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ORIGINAL

Innovative approaches to learning foreign languages: the impact of virtual reality on overcoming the language barrier

Enfoques innovadores en el aprendizaje de lenguas extranjeras: el impacto de la realidad virtual en la superación de la barrera lingüística

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ABSTRACT

The study is aimed at highlighting the peculiarities of using virtual reality in the educational practice of learning foreign languages. The study uses an economic and statistical method to assess the dynamics of the virtual reality market in education and forecast its development until 2029, as well as graphical display methods to visualize changes in interest in VR and market trends. The content analysis was used to systematize the advantages and disadvantages of VR in language learning, the comparative analysis method to correlate different VR platforms, the logical generalization method to summarize information about the functionality of the platforms, and the systematization method to formulate the advantages and disadvantages of using virtual reality in the process of learning foreign languages. The study found that the use of virtual reality in education has been growing rapidly over the past ten years, and the COVID-19 pandemic has spurred this active development.

Keywords: Distance Learning; Immersion; Interactive Environment; Personalization of Learning**;** Platforms and Applications.

RESUMEN

El estudio pretende poner de relieve las peculiaridades del uso de la realidad virtual en la práctica educativa del aprendizaje de lenguas extranjeras. El estudio utiliza un método económico y estadístico para evaluar la dinámica del mercado de la realidad virtual en la enseñanza y prever su evolución hasta 2029, así como métodos de representación gráfica para visualizar los cambios de interés por la RV y las tendencias del mercado. Se utilizó el análisis de contenido para sistematizar las ventajas y desventajas de la RV en el aprendizaje de idiomas, el método de análisis comparativo para correlacionar diferentes plataformas de RV, el método de generalización lógica para resumir la información sobre la funcionalidad de las plataformas, y el método de sistematización para formular las ventajas y desventajas del uso de la realidad virtual en el proceso de aprendizaje de lenguas extranjeras. El estudio concluyó que el uso de la realidad virtual en la educación ha crecido rápidamente en los últimos diez años, y que la pandemia del COVID-19 ha impulsado este activo desarrollo.

Palabras clave: Aprendizaje a Distancia; Inmersión; Entorno Interactivo; Personalización del Aprendizaje; Plataformas y Aplicaciones.

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INTRODUCTION

Foreign language learning is becoming an urgent need in lifelong learning due to constant globalization, internationalization, cooperation between countries, and the need to understand other cultures. Language proficiency implies formulating sentences and expressing your thoughts and feelings. The main reason for the language barrier is often fear and uncertainty. The most common factor is the fear of making mistakes or getting a negative grade. The student thinks that any mistake will provoke judgment or laughter from others.

This blocks confidence and prevents free expression. In this context, attention should be paid to innovative foreign language learning technologies. Effective and innovative teaching methods contribute to rapid and relatively easy language acquisition. Teachers should be aware of the latest scientific achievements and take into account, for example, the peculiarities of brain functioning to improve students' learning outcomes (Savula, 2024).

The crisis caused by the COVID-19 pandemic has become a stimulus for technological development, further enhancing access to education. Technologies that enhance the learning process require an interdisciplinary approach due to the situation's complexity and the variety of disciplines involved. It is important to understand how modern innovative technologies can be used and how learners and teachers adapt their learning practices through their use (Scanlon et al., 2019). Modern approaches make learning more engaging for students and the process more enjoyable than traditional methods of reading and translation (Maiboroda, 2024).

Virtual reality (VR) provides mental and physical immersion in this context, creating a sense of full integration into the virtual environment (Pinto et al., 2021). VR systems can be helpful because they bring language learning closer to the cultural context and create realistic simulations that cannot be reproduced in the physical world (Palamar et al., 2024).

Many researchers have paid attention to the peculiarities of implementing virtual reality as an innovative technology in foreign language learning. Alkhayat (2023) studied the use of VR platforms for the professional development of teachers of English as a second language. He drew attention to the advantages of VR over standard web conferencing, emphasizing its ability to create immersive environments. Other authors, such as Bosa et al. (2024) and Żammit (2024), developed this topic by exploring the practical implementation of VR in foreign language teaching. The authors demonstrated how VR increased students' cognitive engagement through interactive simulations and culturally relevant learning materials.

