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THE ROLE OF ONLINE SIMULATIONS AND VR/AR IN DEVELOPING PROFESSIONALLY-ORIENTED FOREIGN LANGUAGE COMPETENCE

Abstract. The rapid development of digital technologies has significantly transformed modern educational practices, particularly in the field of foreign language learning. Among the most innovative tools are online simulations and immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR), which create interactive and realistic learning environments. The purpose of this study is to examine the role of online simulations and VR/AR technologies in developing professionally-oriented foreign language competence among students in higher education institutions. The research focuses on the pedagogical potential of immersive technologies to enhance communicative skills, professional vocabulary acquisition, intercultural competence, and learner motivation. The study analyzes contemporary theoretical approaches to professionally-oriented foreign language competence and explores the integration of digital simulations into language learning curricula. Special attention is given to the advantages of VR and AR technologies in creating authentic professional scenarios that simulate real-life communication contexts. These technologies allow learners to practice professional communication in simulated environments, thereby reducing anxiety and increasing confidence in using foreign languages in specialized contexts. Furthermore, the study examines the effectiveness of online simulations in promoting experiential learning, collaborative interaction, and problem-solving skills. The findings indicate that the use of VR/AR and online simulations contributes to improved language proficiency, enhanced professional communication skills, and increased learner engagement. The integration of



immersive technologies into foreign language education supports competency-based learning and aligns with the requirements of modern professional training. However, the implementation of such technologies also presents certain challenges, including technical limitations, financial costs, and the need for teacher training. In conclusion, online simulations and VR/AR technologies represent promising tools for the development of professionally-oriented foreign language competence. Their integration into educational practice can significantly improve the quality of language training and prepare learners for effective communication in professional environments. Further research is recommended to explore optimal strategies for incorporating immersive technologies into foreign language teaching methodologies.

Keywords: online simulations; Virtual Reality (VR); Augmented Reality (AR); professionally-oriented foreign language competence; immersive learning; digital technologies in education; professional communication; foreign language teaching; experiential learning; higher education

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РОЛЬ ОНЛАЙН-СИМУЛЯЦІЙ ТА VR/AR У РОЗВИТКУ ПРОФЕСІЙНО-ОРІЄНТОВАНОЇ КОМПЕТЕНЦІЇ З ІНОЗЕМНИХ МОВ

Анотація. Швидкий розвиток цифрових технологій суттєво трансформував сучасні освітні практики, зокрема у сфері вивчення іноземних мов. Серед найінноваційніших інструментів є онлайн-симуляції та імерсивні технології, такі як віртуальна реальність (VR) та доповнена реальність (AR), які створюють інтерактивні та реалістичні навчальні середовища. Метою цього дослідження є вивчення ролі онлайн-симуляцій та технологій VR/AR у розвитку професійно-орієнтованої компетенції іноземної мови у студентів вищих навчальних закладів. Дослідження зосереджено на педагогічному потенціалі імерсивних технологій для покращення комунікативних навичок, засвоєння професійної лексики,



міжкультурної компетентності та мотивації учнів. У дослідженні аналізуються сучасні теоретичні підходи до професійно-орієнтованої компетенції іноземної мови та досліджується інтеграція цифрових симуляцій у навчальні програми з вивчення мов. Особлива увага приділяється перевагам технологій VR та AR у створенні автентичних професійних сценаріїв, що імітують реальні комунікативні контексти. Ці технології дозволяють учням практикувати професійне спілкування в імітованих середовищах, тим самим зменшуючи тривожність та підвищуючи впевненість у використанні іноземних мов у спеціалізованих контекстах. Крім того, у дослідженні розглядається ефективність онлайн-симуляцій у сприянні практичному навчанню, спільній взаємодії та навичкам вирішення проблем. Результати дослідження показують, що використання VR/AR та онлайн-симуляцій сприяє покращенню володіння мовою, розвитку навичок професійного спілкування та підвищенню залученості учнів. Інтеграція імерсивних технологій в освіту з іноземних мов підтримує навчання, засноване на компетентностях, та відповідає вимогам сучасної професійної підготовки. Однак впровадження таких технологій також створює певні труднощі, зокрема технічні обмеження, фінансові витрати та необхідність навчання вчителів. На завершення, онлайн-симуляції та технології VR/AR є перспективними інструментами для розвитку професійно-орієнтованої компетенції з іноземних мов. Їхня інтеграція в освітню практику може значно покращити якість мовної підготовки та підготувати учнів до ефективного спілкування в професійному середовищі. Рекомендуються подальші дослідження для вивчення оптимальних стратегій інтеграції імерсивних технологій у методики викладання іноземних мов.

