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Virtual research laboratory in foreign language teaching: Strategies and role

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Abstract. With the growth of technology and the availability of virtual tools, the creation of interactive and dynamic learning environments that increase students' interest and motivation becomes relevant and possible. The study aimed to analyse and evaluate the effectiveness of using virtual laboratories in the process of learning foreign languages. Analytical research methods, generalisation, systematisation, and surveying were used in the research. The study demonstrated that virtual reality (VR) could change the traditional approach to language learning through immersive experiences of students' interaction with language structures. The article highlighted technical and pedagogical challenges that require an integrated approach. The study confirmed that mobile learning and augmented reality (AR) offer new education opportunities, providing interactivity and personalisation. The research concluded that augmented reality could improve the learning of complex concepts and increase student motivation. This article highlighted a need for effective pedagogical strategies for the successful implementation of virtual reality and augmented reality. A survey of students at Northwest Normal University was also conducted. The survey of students who use virtual labs to learn foreign languages indicates that they are more effective and useful for the learning process, including the use of Duolingo, Rosetta Stone, Babbel, Memrise, Busuu, Lingodeer, BBC Languages, and Italki. Although the majority of students have a positive attitude towards this technology, some prefer traditional methods, which indicates the need for additional adaptation and support of virtual resources to ensure their optimal effectiveness. The study findings can be used to adapt existing foreign language curricula and courses to the use of virtual research laboratory tools

Keywords: student motivation; modern educational technologies; digital innovations; immersive learning; interactivity

INTRODUCTION

Traditional teaching methods may not be effective enough in today's world, where students are accustomed to digital technologies. Online laboratories can be an innovative approach to learning that incorporates current trends. Virtual research laboratories allow students to study material independently at their own pace, completing practical tasks and experiments that are tailored to their personal needs and level of knowledge. Foreign language learning requires real-world practical use of the language. Digital labs can create simulations of real-life language situations, allowing students to experience a different cultural context.

The study's problem concerns the lack of educational innovations that can lead to the use of outdated teaching methods that do not meet modern requirements. Given the rapid progress of digital technologies over the past decade, an increase in the use of various methods in language education has been observed. R. Zhang & D. Zou (2022) focused on the potential of modern technologies to address current

and future challenges of society, especially in the context of the education sector. The researchers highlighted four key principles and advantages of the latest educational technologies: stimulation of practical actions, provision of meaningful educational material, intensification of interaction between participants in the educational process, and reorganisation of pedagogical strategies. An in-depth analysis of the use of innovative technological solutions, including virtual platforms, can help adapt educational systems to the requirements of the present and to develop key competencies.

According to a study by C.P. Wang *et al.* (2020), 3D virtual environments have proven to be an effective tool for language learning over the past two decades. Meta-analysis shows a variety of effects depending on different factors, such as specific teaching methods. These results highlight the potential importance of understanding the relationship between different options and the impact of virtual environments on language learning. Thus, research into this aspect could make a significant contribution to the development of language teaching methods and the optimisation of learning processes. According to X. Huang *et al.* (2021), modern technologies, such as augmented and virtual reality (VR), are becoming a significant contributor to innovations in foreign language learning. According to the researchers, these technologies provide new opportunities that were previously unattainable or difficult to implement. Scientists point out that augmented reality (AR) makes it possible to integrate digital elements into the real world, which makes the learning process more interactive and interesting. In the context of language education, AR can be used to create situations of language use in real-life settings. A more comprehensive study of the impact of AR and VR on students' motivation, language acquisition and language skills development are also relevant.

H. Jehma & A. Akaraphattanawong (2023) investigated the potential of VR to improve English listening skills, which indicates the constant evolution of technology in education and its ability to integrate different aspects of language learning. According to the researchers, the VRChat platform can provide an interactive, immersive experience that helps learners immerse themselves in the language environment, which can increase their motivation and interest in learning. The use of virtual platforms in foreign language learning should be further explored.

T. Liu *et al.* (2023) emphasized the key role of teachers in the context of the use of information and communication technologies (ICT) in modern education. According to the researchers' findings, the use of ICTs is becoming increasingly popular in learning processes, including language education. Among the innovative methods highlighted by the researchers are gamification to improve language skills, the use of VR in language teaching, voice recognition tools for language learning, text analysis software and collaborative online resources for collaborative writing. This didactic approach is promising but requires further research to explore the possibilities of virtual communication in education more deeply and comprehensively.