The authors of Kondratiuk et al. (2022) focused on using VR for distance language learning. Their study showed that VR helped improve language skills by creating realistic communication environments. Their study also emphasized training teachers to work with VR to improve language learning outcomes. Nurtdinova (2020) investigated the methodological organization of teaching materials using VR for professional foreign language teaching. The author proposed practical approaches to curriculum development that considered the specifics of the virtual environment and emphasized the importance of integrating VR into professional language programs.

Palamar et al. (2024) and Wu (2024) focused on using immersive technologies in language teaching in Ukraine. The authors pointed to VR's ability to increase students' cognitive interest and achievement in language learning. Their results also emphasized the importance of VR in developing the educational process.

Sarnovska et al. (2024) conducted an important study focusing on innovative applications of VR and AI in distance language teaching at universities. They emphasized the importance of using AI to adapt educational programs to students' needs and improve the quality of the learning process. The authors Urkevica and Daniela (2023) studied the development of foreign language teaching within the framework of technologically advanced learning. The authors examined the role of the latest technologies in transforming traditional approaches to language teaching, emphasizing their effectiveness in strengthening the interaction between teachers and students. Kryvtsun (2024) analyzed the problem of overcoming the language barrier in higher education.

Thus, despite the large number of studies conducted to determine the role of innovative technologies such as VR, the study of the impact of this technology on overcoming the language barrier still requires additional research and constant modernization, as the level of digitalization is constantly growing, which requires new approaches. The study aims to highlight the aspects of using virtual reality as an innovative educational technology to overcome the language barrier. The objectives of the study are summarized as follows:

1. To identify the trend of popularity of virtual reality in education.
2. To describe the advantages and disadvantages of using virtual reality in foreign language teaching.
3. To highlight the peculiarities of using modern VR platforms for learning foreign languages.

METHOD

The first stage of the study involved collecting and analyzing data on interest in virtual reality in education from 2004 to 2024 using the Google Trends tool. This made it possible to determine the global popularity of virtual reality in the educational context. Data from the source "Virtual Reality (VR) in Education Market" was used to assess the dynamics of the virtual reality market in education and forecast its development until 2029.

The methodology included economic and statistical analysis, which allowed us to identify market trends and forecast future changes in the development of this technology in the education sector. Graphical display methods were used to create visualizations that demonstrate changes in interest in virtual reality in education and the dynamics of the virtual reality market in the education sector.

The next stage of the study involved analyzing the scientific works of authors who have studied the use of virtual reality in foreign language learning to systematize the advantages and disadvantages of this technology. Content analysis methods were used to summarize the research results and highlight the main aspects that affect the effectiveness of VR in teaching. Graphical display methods were used to visualize the results obtained, which made it possible to classify the advantages and disadvantages and visualize their interrelationships.

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The final stage of the study involved using literature review methods to collect research papers and articles on modern virtual platforms used in foreign language teaching. Further, the data analysis method was used to process the data obtained, which allowed us to systematize information about popular platforms, their functionality, and effectiveness. To compare different technologies, the study used the comparative analysis method, which helped identify the most appropriate platforms for improving the learning process. The data visualization methods also allowed us to display the results of the platform comparison graphically, and the synthesis method helped to summarize information from various sources, which made it possible to formulate a comprehensive overview of modern technologies in foreign language learning.

RESULTS

Identifying the trend of virtual reality popularity in education

The "virtual reality" system was created by the American computer scientist Sutherland in 1966 by replacing an infrared sensor with computer images (Bosa et al., 2017). In 1989, computer scientist Jaron Lanier coined the term "virtual reality" (Trach, 2017). Today, virtual reality has become widely used in areas such as robot control, entertainment, healthcare, computer games, commerce, museums, the automotive industry, the military, and education.

VR technologies for language learning have been actively used relatively recently, around 2020. In the 2000s, virtual reality was mainly used for professional purposes such as training and simulations. In the 2010s, VR became more accessible to a broader audience due to the emergence of consumer VR headsets. By the end of this period, with the development of artificial intelligence, virtual simulations were widely used in education, medicine, and the entertainment industry.