Ключові слова: *онлайн-симуляції; віртуальна реальність (VR); доповнена реальність (AR); професійно-орієнтована компетенція з іноземних мов; імерсивне навчання; цифрові технології в освіті; професійне спілкування; викладання іноземних мов; експериментальне навчання; вища освіта*

Introduction

In the context of globalization and increasing international cooperation, professionally-oriented foreign language competence has become an essential component of modern higher education. Specialists across various fields are expected to communicate effectively in a foreign language within their professional domains, including business, medicine, engineering, military services, and education. Foreign language competence is no longer viewed as a purely linguistic ability but as an integrated skill that enables individuals to perform professional tasks, interact in multicultural environments, and participate



in international collaboration. Consequently, the development of such competence has become a key priority in contemporary language education.

At the same time, rapid technological advancement has significantly transformed educational practices. In particular, immersive technologies such as Virtual Reality (VR), Augmented Reality (AR), and online simulation platforms have gained increasing attention in recent years. These technologies provide interactive, authentic, and experience-based learning environments that simulate real-life professional situations. Their integration into education reflects a broader shift toward digitalization and learner-centered approaches, where students actively engage in problem-solving and communicative tasks within realistic contexts.

Despite these innovations, a persistent problem remains in foreign language education: a gap between traditional classroom-based instruction and the requirements of real professional communication.

Conventional teaching methods often emphasize grammar, vocabulary memorization, and controlled exercises, which may not fully prepare learners for spontaneous, context-dependent communication in professional environments. As a result, students may possess theoretical language knowledge but lack the ability to apply it effectively in authentic professional situations. This gap highlights the need for more dynamic, practice-oriented, and immersive approaches to language teaching.

The aim of this study is to investigate the role of online simulations and VR/AR technologies in the development of professionally-oriented foreign language competence among students in higher education institutions. The study seeks to determine how immersive and simulation-based learning environments contribute to improving communicative skills, professional vocabulary acquisition, intercultural awareness, and learner motivation.

To achieve this aim, the following objectives are formulated: to examine the pedagogical potential of VR/AR and online simulation technologies; to classify types of simulations and digital platforms used in language education; to identify advantages and limitations of immersive technologies in foreign language teaching; and to propose methodological recommendations for integrating these technologies into curriculum design.

The study is guided by the following research questions:

1. How do online simulations and VR/AR technologies contribute to the development of professionally-oriented foreign language competence?
2. Which types of immersive and simulation-based tools are most effective in foreign language learning?
3. What pedagogical advantages and challenges are associated with the use of VR/AR in language education?



Alternatively, the study may also be framed by the hypothesis that the integration of VR/AR technologies and online simulations into foreign language instruction significantly enhances the development of professionally-oriented foreign language competence by increasing learner engagement, improving communicative performance, and providing authentic professional communication contexts

Virtual Reality (VR) and Augmented Reality (AR) represent innovative digital technologies that have significantly transformed educational environments, professional training, and communication practices. These technologies enable users to interact with computer-generated environments or digital elements integrated into real-world contexts, thereby creating immersive and interactive learning experiences. The development of VR and AR technologies has evolved gradually over several decades, influenced by advances in computer science, engineering, psychology, and pedagogy.

The origins of Virtual Reality can be traced back to the mid-twentieth century, when researchers began exploring the possibility of creating immersive multisensory environments. One of the earliest attempts to simulate sensory experiences was undertaken by *Morton Heilig*, an American inventor and cinematographer, who in 1962 developed the Sensorama, a mechanical device designed to provide users with a simulated environment incorporating visual, auditory, tactile, and olfactory stimuli. Although Sensorama was not computer-based, it introduced the fundamental concept of immersion, which later became a defining feature of Virtual Reality systems [5].

A significant milestone in the development of Virtual Reality occurred in 1968, when computer scientist Ivan Sutherland, in collaboration with *Bob Sproull*, created the first head-mounted display system, commonly known as the "Sword of Damocles." This device allowed users to view simple computer-generated wireframe images and is widely recognized as the first functional Virtual Reality headset. Sutherland's work laid the theoretical and technological foundations for modern computer graphics and interactive simulation systems [13].