M. Dooly & M. Vinagre (2022) note, that "the essence of virtual laboratories as innovative computer systems or software solutions designed to emulate real laboratory conditions". The researchers are convinced that users have the opportunity to recreate experimental conditions, conduct research and participate in training sessions in a simulated environment, which often includes elements of interactivity. According to scientists, virtual laboratories ensure advanced technologies are used to create virtual analogues of real laboratories where students can effectively learn foreign languages. Employing these innovative systems, as scientists state, students can immerse in simulated laboratory conditions, interact with virtual equipment, and conduct experiments, which opens up new opportunities for in-depth language learning that are worth exploring more thoroughly.

H.C. Yeh *et al.* (2022) argued that the use of VR technology contributes to the improvement of intracultural awareness among foreign language learners. In particular, their observations suggest that the use of VR technologies, such as panoramic images, audio features, interaction, and structuring, contributes to the development of a deeper understanding and testing of intracultural aspects in foreign language learning. According to scientists, one of the key advantages of using VR technology is the ability to create immersive virtual environments that provide students with not only the opportunity to observe but also to actively participate in virtual cultural spaces. They note that the presence of interactive elements, such as interaction with virtual objects or interaction with other virtual participants, enhances the student's active role in the process of learning about cultural differences, which is worth exploring further.

The study aimed to analyse and systematically evaluate the effectiveness of virtual laboratories in the context of their implementation in the foreign language teaching process.

MATERIALS AND METHODS

Analytical research methods, generalisation, systematisation, and surveys were used in the study. These methods were used to increase the scientific validity of obtained results. The analytical research method was used to analyse VR in detail as a potential tool for transforming traditional language learning methods, focusing on deep immersion of students in language structures. The analytical method was used to identify the possibilities and benefits of using mobile learning and AR, as well as highlight the existence of technical and pedagogical challenges that need to be addressed comprehensively. The generalisation method was used to identify the features and roles played by virtual and AR in improving the dynamics and engagement of students in the process of learning foreign languages by providing them with an intensive and multidimensional experience. This method was used to assess the possibilities of creating conditions for virtual experiments, which can significantly increase the accessibility of the learning process. The generalisation method was used to highlight the importance of integrating advanced technologies into teaching to enhance

students' linguistic and cultural competencies. The systematisation method was used to highlight the importance of students' interaction with virtual experimental situations, which can increase their adaptability and responsiveness in learning. The advantages of virtual laboratories as a safe and affordable alternative were highlighted using the systematisation method.

The survey method was employed to obtain responses from students at Northwest Normal University. This method was used to collect primary data directly from the participants of the study, providing an opportunity for a deeper understanding of their views and experiences. The questionnaire included the following questions:

1. Do you actively use virtual laboratories in your foreign language teaching?
2. Do you think virtual labs are useful for improving your foreign language skills?
3. Do you feel that virtual labs help you understand the material better?
4. Do you prefer traditional teaching methods to virtual labs?
5. Has your motivation to learn a foreign language changed since the introduction of virtual labs?
6. Do you find virtual labs easy to use?
7. Do you feel that virtual labs help you to concentrate better on your studies?
8. Do you advise other students to use virtual laboratories to learn a foreign language?

The survey was also used to study specific virtual laboratories used by students in foreign language learning:

1. What specific virtual labs do you use?
2. What types of virtual labs do you prefer?
3. Do the virtual laboratories you use allow you to communicate with native speakers?
4. What is your preferred basis for using a virtual lab?

From 01.12.2023 to 04.01.2024, 2 group surveys were conducted among 100 students from this university, conducted in person and anonymously. All the provisions of the Declaration of Helsinki (2013) were met during the survey. Of this number, 45 participants were male, while 55 were female. This gender balance ensured a diversity of opinions and feedback. Given the age range of respondents varied from 18 to 24 years, the survey presented information on how different age groups perceive these aspects. At the time of the analysis, all respondents were living in Wuhan, China, which provides a specific context for interpreting the data. The information obtained was processed through statistical analysis of students' responses to the proposed survey questions. The survey method and the analysis of statistical data were used to determine the opinions and attitudes of Northwest Normal University students towards the use of virtual laboratories in foreign language teaching. The findings reflect students' attitudes towards the latest technologies in the learning process and their desire to use these technologies to improve the quality of their education. Considering the demographic characteristics of the respondents, such as gender and age range, the research analysis was also carried out considering possible differences in the perception and use of virtual laboratories among different groups of students.