The latest research (Palamar et al., 2024; Pinto et al., 2024; Sarnovska et al., 2024) shows that the most effective way to learn foreign languages is to be fully immersed in the language environment. Constant interaction with such an environment is the most effective method of learning a foreign language. Modern teachers constantly look for teaching methods that are close to real-life conditions. Virtual reality technologies, combined with gamification elements, help maintain motivation and interest in learning, allowing you to immerse yourself in a foreign language environment and learn a language on a qualitatively new level.

This innovative technology is gradually gaining momentum. Figure 1 shows a graph that reflects the dynamics of interest in virtual reality in the education sector from 2004 to 2024. This graph allows us to assess how interest in this technology has changed in the context of educational innovations and the development of digital technologies.

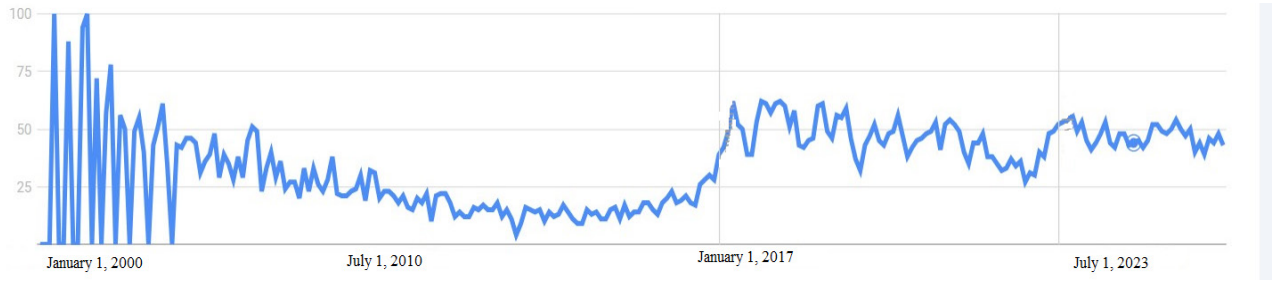


Figure 1. The interest in virtual reality in the field of education around the world between 2004 and 2014

Thus, in the mid-2000s, interest in VR was extremely high due to the curiosity of the unknown. A particular acceleration was observed after 2010 when technologies improved significantly and educational institutions introduced VR into the educational process. In recent years (especially after 2020), the upward trend in interest has intensified even more due to the COVID-19 pandemic, which has contributed to the development of distance learning and innovative technologies in education. The dynamics of virtual learning market growth shown in figure 2 confirm the growth dynamics of the virtual reality market in education with a forecast until 2029.

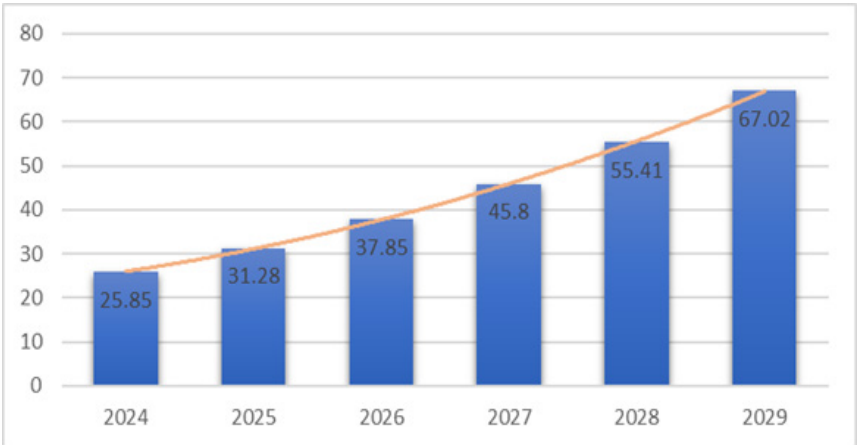


Figure 2. Dynamics of the virtual reality market in education with a forecast until 2029, USD billion

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The graph in figure 2 shows that the educational virtual reality market has significant potential for growth in the coming years. This growth is driven by more and more companies integrating VR technologies and game elements into the educational process, making it more interactive and engaging for students. The above analytical information makes it possible to form specific trends, which are summarized as follow:

1. Increased integration of VR into the educational process.
2. Technological progress in VR developments.
3. Growing demand for VR educational products.