Further development of Virtual Reality technologies took place during the 1980s, when the term "Virtual Reality" was popularized by *Jaron Lanier*, founder of the company VPL Research. During this period, the development of interactive gloves, head-mounted displays, and motion-tracking systems enabled users to manipulate virtual objects in simulated environments. At the same time, government institutions such as NASA began utilizing VR technologies to train pilots and astronauts, demonstrating the practical applications of immersive simulation in professional contexts. These early implementations significantly influenced the expansion of VR into education, medicine, engineering, and military training [13]. Augmented Reality emerged slightly later than Virtual



Reality, focusing on the integration of digital elements into real-world environments rather than complete immersion in virtual spaces. The term "Augmented Reality" was introduced in 1990 by *Tom Caudell*, an engineer working at Boeing, who used the technology to assist workers in assembling aircraft wiring systems. By overlaying digital instructions onto physical components, AR systems improved accuracy and efficiency in complex manufacturing processes [13].

The first fully functional Augmented Reality system was developed in 1992 by *Louis Rosenberg* at the United States Air Force Armstrong Laboratory. His system, known as Virtual Fixtures, enhanced human performance by providing visual overlays that guided users during manual tasks. This development demonstrated the potential of AR technologies to improve precision and safety in professional environments. In 1999, researcher Hirokazu Kato introduced the ARToolKit, an open-source software library that enabled real-time tracking of virtual objects within physical environments. The availability of ARToolKit significantly expanded research opportunities and facilitated the widespread adoption of Augmented Reality technologies in academic and industrial settings [13]. The transition into the twenty-first century marked a new phase in the development of Virtual and Augmented Reality technologies, characterized by rapid technological advancement and commercialization. During the 2010s, consumer-oriented VR devices such as the Oculus Rift contributed to the widespread availability of immersive systems. Technology companies, including Microsoft, HTC, and Sony, introduced advanced VR and mixed-reality devices capable of supporting high-quality visualization and interaction. At the same time, the development of smartphones and mobile computing platforms enabled the integration of AR technologies into everyday applications, including navigation systems, gaming environments, and educational tools.

From a theoretical perspective, the study of Virtual and Augmented Reality has been influenced by interdisciplinary research involving computer science, cognitive psychology, and educational theory. Researchers such as *Paul Milgram* contributed to the conceptual understanding of mixed reality environments through the development of the Reality–Virtuality Continuum model, which categorizes technologies based on the degree of immersion and integration between virtual and real environments. This model remains widely used in contemporary research to classify immersive technologies and analyze their educational potential [8].

Modern educational research has emphasized the pedagogical value of VR and AR technologies in creating authentic learning environments. Scholars such as *Chris Dede* have investigated the use of immersive virtual environments to support experiential learning and knowledge construction. Similarly, *Jeremy*



Bailenson has conducted extensive research on virtual reality and human interaction, examining how immersive technologies influence behavior, perception, and communication. Another influential researcher, *Mel Slater*, has explored the concept of presence in virtual environments, defining it as the psychological sensation of "being there" within a simulated space. These studies have contributed significantly to understanding how immersive technologies affect learning outcomes and user engagement [3].

In recent years, Virtual and Augmented Reality technologies have been increasingly integrated into educational practice, particularly in professionally-oriented training. Their application in fields such as medicine, engineering, aviation, and military education has demonstrated their capacity to simulate complex professional scenarios that would otherwise be difficult or costly to reproduce in traditional classrooms. Scholars S. Palamar, K. Brovko, S. Semerikov notice that in language education, VR and AR technologies support the development of communicative competence by enabling learners to participate in simulated real-life interactions within culturally authentic environments. These immersive experiences enhance learner motivation, improve retention of knowledge, and facilitate the development of professional communication skills [9].

In summary, the historical development of Virtual and Augmented Reality technologies reflects a gradual transition from experimental mechanical systems to sophisticated digital environments capable of supporting complex professional and educational tasks. The contributions of early pioneers such as Heilig and Sutherland, together with modern researchers in immersive learning and human-computer interaction, have established VR and AR as powerful tools for innovation in education. The growing accessibility of these technologies and their proven effectiveness in professional training suggest that they will continue to play a significant role in the modernization of educational systems and the development of professionally-oriented competencies.

Nowadays online simulations used in the development of professionally-oriented foreign language competence can be classified into several categories depending on their technological complexity, pedagogical design, and communicative focus.