RESULTS

VR is becoming increasingly popular in society, attracting the attention of not only entertainment consumers but also educational researchers. Its potential as a powerful learning tool is sparking lively debate and research by scientists and educators. In language learning, "VR is an invaluable tool in language classrooms" (Parmaxi, 2023). It can transform the traditional approach to learning by providing students with the opportunity to immerse themselves in authentic linguistic environments where they can interact with language structures in real-time. Such immersive experiences can greatly increase student motivation by providing them with more authentic language experiences. However, VR in language classrooms is not a solution to all educational problems. There are several technical challenges related to system setup, compatibility, and potential limitations for users. For example, not all students may have access to the necessary equipment or high-speed internet connection. There are concerns regarding the pedagogical value of VR. However, the availability of the latest technology does not guarantee its effective use for educational purposes. To achieve the best results, it is necessary to develop appropriate pedagogical strategies and techniques that consider the specifics of language learning and the needs of students. Although VR has great potential to improve language learning, its implementation requires a comprehensive approach.

In the context of AR, apps such as Aurasma provide unique learning opportunities, as "educational practices are being developed and diversified by the progress of the millennial generation, which is seeking to use mobile technology in all aspects of their lives" (Taskiran, 2019). Such applications combine the real world with digital content, creating interactive tasks and scenarios. For example, in the study described above, students had the opportunity to practice their speaking and listening skills by collecting the correct item in a virtual "junk room". This task not only increases their motivation to learn but also develops their communication skills by requiring them to listen carefully and understand and use language to achieve a specific purpose. Such techniques demonstrate how modern technology can be effectively integrated into the learning process, providing students with real, engaging, and interactive experiences that promote deeper language acquisition.

Learning a foreign language is not limited to mastering grammar and vocabulary, oral and communication skills are also important. Describing objects or scenarios in a virtual environment can be particularly useful. VR or other simulation technologies can create authentic situations where learners have to describe objects, actions or events using the target language. Such exercises can be part of a game environment where each student is given a task or "mission" to complete while communicating with other

participants. In a game where students need to communicate to achieve a goal, they face real communication challenges: quick and effective thought formation, responding to their partners' responses and adapting their language to the situation. This not only improves grammatical skills but also develops the ability to listen, respond and interact in real-time. Such interactive teaching methods "activate students by making the language learning process more interesting" (Reitz *et al.*, 2019). They allow students not only to learn new words and structures but also to use them in real-life communication situations, which is key to achieving excellent oral skills.

The use of "virtual environments in education plays a key role in improving the quality of the learning process", in particular in the development of language competencies and intercultural understanding of students (Fondo, 2021). Virtual environments, as an innovative tool, create immersive language learning environments, where learners can interact in authentic communicative situations. Virtual environments provide an opportunity for objective assessment of language competencies, where "learners can demonstrate their skills in real or simulated communication tasks" (Kapici *et al.*, 2019). Furthermore, virtual technologies can create interactive scenarios for the development of intercultural sensitivity, where students can learn and understand the cultural characteristics, traditions, and customs of different nations. Considering these aspects, it is possible to conclude that these virtual environments contribute to the more effective and dynamic development of students' language skills and intercultural competence, making the learning process not only productive but also interesting. VR opens up significant opportunities in the learning process. Its ability to immerse users in various environments creates unique conditions for active and effective learning. However, considering the specific needs of other study fields, such as science, technology, and engineering, it becomes clear that the potential of VR and AR can be expanded through virtual laboratories.