Advantages and disadvantages of using virtual reality in foreign language learning

Virtual reality in foreign language learning is an innovative and effective way to learn a foreign language. The advantages and disadvantages of using virtual reality in foreign language learning are important to consider when choosing the appropriate learning format. The advantages and disadvantages of using virtual reality are illustrated in figure 3.

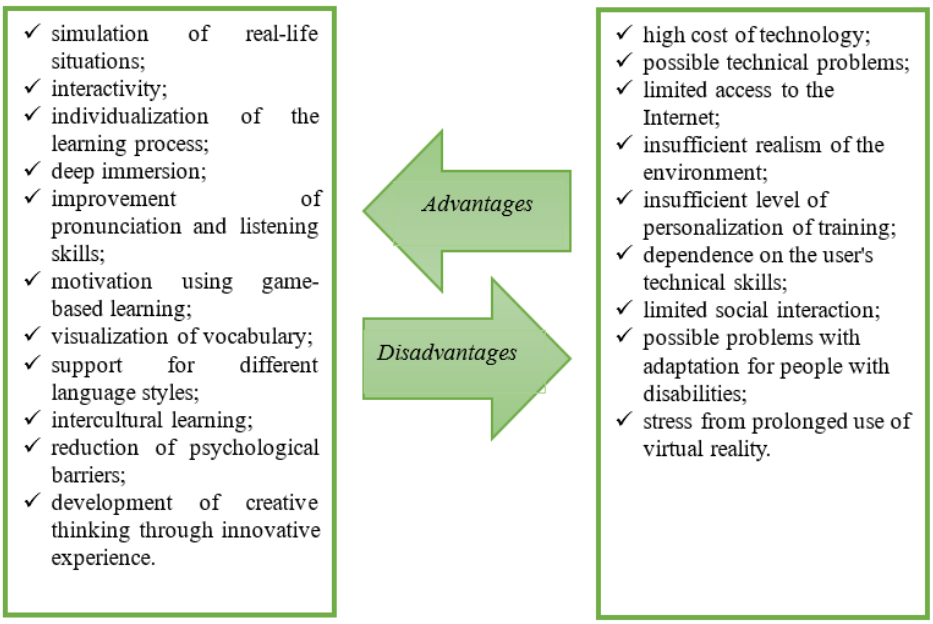


Figure 3. Advantages and disadvantages of using virtual reality in the process of learning foreign languages

Using virtual reality in foreign language learning thus creates many new perspectives in training and education, which are usually laborious, time-consuming, or financially expensive when using traditional methods. Virtual reality technologies have great potential for educational development, including foreign language learning.

Virtual reality can be used to create interactive language courses where students can practice language skills in realistic situations, such as traveling, communicating with native speakers, or interacting in different cultural contexts. This allows you to immerse yourself in the language environment, significantly improving the learning process and making it more effective and engaging. These capabilities have already been implemented in programs such as VE 3D Center, which offers interactive courses for students and teachers in virtual systems on PCs, 3D Intranet, and 3D Internet.

Virtual reality immerses the learner in a language environment where they can communicate with native speakers in realistic simulated situations. This makes learning interactive and engaging, significantly increasing student motivation and participation. Technology is combined with a communicative methodology, allowing students to practice speaking without fear, which helps to overcome the language barrier.

Despite the significant advantages of VR technologies, their use in language learning is fraught with obstacles. The most important one is the cost of equipment. The headsets, controllers, and computers remain expensive, making them difficult for many educational institutions and students to access. Moreover, VR applications require a high-speed internet connection, which may not be available in remote regions. The cost of VR equipment can vary significantly. For example, basic controllers can be purchased for as low as USD 100, while more functional, high-end devices are available for USD 1000. while more functional ones, such as HTC Vive Controllers, cost USD 200. The Meta Quest 3 virtual reality headset will cost about USD 500. In addition to the equipment, you should consider the cost of subscriptions to VR platforms for language learning, which starts at USD 10-15 per month. At the same time, there are also free resources that allow using VR for learning.