These include role-play simulations, VR and AR immersive environments, scenario-based decision-making tasks, game-based learning systems, video-based interactive simulations, AI-driven conversational agents, and collaborative or project-based simulations. Each type contributes differently to competence formation by enhancing linguistic accuracy, communicative fluency, professional terminology acquisition, and intercultural interaction skills. The integration of these simulation types into foreign language instruction supports experiential



learning and bridges the gap between theoretical knowledge and real professional communication contexts [14].

The implementation of online simulations and VR/AR technologies in developing professionally-oriented foreign language competence relies on a wide range of digital platforms. These include learning management systems (LMS), immersive VR environments, AR mobile applications, AI-driven conversational tools, scenario-based simulation platforms, video interaction systems, game-based learning environments, and collaborative communication tools. Each platform type serves specific pedagogical functions, supporting different aspects of foreign language competence such as speaking fluency, professional vocabulary acquisition, intercultural communication, and decision-making skills. The integration of these platforms into foreign language education enhances the authenticity, interactivity, and effectiveness of professionally-oriented learning [4].

Table 1

Types of Platforms Used for Online Simulations and VR/AR in Developing Professionally-Oriented Foreign Language Competence

Type of Platform	Description	Examples	Educational Use in Foreign Language Learning	Key Competences Developed
Learning Management Systems (LMS)	Platforms for organizing courses, tasks, and assessments with integration of simulation activities.	Moodle, Canvas, Google Classroom	Hosting role-plays, assignments, video simulations, and collaborative tasks.	Writing, reading, task management, professional communication
VR Learning Platforms	Systems that provide fully immersive virtual environments for training and interaction.	Engage VR, ClassVR, Mozilla Hubs	Virtual meetings, professional role-play, immersive situational communication.	Speaking fluency, situational competence, confidence
AR Learning Platforms	Mobile or wearable systems that overlay digital content onto real-world environments.	Google ARCore, Apple ARKit, Merge Cube apps	Vocabulary labeling, technical instruction, contextual language learning.	Vocabulary acquisition, contextual understanding



Type of Platform	Description	Examples	Educational Use in Foreign Language Learning	Key Competences Developed
AI Conversational Platforms	AI-based systems for dialogue practice and communication simulation.	ChatGPT-based tools, Elsa Speak, Mondly, Duolingo Max	Simulated interviews, client interaction, language practice conversations.	Speaking fluency, pronunciation, discourse competence
Simulation & Scenario-Based Platforms	Platforms designed for branching scenarios and decision-making tasks.	Simul8, VirBELA, GoReact	Crisis communication, business negotiations, professional decision tasks.	Critical thinking, professional communication, writing
Video Interaction Platforms	Tools that allow interactive video-based learning with embedded tasks.	Edpuzzle, H5P, Flip (Flipgrid)	Workplace communication analysis, listening tasks, role-based responses.	Listening comprehension, discourse analysis
Game-Based Learning Platforms	Platforms that use game mechanics for educational simulations.	Kahoot!, Minecraft Education Edition, Classcraft	Business simulations, teamwork tasks, language quests.	Motivation, collaboration, vocabulary development
Collaborative Communication Platforms	Tools for real-time communication and teamwork in virtual environments.	Zoom, Microsoft Teams, Google Meet	Virtual meetings, negotiations, group projects in foreign language.	Speaking interaction, intercultural competence
Virtual Reality Social Spaces	3D social environments for interaction and communication.	Spatial.io, AltspaceVR (legacy), VRChat	Virtual conferences, academic discussions, professional networking.	Communication fluency, intercultural awareness
Specialized Professional Simulation Platforms	Industry-specific training platforms adapted for education.	Oxford Medical Simulation, Labster, VirBELA enterprise	Medical, scientific, business, or technical communication training.	Professional discourse, domain-specific vocabulary



Virtual Reality (VR) and Augmented Reality (AR) are immersive technologies that have significantly influenced modern educational practices, particularly in skill-based and professionally-oriented learning. Although both technologies aim to enhance interaction with digital content, they differ fundamentally in the degree of immersion and the way virtual elements are integrated into the learning environment [11].