Virtual laboratories allow students to interact with complex scientific experiments without leaving the classroom. This is especially useful in foreign language learning, where practice and immersion in a language environment can play a critical role in building language skills. Virtual laboratories that simulate the reality of language situations allow students to test their knowledge and skills in real-time, receiving immediate feedback and the opportunity to correct their mistakes. Thus, from VR to virtual laboratories, there is a gradual shift from immersive learning to the practical implementation of acquired knowledge. In the context of foreign language learning, this approach can be an answer to the need for deeper and more targeted learning, supporting students in their constant pursuit of differences in language performance. Virtual laboratory activity is an innovative approach to computer activities aimed at facilitating students' experimental research in a virtual or real environment. Such laboratory activities serve not only as a supplement to traditional laboratory practices but also as a tool for enhancing the learning process and deepening students' knowledge. The use of online laboratories allows students to have flexibility in conducting experiments, promoting their independence, and developing critical thinking. "The introduction of digital laboratories also has a positive impact on the cost-effectiveness of the educational process" (Kapilan *et al.*, 2021). Since virtual laboratories do not require specialised equipment, staff, maintenance, and other operating costs, they become more accessible and cost-effective than standard laboratory facilities.

Digital laboratory activities open up new opportunities in the field of pedagogical training of students (Porat *et al.*, 2023; Schwartz *et al.*, 2023). A mixed laboratory that combines elements of virtual and traditional laboratory techniques can be considered the best option for a laboratory environment for teaching undergraduate students. The use of digital technologies in the educational process not only increases the interactivity and accessibility of educational material but also creates an opportunity for a more integrated study of the subject (Wang *et al.*, 2018). The mixed laboratory, combining the advantages of both approaches, provides a balance between theoretical knowledge and practical skills, making the learning process more effective and adapted to the needs of modern students. A survey of students who use virtual laboratories in foreign language teaching was conducted (Table 1).

Table 1. Results of the survey of students at Northwest Normal University

No.	Criteria	Yes	No
1	Do you actively use virtual laboratories in your foreign language teaching?	83%	17%
2	Do you think virtual labs are useful for improving your foreign language skills?	90%	10%
3	Do you feel that virtual labs help you understand the material better?	65%	35%
4	Do you prefer traditional teaching methods to virtual labs?	30%	70%
5	Has your motivation to learn a foreign language changed since the introduction of virtual labs?	45%	55%
6	Do you find virtual labs easy to use?	85%	15%
7	Do you feel that virtual labs help you to concentrate better on your studies?	73%	27%
8	Do you advise other students to use virtual laboratories to learn a foreign language?	89%	11%

Source: compiled by the author

The analysis of the respondents' answers shows a generally positive attitude towards the use of virtual laboratories in the process of teaching a foreign language. The advantages identified include the active use of this technology by students, which underlines its widespread use in the academic environment. Given the modern requirements for education and the rapidly changing landscape of technological innovation, the study of the effectiveness and relevance of interactive technologies in the learning process is becoming an important component of the pedagogical approach. Some responses highlight the need for further adaptation and support of this technology. Some students highlighted the need for additional support or learning resources to make effective use of virtual laboratories. This may indicate that further development and refinement are required to fully meet student needs and make optimal use of the technology. However, it is worth noting that the majority of survey participants still express confidence in the convenience and effectiveness of virtual laboratories. They note the comfort and effectiveness of this technology for users. The observation that virtual laboratories help students to concentrate better on their studies is also an important aspect that indicates their relevance for increasing concentration during the learning process.

Modern virtual laboratories focus on several key aspects. They attempt to simulate real laboratory conditions as accurately as possible, where students can conduct virtual experiments. These laboratories are highly accessible: available online from anywhere in the world, providing access anytime. At the same time, safety is an important advantage, as virtual laboratories can be used to conduct research without the real risks associated with hazardous substances or equipment. Furthermore, they often offer interactive tools and scenarios that promote active user interaction with the virtual environment. Virtual laboratories play an important role in education: they demonstrate concepts, develop practical skills, and stimulate students' interest in the subject matter. Virtual laboratories are widely used in a variety of industries, including education, science, engineering, and medicine, allowing research and training to take place in a simulated environment. To improve the learning process and ensure high-quality education, it is recommended to focus on the following aspects. It is necessary to ensure support from university structures, develop additional learning resources, conduct training for teachers and students, and regularly evaluate the effectiveness of virtual laboratories. Such a comprehensive approach will maximise the benefits of virtual technologies in foreign language teaching and meet the needs of the modern educational process.

