significantly improved the quality of machine translation, and web services of machine translation with free Internet access have led to the fact that millions of users daily apply to such services as Yandex Translator, Google Translator, Online Translator for their educational, professional or private purposes.

In addition, some machine translation services as neural network-based translators, DeepL in particular, are able to understand the context well and produce a high level of translation comparable to human translation. So, DeepL "knows" 33 languages and

can be used online on a website, through a mobile application, or by installing a program in a browser of a computer, so it can integrate, for example, into Word and translate text directly on the page.

Text writing AI assistants

Text writing AI assistants can help users at various stages of learning to write. Using AI systems and neural networks, they check grammar, spelling, and punctuation, correct errors in a written text, constantly analyze the content and structure of it, make recommendations for further improving the stylistic appearance of the text and its tonality, and provide additional resources for study. In language classes, these systems help students to independently perform their written work, correct mistakes, think over and design the writing process. Using AI in this way helps to strengthen the self-control and build student autonomy. The examples of text writing AI assistants are such electronic resources as: Grammarly, Ginger, ProWriting Aid, Textio, AI Writer, Textly AI, Essaybot, etc.

Communication with chatbots

Chatbots find their effective use in foreign language classes. The dialog interaction between a human user and a computer (robot) using natural language is implemented within the framework of an informal chat (in the written or oral form). Students can learn and master RFL in the process of direct communication with a chatbot. In addition, chatbots can provide customized responses to students' messages, evaluate their academic performance, and give advice on what students need to improve. Thus, various AI chatbots (for example, "ChatGPT", "DeepSeek Chat", "Replicka", etc.) can be used to train spoken Russian in such aspects as:

- composing dialogues (a model prompt: "*Create a dialogue between two people in a store / market / airport, etc. in Russian*");
- grammar check (a model prompt: "*Correct grammatical errors in the text*");
- explanation of the rules (a model prompt: "*How to determine the type of a verb in Russian?*").

As a self-study of RFL, one can contact the virtual voice assistant "Alice" created by Yandex. Alice recognizes natural speech, simulates live dialogue, provides answers to user's questions, and solves applied tasks thanks to the skills programmed on the basis of AI technologies. Alice works on smartphones, tablets, computers, and in cars.

In addition, any mobile phone user can communicate with a range of virtual assistants from the Russian mobile operator MegaFon: Eva, Max, Cat and their stylized versions Eva-chan, Eva Trend and Max Comic. These software products based on AI technologies in the format of chatbots answer phone calls instead of the user in cases when he is not answering or busy, they block spam and protect on the Internet. They

can clarify details, for example, find out from the interlocutor at what time the user can call back or where to pick up the order from the online store.

Application of AI-based software for language learning (platforms and applications)

Online platforms and mobile applications are becoming a more and more common practice in learning RFL. Cloud-based online platforms that integrate natural language processing, crowdsourcing, gamification elements, automatic speech recognition, automatic speech generation, and AI text writing applications are among the most popular and actively used materials.

Among those based on AI digital technologies and online learning resources for teaching and learning RFL that have proved themselves positively and being in demand, the following ones should be mentioned:

- platforms and applications for language learning with adaptive courses. Thus, according to the global online platform Statista that specializes in data gathering and visualization, the monthly number of active worldwide users of the Duolingo application increased from 37 million in 2020 to 113 million in 2024 [Statista, 2025]. This application offers courses in 43 languages, including Russian. The proposed learning method includes gamification of the educational process in order to motivate users with points, rewards, and interactive lessons with interval repetition and revision. As in the case presented above, this application uses personalized robots with a certain stylized national and cultural appearance in interaction with which it is proposed to conduct short daily lessons for consistent step-by-step practice of a foreign language;
- mobile applications for vocabulary learning (the thesaurus dictionary of the Russian language "Word Map" which allows to memorize word combinations and find synonyms, study the meanings of phraseologisms and conduct morphemic analysis of words, as well as "Anki", "Quizlet", "Memrise", etc.) with interval repetition algorithms;
- the free general linguistic mobile application "Glasary of Language", which contains extensive information about the structure and history of the Russian language (over 600 author's articles and popular science essays, an index of 2,000 terms and linguistic concepts).