Recent studies of P. Milgram, H. Takemura, A. Utsumi, F. Kishino, F. have shown that Virtual Reality (VR) refers to a fully immersive, computer-generated environment that replaces the real world with a simulated one. Users typically interact with VR environments through head-mounted displays and motion-tracking devices, which create a sense of presence in a completely artificial space. In educational contexts, VR enables learners to experience realistic professional situations such as virtual laboratories, medical procedures, engineering operations, or communication in simulated workplaces [8]. Augmented Reality (AR), in contrast, does not replace the real world but enhances it by overlaying digital information onto the physical environment. AR applications typically use smartphones, tablets, or smart glasses to project interactive visual elements, text, or 3D objects into real-world settings. In foreign language learning, AR can support vocabulary acquisition, contextualized instruction, and task-based learning by connecting linguistic input with real-life objects and situations.

The key difference between VR and AR lies in the level of immersion: VR creates a fully synthetic environment, while AR integrates digital elements into the real world. Both technologies, however, contribute to experiential learning and support the development of professionally-oriented foreign language competence by simulating authentic communicative contexts [11].

Scolar L. Popova's findings *Immersive Technologies as a Modern Educational Strategy for Training Future Specialists* demonstrate that immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) have significantly influenced modern educational practices, particularly in skill-based and professionally-oriented learning. Although both technologies aim to enhance interaction with digital content, they differ fundamentally in the degree of immersion and the way virtual elements are integrated into the learning environment [11].

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Table 2

Kinds of Online Simulations in Developing Professionally-Oriented Foreign Language Competence

Type of Online Simulation	Definition	Examples in Professional Foreign Language Learning	Main Competences Developed
Role-play simulations	Structured communicative activities where learners assume professional roles in interactive scenarios.	Doctor–patient dialogue, translator–client meeting, business negotiation, military briefing.	Speaking fluency, pragmatic competence, professional vocabulary
Scenario-based simulations	Problem-oriented simulations with a defined situation requiring decisions and communication.	Crisis management, customer complaints, emergency response communication.	Critical thinking, decision-making, professional communication
AI-driven conversational simulations	Interaction with artificial intelligence systems simulating human interlocutors.	Virtual interviewer, academic supervisor, client communication chatbot.	Speaking practice, discourse competence, fluency
Video-based interactive simulations	Simulations built on videos with embedded tasks and branching questions.	Workplace communication videos, professional interviews, case discussions.	Listening comprehension, situational vocabulary, comprehension strategies
Game-based simulations (serious games)	Learning through structured game mechanics simulating professional tasks.	Business strategy games, logistics planning, language mission games.	Motivation, teamwork, problem-solving, lexical development



Type of Online Simulation	Definition	Examples in Professional Foreign Language Learning	Main Competences Developed
Task-based simulations	Completion of real-world professional tasks using a foreign language.	Writing reports, preparing presentations, translating documents.	Writing competence, professional discourse, accuracy
Collaborative online simulations	Group-based simulations requiring teamwork in virtual environments.	International project meetings, research collaboration, negotiations.	Collaboration, intercultural competence, negotiation skills
Virtual Reality (VR) simulations	Fully immersive 3D environments replicating professional contexts.	Virtual hospital, airport, courtroom, military base simulation.	Communicative competence, situational language use, confidence
Augmented Reality (AR) simulations	Real-world environments enhanced with digital overlays and instructions.	AR-guided technical training, vocabulary labeling in real contexts.	Contextual vocabulary acquisition, professional terminology
Hybrid simulations	Combination of classroom instruction and digital simulation environments.	Pre-task preparation + VR scenario + online reflection activities.	Integrated communicative competence, adaptability

Research by S. Amelina, R. Tarasenko, S. Semerikov and Y. Kazhan indicates that the incorporation of VR/AR technologies into foreign language curricula should be aligned with competence-based and learner-centered approaches. First, immersive technologies should be introduced gradually, beginning with simple digital simulations and progressing toward more complex VR-based environments. This staged integration ensures that both students and educators adapt effectively to new learning tools [1].

Second, VR/AR activities should be directly linked to professionally-oriented learning outcomes.

For example, in language courses for future specialists in medicine, engineering, military translation, or business, VR environments can simulate authentic workplace interactions such as consultations, negotiations, briefings, or technical problem-solving tasks. This alignment ensures that language learning is not isolated but embedded within professional contexts. Scholars R. Kaplan-Rakowski, T. Thrasher highlight the importance of the impact of high-immersion virtual reality and interactivity on vocabulary learning [7].

Third, curriculum designers should ensure the integration of VR/AR into existing modules rather than treating them as separate or optional tools. This



promotes continuity in learning and reinforces the development of communicative, intercultural, and professional competencies [3].