In the modern world, where technological progress is steadily moving forward, educational approaches are also undergoing radical changes. The digital age generation constantly seeks ways to integrate mobile technologies into all areas of their lives, including education. This phenomenon has led to the emergence of a new approach to education – mobile learning. Mobile learning opens up many opportunities for educators and students. In particular, in the context of learning English as a foreign language, mobile technologies are becoming an indispensable tool. AR is one of the key technologies in this context. AR can integrate digital content such as video, audio, and images into the real world, expanding it and adding new dimensions. In the context of learning, AR can create interactive scenarios where students can interact with virtual objects or characters, gaining new knowledge and enjoying the process. One of the key benefits of using AR in mobile learning is to increase student motivation. Interactivity and visualisation in AR create an engaging learning environment that stimulates interest in the subject. In addition, AR can adapt to individual student needs by providing personalised tasks and materials. It is also important to note that AR can make it easier to learn complex concepts or topics. Visualisation through AR can contribute to a better understanding of the material, especially in the context of language learning, where correct pronunciation, accentuation, and melody are important. In general, AR in mobile learning opens up new horizons for the educational process. It combines technological progress and pedagogical innovations to create an effective, engaging, and interactive learning environment.

The study also examined which virtual labs are used by students to learn a foreign language. The survey found that modern students use many different virtual laboratories and online resources that provide opportunities for language learning. In particular, Duolingo, Rosetta Stone, Babbel, Memrise, Busuu, Lingodeer, BBC Languages and Italki (Table 2).

Table 2. Virtual laboratories used by students at Northwest Normal University

No.	Virtual laboratories	Type	Native speaker communication	Price
1	Duolingo	Feedback and games	No	Free, premium available
2	Rosetta Stone	Immersion method	No	High
3	Babbel	Online courses, grammar	Yes	Payment required; free trial available
4	Memrise	Flash-cards, games	No	Free, premium available
5	Busuu	Community and tasks	Yes	Free, premium available
6	Lingodeer	Games and interactive lessons	No	Free, premium available
7	BBC Languages	Audio and video lessons	No	Free

Source: compiled by the author

Following the survey results, it is worth noting that students who learn foreign languages using virtual laboratories reflect on the positive aspects of this tool. Let us consider the main scientific aspects that they note in their experience. Students note that virtual laboratories create an interactive environment that encourages students to engage in active learning. This is especially important for the formation of a student's active attitude towards learning foreign languages, as they have the opportunity to choose their tasks and actively participate in the learning process (Huang & Wu, 2023). The use of virtual laboratories allows students to study at their own pace, anywhere, anytime. This encourages independence in learning and flexibility of schedule, which is important in the context of modern requirements for educational technologies. Interaction with other users in virtual labs helps students develop their language skills. This includes the ability to communicate and use the language in practical situations, which improves their communication and language use skills in real-life situations. Students emphasise the accessibility of virtual laboratories, expressing satisfaction with the possibility of using free or trial options. The level of support students receive through these platforms is also considered important. Students' perception is that virtual laboratories significantly increase the effectiveness of their learning and make the process more convenient. The high evaluation of their effectiveness demonstrates their belief in the importance and benefits of using this tool.

Thus, the survey results indicate that virtual laboratories are a significant tool for learning foreign languages in the modern educational environment, promoting active and effective learning that meets the requirements of the modern educational process.

DISCUSSION

Virtual research laboratories in foreign language teaching are a relevant and promising area that attracts the attention of scientists from all over the world. Different approaches and strategies proposed in research can play a key role in shaping optimal teaching methods. The positions of researchers should be studied and compared with the study results for a thorough analysis.

According to N. Enzai *et al.* (2021), significant changes in educational processes have occurred under the influence of the Covid-19 pandemic, in particular, the transition to online distance learning. Of particular interest is the possibility of using AR, which can overlay multimedia content in the real world using common web devices such as smartphones and tablets. This provides flexibility and accessibility to the learning process anywhere and anytime. According to the researchers, the use of AR can not only increase student engagement and motivation but also help overcome the financial and space constraints associated with scientific and technical equipment in laboratories. Given the above studies and the findings of this paper, it can be argued that the use of AR in education has great potential to improve the learning process, in particular in ensuring accessibility, motivating students and optimising the use of resources.