In addition, in terms of the use of based on AI digital technologies and online learning, the following tools can be applied to self-study:

- online language learning platform LingQ (suitable for language immersion and helpful for natural learning through the real content such as podcasts, articles, books and videos where one can read and listen with instant translation);

- online language learning service "Clozemaster" using language games (focused on learning vocabulary in context through exercises such as "*insert a missing word*", i.e. by teaching new words in real sentences, the program helps to understand not only their meaning, but also how these words are used in real communication);
- software product Rosetta Stone (combining proven techniques and effective speech recognition technology, it uses a full immersion method without translation and is suitable even for beginners);
- the official course "Learn Russian" from Russia Today (RT) (as part of the multimedia project "Window to Russia", implemented with the support of the Ministry of Digital Development, Communications and Mass Media of the Russian Federation).

Intelligent learning systems

Intelligent learning systems are computer-based learning systems that are designed to simulate customized individual learning. They include four basic components: the domain model, the student model, the learning model, and the interface model. Based on learning models, algorithms, and neural networks, they can make decisions about an individual student's learning trajectory and content selection, provide cognitive foundations and assistance, and engage the student in dialogue. Intelligent learning systems have enormous potential, especially in large distance learning institutions where the educational process is conducted with thousands of students and where individual learning is impossible. By integrating learning systems based on natural language processing technologies (both downloadable software and online systems) that are capable of providing corrective feedback and adapting learning materials, reactive one-way intelligent learning systems have been transformed into interactive machine learning systems.

It should be noted that at a more advanced stage, corpus linguistics and Big Data methods can be introduced into teaching RFL using digital AI technologies through error rate analysis and appropriate adaptation of classes and educational programs. In this regard, the following digital resources and technologies may be in high demand:

- "National corpus of the Russian language" (through the search for examples of the use of words);
- free web service "SkELL" (*Sketch Engine for Language Learning* - a tool for language learners and teachers that allows them to study word usage based on contextual examples, analyze the frequency of words and their compatibility, enrich the vocabulary and improve the grammar);
- the online search service Google Ngram Viewer (allows to search for the contexts of a word in a specified chronological period, as well as analyze and visualize the frequency of use of certain language units (words and

expressions) by plotting graphs based on a large array of printed sources collected in the Google Books service).

Intelligent Virtual Reality

Gamification and interactive methods of teaching RFL based on immersiveness (i.e. immersion in the language) and implemented with the use of AI technologies are effective tools for the formation and development of linguocommunicative competencies. Among the latest and innovative of them the following ones can be mentioned:

- VR/AR and interactive language environments: "Mondly VR" (provides the opportunity to conduct virtual dialogues with AI characters in Russian); "VRChat" (realizes the opportunity to visit Russian-speaking rooms for the practice with native speakers); "Influential" (a game that focuses on increasing vocabulary and pronunciation through memorizing objects in a virtual apartment).
- various virtual tours to Russian cities and their place of interest with the language and linguocultural assignments to be done.
- game simulators that enable dialogues in virtual reality (VR) or metaverses with the Russian language support ("Lego Bricktales", "War Thunder", "Real Pool 3D", "DCS World", etc.).

Intelligent VR is a complex system that integrates conversational AI tools, spatial context recognition technologies, gesture and facial recognition systems, NLP, speech recognition technologies, and natural language understanding. Students can practice speaking through AI-powered avatars that simulate realistic conversations with native speakers allowing students to develop fluency and build self-confidence through personalized practice. Intelligent VR and game simulators are used to create authentic virtual reality and learning environments based on the gamification of the educational process. Virtual agents (avatars) can act as teachers, facilitators, or peers of students.

Conclusions

The integration of AI into the educational process provides a new quality of both foreign language acquisition and teaching. AI-based technologies and tools help to create a complex cognitive educational environment in which learning can be more personalized and teaching more flexible and adaptive. AI technologies can contribute to the formation and development of students' knowledge and skills that are necessary today in a modern technologically advanced society and, no doubt, will be in demand in the nearest future.

AI-based tools can be used in many ways, and in this paper, the following have been identified, analyzed, and described: adaptive learning and personalized learning materials, machine translation tools, text writing AI assistants, chatbots, AI-based

software platforms and applications for language learning, intelligent learning systems, intelligent virtual reality.

In order to efficiently and effectively integrate these technologies and tools into the daily educational process of learning foreign languages in general and RFL in particular, modern teachers need to form, timely update and constantly modernize their own knowledge, skills and knowledge of AI technologies. They should not just keep up with the times, or avoid unnecessary workload and useless repetitive routine tasks, or carry out supportive and accompanying activities in relation to students, but, what is more important, they should fulfill the noble function that is inherent in the very name of this profession of a *pedagogue* (Ancient Greek - *παιδαγωγός*), the function not to be led, but to lead.

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