Scholars Y. Rudnik, L. Petryk, N. Koshar na, A. Dzurulo, L. Popova highlight the importance of the students' awareness considering the academic integrity of artificial intelligence use in terms of foreign language acquisition. Effective use of VR/AR technologies requires teachers to adopt new instructional roles, shifting from knowledge transmitters to facilitators of interactive and experiential learning. Educators should receive targeted training in digital pedagogy, simulation design, and technology-assisted language instruction [12].

It is recommended that teachers carefully select or design VR/AR tasks based on specific learning objectives, ensuring that each activity has clear linguistic and professional outcomes. Pre-task preparation is essential to introduce vocabulary, contextual knowledge, and communicative strategies, while post-task reflection should focus on analyzing language use, problem-solving strategies, and intercultural aspects of communication. Online simulations used in the development of professionally-oriented foreign language competence represent a wide range of pedagogical tools that combine communication, problem-solving, and experiential learning. They include role-play and scenario-based simulations, AI-driven conversational systems, video-based interactive environments, serious games, task-based activities, collaborative online projects, and immersive VR/AR environments .

One effective application of VR technology is the simulation of *virtual professional meetings*, where learners participate in realistic scenarios such as business negotiations, diplomatic discussions, or military briefings. These environments allow students to practice formal communication, turn-taking strategies, and domain-specific terminology in real time.

Another example includes *scenario-based simulations*, where learners are placed in decision-making contexts that require problem-solving in a foreign language. For instance, students may analyze a crisis situation in a virtual environment and communicate solutions collaboratively, thereby enhancing both linguistic and critical thinking skills. AR technologies can be used in *interactive case studies*, where learners receive real-time digital overlays of instructions, vocabulary support, or contextual information while performing tasks. For example, engineering or medical students may use AR applications to identify objects, follow procedural steps, or interpret professional documentation in a foreign language.

Additionally, *virtual role-play environments* enable learners to assume professional identities such as translators, healthcare workers, engineers, or military officers. These role-based tasks foster communicative authenticity and encourage the use of specialized vocabulary in contextually meaningful



situations. Each type contributes to different aspects of competence formation, including linguistic accuracy, communicative fluency, professional vocabulary acquisition, intercultural awareness, and decision-making skills. Their integration into foreign language teaching enhances authenticity, motivation, and the effectiveness of professionally-oriented language learning .

Furthermore, scholars L. Hladkoskok, O. Petrenko, A. Matychak, Y. Sobkov, Z. Cherska think that integration of professional expertise and digital solutions for effective language communication in foreign language teaching-educators should consider cognitive load and accessibility issues when implementing immersive technologies. Overly complex environments may distract learners from linguistic objectives; therefore, balance between technological immersion and pedagogical clarity is essential [6].

Table 3

**Advantages and Disadvantages of Online Simulations and VR/AR
in Developing Professionally-Oriented Foreign Language Competence**

Dimension	Advantages	Disadvantages
Professional authenticity	Creates realistic professional environments (meetings, negotiations, medical, technical, military contexts), supporting real-life language use.	Simulated environments may not fully replicate real workplace unpredictability and pressure.
Language competence development	Enhances speaking, listening, and interaction skills through contextualized communication.	Limited focus on writing accuracy unless specifically designed into tasks.
Vocabulary acquisition	Promotes acquisition of domain-specific and professional terminology in meaningful contexts.	Risk of fragmented vocabulary learning without systematic reinforcement.
Learner engagement and motivation	Increases motivation through interactive, immersive, and game-like learning experiences.	Initial novelty effect may decrease over time if tasks become repetitive.
Experiential learning	Supports “learning by doing,” improving retention and practical language application.	Requires well-designed scenarios; poorly structured simulations reduce effectiveness.
Intercultural competence	Simulates international communication and cross-cultural professional interaction.	Cultural representations may be simplified or stereotypical in some simulations.
Safety and risk-free practice	Allows students to practice high-stakes professional situations without real consequences.	May create artificial sense of security compared to real-world communication stress.