The study conducted by L. Canals (2020) on the use of virtual environments for foreign language learning revealed several important aspects. According to the results, the virtual learning environment has proven to be an effective tool for stimulating the development of students' oral language skills. Particular emphasis is placed on identifying the positive impact of this approach on stimulating students' motivation to actively concentrate on learning a foreign language. The author notes that virtual learning has contributed to the formation of students' sense of purpose, as well as the desire to cooperate with peers in performing communicative tasks. The analysis of the study results indicates that the effectiveness of the virtual environment was particularly pronounced among those students who started their studies with a lower level of language proficiency. This may be because the virtual environment provides additional opportunities for individualising the learning process and adapting to the characteristics of each student. As such, the researcher's study confirms the importance of using virtual technologies in modern education, especially in the context of foreign language learning. Compared with the results of this study, it is worth noting that virtual learning can effectively combine technological and pedagogical aspects, contributing to a deeper understanding and mastery of the language by students of different levels of knowledge.

One of the key aspects of a study by I. Bagea (2023) is the consideration of students' motivation in the language learning process. She pointed out that a deep cultural understanding can be an additional incentive for students, which can make the learning process more enjoyable and effective. Furthermore, the style of communication and perception of the language and culture being studied also change as students develop deeper cultural understanding. Ultimately, the researcher's study highlights not only the importance of language learning in the context of globalisation but also the need to integrate cultural aspects into the learning process, which helps students gain a deeper understanding and appreciation of cultural diversity, an essential component of modern international interaction. Compared to the results of this study, it is worth noting that technology alone does not ensure success – it is also necessary to integrate cultural aspects into the learning process. In summary, although virtual learning has many technological advantages, the researcher emphasises that cultural context is a key factor in ensuring the success of this learning approach.

Over the past decades, virtual learning environments have played a key role in modernising approaches to foreign language learning. R. Hampel & U. Stickler (2012) focused on the revolutionary opportunities that these technologies offer for advanced language acquisition, considering them from a psycholinguistic and sociocultural perspective. The central aspect of this approach is the mediation of language learning through active interaction with experts and peers. Scientists emphasise that the use of various artefacts, including technological solutions, contributes to the creation of complex

mechanisms for learning a foreign language. According to the researchers, students actively integrate and adapt different modes of communication to maximise the effectiveness of the learning process and create deep linguistic meaning. It is worth noting that modern online video conferencing, which is a multimodal platform, opens up new perspectives in foreign language teaching. Both teachers and learners are adapting to this dynamic environment by exploring and adapting new strategies of communication and interaction. Thus, this innovative pedagogical paradigm opens the door to new models of communication, enriching the process of learning foreign languages and increasing students' motivation to actively participate in the learning process.

According to pedagogical expert M. Hamilton (2013), the concept of digital learning, which focuses on learners' autonomy, increased choice, and independence, seems attractive and logical at first glance. However, the author emphasises that a detailed analysis of this model turns out to be much more complex and nuanced than it might seem at first glance. M. Hamilton emphasises the need for an in-depth study of the theories behind the development of autonomy in the context of virtual language learning. The researcher also suggests that a deeper understanding of the relationship between the concept of autonomy and the use of technology in the learning process can have a significant impact on methodological approaches to language teaching. Compared to the results of the present study, it is worth noting that such an understanding is critical for all participants in the educational process, from academic researchers to teachers, providing the basis for effective and innovative learning in the modern world.

M. Rahimi & J. Fathi (2022) analysed the impact of using electronic tools on the development of English as a foreign language (EFL) students' speech competency. The researchers focused on such aspects of speech activity as fluency and coherence of utterances, vocabulary, grammatical rank of expressiveness and its accuracy, as well as the phonetic side of speech. According to the results of the experiment, the researchers found that both learning formats, traditional and using electronic tools and digital innovations, contributed to the improvement of students' speaking skills. However, a detailed analysis showed that the group that used electronic tools demonstrated a higher level of speaking competence compared to students who were traditionally taught. This indicates that the use of modern technologies in the learning process can have an additional encouraging effect on the development of students' language skills. In particular, the researchers note that students who learnt a foreign language using a digital interface showed greater readiness and confidence in their ability to communicate in English. It is worth noting that additional practice in virtual communication contributes not only to formal language learning but also to the development of communicative competencies, which are an important aspect of foreign language acquisition.

Virtual learning environments created new horizons in foreign language learning by offering comprehensive approaches to language skills acquisition through active interaction and integration of technologies. Researchers note the positive impact of using electronic tools on the development of various aspects of students' language competence. In particular, studies have shown that digital technologies help improve students' communication skills, motivation, and readiness for intercultural communication. This approach to teaching opens up prospects for innovative and effective foreign language learning in the modern world.