The technical complexity of the technology is another problem. Since VR has only recently been used in education, users may face technical difficulties, difficulties setting up their devices, and limited functionality. Equally important are the methodological obstacles: there is a limited amount of high-quality educational content available today, and teachers need special training to use VR in their work effectively (Plötner, 2024)

These barriers must be overcome by developing government programs to finance and implement VR technologies in education.

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Schools, universities, and VR content developers should cooperate to create high-quality educational materials. Additional research will help identify the most effective ways to integrate VR into the learning process and adapt these technologies to the needs of modern education.

Features of using modern VR platforms for learning foreign languages

VR systems are available for both educational institutions and private users. Educational institutions have special funding programs available to enable them to purchase headsets for whole groups or classes. Numerous language learning apps are available for private users to use at home, and the steady decline in hardware prices is making these technologies increasingly affordable. The following is a list of the most popular platforms used for this purpose (table 1).

Virtual reality technologies are becoming more accessible but require the right equipment. Technical specifications are important for a high-quality virtual experience: the higher the resolution of the monitor or headset, the more precise the image, and the wider the field of view will provide a deeper immersion in the virtual world. Interaction with VR environments requires additional devices like controllers and motion-tracking sensors.

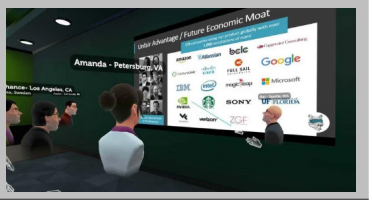
The devices used in such systems can vary from 3D rooms and three-dimensional screens to virtual reality helmets and other configurations. The VR system can also be equipped with various peripherals, such as virtual reality gloves, joysticks, or motion capture suits. All these technologies allow users to interact with the virtual environment at a high level of interactivity.

For successful virtual reality implementation in language learning, there are two perspectives to consider: the teacher's and the student's. Teachers should develop VR lessons and exercises that correspond to specific lesson objectives. For example, to develop listening skills, it is possible to create an exercise that simulates a real-life situation, such as "Going to a museum in virtual reality," where students listen and analyze the content.

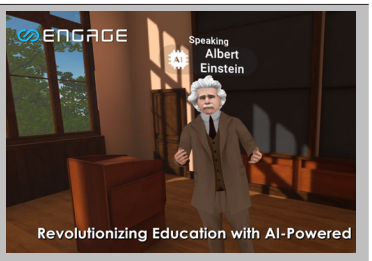
VR makes it possible to create immersive language learning, including modeling real-life situations that allow students to practice speaking. These activities increase motivation and learning efficiency. Integrating VR into traditional teaching methods can be done by setting aside up to 10 minutes at the end of a class for a short VR session to help reinforce the material.

Students should use VR regularly but without overloading. Taking breaks during virtual sessions is important to avoid fatigue or discomfort. Students should stop using VR if they feel dizzy or nauseous. VR language learning is especially effective when combined with other methods. Students can continue traditional lessons by adding short VR sessions to them, the duration of which can be gradually increased. Choosing VR programs that correspond to the student's language proficiency level is also important to keep them motivated and achieve better results.

Table 1. The most popular VR platforms for learning foreign languages

№	Name of the platform	Description of the platforms	Скрін з додатку
1	Labster	The world leader in creating virtual learning simulations that are already used for the successful training of 5 million students in 3000 educational institutions from 70 countries. The platform offers virtual simulations in various fields, including foreign languages. The platform offers about 300 simulations with interactive exercises in the 3D environment of virtual laboratories, lasting from 10 to 50 minutes.	
2	Mondly: Learn Languages in VR	The platform allows users to learn English, Spanish, French, German, Italian, and other languages.	
3	ImmerseMe	The researchers at Oakwood University conducted a study to assess how two virtual reality language learning platforms, IMMERSE and ImmerseMe, align with theories of second language learning. They developed a special rubric based on five key principles of second language learning pedagogy including: focus on content, clear input, attention to form, interaction, and motivation. The researchers took two Spanish lessons on each platform and used their rubric to assess the presence and degree of compliance with these principles in each lesson. This approach allowed them to determine how effectively each platform supports the basic principles of second language acquisition.	
4	Lecture VR	This is an educational program that uses VR technology to conduct interactive lectures, seminars, and classes.	