Dimension	Advantages	Disadvantages
Collaboration and communication	Encourages teamwork, negotiation, and group problem-solving in digital environments.	Technical issues may disrupt communication and reduce interaction quality.
Feedback and learning support	Provides immediate feedback and adaptive learning pathways in many systems.	Not all platforms offer high-quality pedagogical feedback; some are purely technical.
Accessibility and cost	Online simulations can be accessible remotely; AR via mobile devices increases flexibility.	VR/AR systems require expensive hardware and stable technological infrastructure.
Teacher role and training	Encourages innovative, student-centered teaching approaches.	Requires significant teacher training and digital competence development.
Technical and physical factors	High immersion can improve focus and engagement in well-designed systems.	Possible technical barriers, cognitive overload, fatigue, or motion sickness.

Conclusion. In conclusion, the integration of VR/AR and online simulations into foreign language education significantly enhances the development of professionally-oriented foreign language competence. These technologies provide realistic communicative contexts, increase learner motivation, and support active, experiential learning. However, their successful implementation depends on well-structured curriculum design, teacher training, and pedagogically sound task development. When effectively applied, immersive technologies can transform traditional language instruction into a dynamic, practice-oriented, and professionally relevant learning process.

References

1. Amelina, S., Tarasenko, R., Semerikov, S. and Kazhan, Y. Teaching Foreign Language Professional Communication using Augmented Reality Elements. In Proceedings of the 1st Symposium on Advances in Educational Technology (AET 2020) - Volume 1, pages 714-725
2. Bower, M., Howe, C., McCredie, N., Robinson, A., and Grover, D. (2014). Augmented reality in education – cases, places and potentials. *Educational Media International*, 51(1):1–15.
3. Dede, C. (2009). Immersive interfaces for engagement and learning. *Science*, 323(5910), 66–69. <https://doi.org/10.1126/science.1167311>
4. Godwin-Jones, R. (2016). Augmented reality and language learning: From annotated vocabulary to placebased mobile games. *Language Learning & Technology*, 20(3):9–19. URL:<https://scholarspace.manoa.hawaii.edu/bitstream/10125/44475/1/20>
5. Heilig, M. (1962). Sensorama simulator. U.S. Patent No. 3,050,870. URL: <https://patents.google.com/patent/US3050870A>



6. Hladkoskok, L., Petrenko, O., Matiychak, A., Sobkov, Y., & Cherska, Z. (2025). Integration of professional expertise and digital solutions for effective language communication in foreign language teaching. *Revista on line de Política e Gestão Educacional*, 29(esp4), e025100. <https://doi.org/10.22633/rpge.v29.iesp4.20769>
7. Kaplan-Rakowski R, Thrasher T (2023) The Impact of High-Immersion Virtual Reality and Interactivity on Vocabulary Learning. *Smart Learn Environ* 10. <https://doi.org/10.1186/s40561-023-00263-9>
8. Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (1995). Augmented reality: A class of displays on the reality–virtuality continuum. In *Telem manipulator and Telepresence Technologies* (Vol. 2351, pp. 282–292). SPIE. <https://doi.org/10.1117/12.197321>
9. Palamar S., Brovko K., Semerikov S. 2023. Enhancing Foreign Language Learning in Ukraine: Immersive Technologies as Catalysts for Cognitive Interest and Achievement. *CEUR Workshop Proceedings (CEUR-WS.org)* 3624. Pp. 69-81 UROL: <https://lib.iitta.gov.ua/id/eprint/741724/1/>
10. Pavlenko, O.O., Bondar, O.Ye., Yon, B.G., Kwangoon, Ch., Tymchenko-Mikhailidi, N.S., Kassim, D.A.: The enhancement of a foreign language competence: free online resources, mobile apps, and other opportunities . In: Kiv, A.E., Soloviev, V.N. (eds.) *Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018)*, Kryvyi Rih, Ukraine, December 21, 2018. *CEUR Workshop Proceedings* 2433, 279–293. URL: <http://ceur-ws.org/Vol2433/paper18.pdf>
11. Popova, L. Immersive Technologies as a Modern Educational Strategy for Training Future Specialists. *Педагогічна освіта: теорія і практика. Психологія. Педагогіка.* № 42 (2) 2024. С. 90–104 DOI: <https://doi.org/10.28925/2311-2409.2024.427>
12. Rudnik Y., Petryk L., Kosharna N., Dzurulo A., Popova L. The students' awareness considering the academic integrity of artificial intelligence use in terms of foreign language acquisition. *Brazilian Journal of Education, Technology and Society (BRAJETS)* (17). с. 50-60. <https://dx.doi.org/10.14571/brajets.v17.nse3.2024>
13. Sutherland, I. E. (1968). A head-mounted three dimensional display. In *Proceedings of the Fall Joint Computer Conference* (pp. 757–764). ACM. URL: <https://doi.org/10.1145/1476589.1476686>
14. Wang J, Mokmin N. Virtual reality technology in art education with visual communication design in higher education: A systematic literature review. *Educ Inf Technol.* 2023;28:15125–15143. <https://doi.org/10.1007/s10639-023-11845-y>