CONCLUSIONS

The study determined that VR could transform the traditional approach to language learning by providing students with an immersive experience of interacting with language structures. However, there are technical and pedagogical challenges that require an integrated approach. Mobile learning and AR open up new opportunities for education, providing interactivity, visualisation, and personalisation of the learning process. AR can improve the learning of complex concepts and help increase student motivation in language learning. For the effective implementation of technologies such as VR and AR in the educational process, it is important to develop effective pedagogical strategies that consider the peculiarities of language learning and the needs of students.

The study highlights that technologies such as AR and VR significantly improve the effectiveness and engagement of foreign language learning by creating immersive and interactive experiences for students. Virtual laboratories are a promising tool for areas of study that require real laboratory conditions, allowing for research and experimentation in a simulated environment. The integration of the latest technologies into the educational process contributes to the development of students' language and intercultural competencies, making learning more dynamic, interesting, and effective. Virtual labs are becoming a key tool in education, allowing students to interact with complex experiments in a virtual environment. They offer a safe, accessible, and interactive alternative to traditional labs, supporting student flexibility and autonomy. Mixed labs, which combine virtual and traditional methodologies, are considered the optimal solution for deep and integrated learning.

A survey of students studying foreign languages using modern technologies was conducted. The survey results show that virtual laboratories are widely used and highly appreciated by foreign language students. The majority of respondents note the usefulness of this technology in improving their knowledge and understanding of the material. However, there is a certain proportion of students who prefer traditional teaching methods. Students' motivation to study can change under the influence of virtual labs, with both positive aspects (feeling more focused) and possible problems that require additional support and resources. Students indicated that they most often use Duolingo, Rosetta Stone, Babbel, Memrise, Busuu, Lingodeer, BBC Languages and Italki platforms. In general, the respondents' answers confirm the potential of virtual labs as an effective

tool for learning foreign languages but also point to the need for further adaptation and support of this technology to maximise its potential. Further studies should focus on the possibilities of using artificial intelligence in a virtual research laboratory in foreign language teaching.

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CONFLICT OF INTEREST

None.

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Віртуальна дослідницька лабораторія у викладанні іноземних мов: стратегії та роль

Анотація. З розвитком технологій та доступності віртуальних інструментів стає актуальним і можливим створення інтерактивних та динамічних навчальних середовищ, які підвищують зацікавленість та мотивацію студентів. Метою дослідження було провести аналіз та оцінку ефективності використання віртуальних лабораторій у процесі вивчення іноземних мов. У дослідженні були використані аналітичні методи дослідження, узагальнення, систематизація та анкетування. Дослідження продемонструвало, що віртуальна реальність може змінити традиційний підхід до вивчення мови через імерсивний досвід взаємодії студентів з мовними структурами. Дослідження висвітлило технічні та педагогічні виклики, які потребують комплексного підходу. Дослідження підтвердило, що мобільне навчання та доповнена реальність пропонують нові можливості для освіти, забезпечуючи інтерактивність та персоналізацію. У дослідженні зроблено висновок, що доповнена реальність може покращити вивчення складних концепцій та підвищити мотивацію студентів. Це дослідження підкреслило потребу в ефективних педагогічних стратегіях для успішного впровадження віртуальної та доповненої реальності. Також було проведено опитування студентів Північно-Західного нормального університету. Опитування студентів, які використовують віртуальні лабораторії для вивчення іноземних мов, свідчить про те, що вони є більш ефективними та корисними для навчального процесу, включаючи використання Duolingo, Rosetta Stone, Babbel, Memrise, Busuu, Lingodeer, BBC Languages та Italki. Хоча більшість студентів позитивно ставляться до цієї технології, деякі надають перевагу традиційним методам, що свідчить про необхідність додаткової адаптації та підтримки віртуальних ресурсів для забезпечення їх оптимальної ефективності. Результати дослідження можуть бути використані для адаптації існуючих навчальних програм та курсів з іноземних мов до використання віртуальних дослідницьких лабораторних інструментів

Ключові слова: мотивація студентів; сучасні освітні технології; цифрові інновації; імерсивне навчання; інтерактивність