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5	Engage VR.	A meta-universe that provides an opportunity to communicate with other people, attend events, take training, and much more in any language.	
6	Language Lab	A virtual reality game that emphasizes language learning rather than language skill practice. Languages currently available include English, Spanish, Arabic, Chinese, French, German, Hebrew, Italian, Japanese, Korean, Portuguese, Russian, Ukrainian, and Dutch.	

DISCUSSION

The current study's findings align with Korobova's (2023) and Lysak's (2022) findings, highlighting similar benefits of using virtual reality in foreign language learning. We can agree with the conclusions of the Żammit study, particularly in recognizing the potential of virtual reality in foreign language learning, especially as a tool that creates an interactive and engaging learning environment. The article emphasizes the importance of this technology as a powerful tool for overcoming the language barrier, as in this study. The author emphasizes the problems of the high cost of technology and technical difficulties that become obstacles to the widespread introduction of VR in the educational process.

The studies by Trach (2017), Bosa et al. (2024), and Palamar et al. (2024) also focus on popular VR platforms. These include Second Life, Google Expeditions, Labster, etc., which overlaps with the current study's analysis of modern VR platforms for learning foreign languages. At the same time, both studies recognize the importance of actively engaging students in the learning process and developing professional communication skills by integrating immersive technologies.

In contrast, the study by Palamar et al. (2024) focuses more on the role of teachers in creating such learning environments and on measuring behavioral outcomes in intercultural learning, which is an important area for further research. Wu (2024) came to an interesting conclusion by surveying students at Northwest Normal University who use virtual laboratories to learn foreign languages. The survey results showed that students consider these tools more effective and valuable for learning, mainly through platforms such as Duolingo, Rosetta Stone, Babbel, Memrise, Busuu, Lingodeer, BBC Languages, and Italki.

Despite the positive attitude of the majority of students towards these technologies, some of them preferred traditional teaching methods, which indicates the importance of further adaptation of virtual resources to ensure their maximum effectiveness. The current study also draws attention to this, emphasizing that although virtual tools have great potential to improve the educational process, their optimal implementation in educational practice requires constant adaptation to the specific needs of students and pedagogical conditions. Thus, in agreement with the conclusions of other researchers, we recognize the importance of integrating VR for developing communication skills and overcoming the language barrier. However, we also emphasize the need to support traditional teaching methods.

CONCLUSIONS

Virtual reality in education has been skyrocketing over the past ten years. Specifically, the COVID-19 pandemic has become one of the catalysts for the introduction of VR technologies in educational processes, providing free access to interactive content and innovative learning technologies.

This trend continues due to the continuous improvement of technology and the growing demand for innovative educational solutions. Virtual reality in foreign language learning has advantages and disadvantages. Advantages include interactivity, personalization of learning, immersive experience, and ease of access. Disadvantages include the high cost of equipment, technical difficulties, and dependence on a stable Internet connection.

VR remains a promising tool in the field of language education. Modern VR platforms for learning foreign languages provide extensive opportunities for immersing students in the language environment. Successful implementation of VR in language teaching requires teachers to develop interactive lessons that meet the course objectives and integrate VR activities into traditional teaching methods. Students are encouraged to use VR regularly, combining it with other teaching methods. Future research could focus on a more detailed study of virtual reality's effect on learning effectiveness and on conducting empirical studies to determine the effect of using these innovative technologies.

FINANCING

None.

CONFLICT OF INTEREST

None.

AUTHORSHIP CONTRIBUTION

Conceptualization: Olha Lapka**,** Anna Shcherbak.

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Data curation: Olha Lapka**,** Anna Shcherbak.
Formal analysis: Olha Lapka**,** Anna Shcherbak.
Drafting - original draft: Olha Lapka**,** Anna Shcherbak.
Writing - proofreading and editing: Olha Lapka**,** Anna Shcherbak.

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