Література

1. Amelina, S., Tarasenko, R., Semerikov, S. and Kazhan, Y. Teaching Foreign Language Professional Communication using Augmented Reality Elements. In *Proceedings of the 1st Symposium on Advances in Educational Technology (AET 2020) - Volume 1*, pages 714-725
2. Bower, M., Howe, C., McCredie, N., Robinson, A., and Grover, D. (2014). Augmented reality in education – cases, places and potentials. *Educational Media International*, 51(1):1–15.
3. Dede, C. (2009). Immersive interfaces for engagement and learning. *Science*, 323(5910), 66–69. <https://doi.org/10.1126/science.1167311>
4. Godwin-Jones, R. (2016). Augmented reality and language learning: From annotated vocabulary to placebased mobile games. *Language Learning & Technology*, 20(3):9–19. URL: <https://scholarspace.manoa.hawaii.edu/bitstream/10125/44475/1/20>



5. Heilig, M. (1962). Sensorama simulator. U.S. Patent No. 3,050,870. URL: <https://patents.google.com/patent/US3050870A>
6. Hladkoskok, L., Petrenko, O., Matychak, A., Sobkov, Y., & Cherska, Z. (2025). Integration of professional expertise and digital solutions for effective language communication in foreign language teaching. *Revista on line de Política e Gestão Educacional*, 29(esp4), e025100. https://doi.org/10.22633/rpge.v29_iesp4.20769
7. Kaplan-Rakowski R, Thrasher T (2023) The Impact of High-Immersion Virtual Reality and Interactivity on Vocabulary Learning. *Smart Learn Environ* 10. <https://doi.org/10.1186/s40561-023-00263-9>
8. Milgram, P., Takemura, H., Utsumi, A., & Kishino, F. (1995). Augmented reality: A class of displays on the reality–virtuality continuum. In *Telem manipulator and Telepresence Technologies* (Vol. 2351, pp. 282–292). SPIE. <https://doi.org/10.1117/12.197321>
9. Palamar S., Brovko K., Semerikov S. 2023. Enhancing Foreign Language Learning in Ukraine: Immersive Technologies as Catalysts for Cognitive Interest and Achievement. *CEUR Workshop Proceedings (CEUR-WS.org)* 3624. Pp. 69-81 UROL: <https://lib.iitta.gov.ua/id/eprint/741724/1/>
10. Pavlenko, O.O., Bondar, O.Ye., Yon, B.G., Kwangoon, Ch., Tymchenko-Mikhailidi, N.S., Kassim, D.A.: The enhancement of a foreign language competence: free online resources, mobile apps, and other opportunities . In: Kiv, A.E., Soloviev, V.N. (eds.) *Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018)*, Kryvyi Rih, Ukraine, December 21, 2018. *CEUR Workshop Proceedings* 2433, 279–293. URL: <http://ceur-ws.org/Vol2433/paper18.pdf>
11. Popova, L. Immersive Technologies as a Modern Educational Strategy for Training Future Specialists. *Педагогічна освіта: теорія і практика. Психологія. Педагогіка.* № 42 (2) 2024. С. 90–104 DOI: <https://doi.org/10.28925/2311-2409.2024.427>
12. Rudnik Y., Petryk L., Kosharna N., Dzurulo A., Popova L. The students' awareness considering the academic integrity of artificial intelligence use in terms of foreign language acquisition. *Brazilian Journal of Education, Technology and Society (BRAJETS)* (17). с. 50-60. <https://dx.doi.org/10.14571/brajets.v17.nse3.2024>
13. Sutherland, I. E. (1968). A head-mounted three dimensional display. In *Proceedings of the Fall Joint Computer Conference* (pp. 757–764). ACM. URL: <https://doi.org/10.1145/1476589.1476686>
14. Wang J, Mokmin N. Virtual reality technology in art education with visual communication design in higher education: A systematic literature review. *Educ Inf Technol.* 2023;28:15125–15143. <https://doi.org/10.1007/s10639-023-11845-y>

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