

^{1,4} Assel Karimova*, ² Nataliia Fominykh, ³ Kundyz Mukatayeva,
⁴ Gulmira Tulekova

¹ Pavlodar Pedagogical University named after Alkey Margulan, Pavlodar, Kazakhstan

² Plekhanov Russia University of Economics, Moscow, Russia

³ M.Narikbayev KazGUU University, Astana, Kazakhstan

⁴ Toraighirov University, Pavlodar, Kazakhstan

BLENDING AI AND VR TECHNOLOGIES FOR CREATING A FOREIGN LANGUAGE LEARNING ENVIRONMENT AND DEVELOPING COMMUNICATIVE COMPETENCE

Abstract. This study investigates the integration of artificial intelligence (and virtual reality technologies as pedagogical tools for enhancing communicative competence and creating a foreign language learning environment. Conducted with 35 university students, the research employed a pre- and post-test design to measure progress across four criteria: fluency, accuracy, lexical range, and communication. The blended use of ChatGPT, structured through the AUTOMAT framework and immersive VR resources provided the simulation of real-life communication experiences. The results revealed a significant improvement in overall performance, with the mean score increasing from 12.14 to 15.50 out of 20. The findings prove that combining AI and VR technologies offers effective conditions for creating a foreign language learning environment and serves as a promising approach for communicative language teaching in higher education.

Keywords: foreign language learning environment, communicative competence, artificial intelligence, virtual reality, educational process.

Introduction

The English language plays a vital role in education and has become essential in developing a shared understanding of global cultures and perspectives (Chaiyasat & Intakaew, 2023). In Kazakhstan, effective English language education serves as a foundation for fostering cross-cultural understanding, facilitating international cooperation and enhancing a nation's competitiveness in the global arena (Kunanbayeva, 2013). Thus, English serves as both a medium of academic communication and an instrument for accessing international knowledge, research, and professional mobility. The State Compulsory Standard of Higher and Postgraduate Education outlines clear expectations for the development of students' functional level of communicative competence across academic, professional, interpersonal, and intercultural domains (MoSHE RK, 2022).

However, despite these clearly formulated requirements, one of the most persistent challenges in non-English-speaking countries is the limited exposure to an authentic language environment, resulting in restricted opportunities for students to engage in the target language. Consequently, the creation of a pedagogically modelled foreign language learning environment (FLLE) becomes essential for supporting communicative competence development, especially in contexts where interaction with native speakers is scarce.

As noted by Furmanova (2014), the language environment consists of two key components: the instructional and illustrative materials used by the teacher to immerse students in the linguistic and cultural reality of the target language and communicative interaction carried out in the target language during classroom activities.

Poholkov and Goryanova (2022) conceptualize the language environment as a didactic system of pedagogically organized conditions that stimulate communicative competence development and compensate for the absence of natural linguistic surroundings.

Kazakhstani scholars similarly emphasize that such an environment does not arise spontaneously and must therefore be intentionally designed. Ermekbayeva (2020) argues that limited exposure to authentic linguistic context slows learners' transition from reproductive to productive language use, making it necessary to design an environment enriched with meaningful communicative tasks, multimodal resources and opportunities for dialogic interaction. Akhmedova (2014) likewise maintains that modelling a realistically functioning information and linguistic space is one that ensures continuous immersion both during classroom instruction and in extracurricular contexts and serves as a crucial mechanism for mastering a non-native language.

Overall, these theoretical perspectives demonstrate that the creation of a pedagogically grounded FLLE is a necessary precondition for developing communicative competence in contexts where natural immersion is limited or absent.

Building on this understanding, blending AI and VR technologies offers a particularly promising solution. AI-powered conversational tools can simulate the main elements of real communication by offering context relevant interaction, helpful guidance, and ongoing feedback that adapts to each student's level. VR technologies, in turn, provide immersive and realistic settings that mirror everyday, academic, and professional communication. When combined, AI and VR create a learning space that closely resembles natural language immersion, encourages active participation and supports the sustained development of communicative competence.

Therefore, the integration of AI and VR technologies represents a theoretically grounded and practically significant approach to addressing the challenge of limited linguistic exposure in the Kazakhstani educational context. This study aims to examine how AI-driven interaction and VR-based immersion can support the creation of an effective FLLE and contribute to the development of students' communicative competence.

Literature Review

The theoretical framework of communicative competence proposed by Canale and Swain (1980) encompasses not only grammatical accuracy but also includes the ability to choose appropriate language in different situations, understand connected speech and apply strategies when communication becomes difficult. As Richards (2006) points out, learners need to be engaged in communicative activities that help them practice speaking, listening, reading, writing and even thinking in a natural way so that these components can develop together.

Developing these skills, however, can be difficult in traditional classroom settings. Nunan (1991) notes that, although teachers try to create activities that feel authentic, the classroom itself is never fully "real" because genuine communication is unpredictable and cannot be completely recreated in a controlled learning environment. As a result, students often receive only limited opportunities to practice language in situations that resemble real communication.

A similar idea is supported by Lou (2025), who argues that traditional methods lack the immersive and interactive qualities necessary for developing real-world communicative skills. These limitations highlight the need for tools and approaches that can offer more realistic, interactive and meaningful practice. Such conditions can be simulated with the help of well-designed AI-based learning and VR environments.

Ma (2021) believes that VR technology can be a useful tool for teachers implementing immersive teaching. It creates a genuine, immersive learning environment that transcends time and space, allowing students to acquire new knowledge in a new "real" setting.

Additional support was seen in the research of Ayasheva and Nurkenova (2025). According to them, VR technologies create opportunities for modeling real speech situations, which contributes to the development of practical communication skills.

According to Lou (2025), VR has become an influential tool in language education because it creates immersive and engaging conditions that support real communication practice. The study examined how students develop English language skills in VR environments and found that immersive tasks helped to improve learners' listening, speaking and overall communication ability.

Another advantage of VR technology is its engaging nature and interactive features that make the learning process more appealing for students, which result in better speaking skills (Lu, 2025).

Similarly, Devitska (2019) notes that one of the most valuable uses of VR technology is its ability to imitate the socio-cultural reality of the target language. The scholar highlights the importance of virtual presence, explaining that VR creates an immediate, interactive setting in which learners feel connected to both the moment and the surrounding environment. The author also emphasizes that AI tools enhance these VR environments by influencing not only audio and visual perception but also enabling interaction, which contributes to more effective language and culture acquisition.

The learning process may now be interactively organized and students' communicative competences can be developed with the help of AI technologies (Perez & Roberts, 2021). In this regard, AI, particularly in the form of voice recognition software and automated dialogue-generating models like ChatGPT, presents a new frontier in addressing the communicative gap in language education. Conversational AI tools can function as interactive agents, capable of engaging in contextually relevant conversation, correcting learners' errors, modelling nativelike responses and adapting to learners' levels.

Both technologies have demonstrated considerable potential for enhancing learners' engagement and linguistic performance. However, the blending of AI and VR holds the greatest promise for creating effective FLLE conducive to the development of communicative competence. For instance, in the study of Tobias et al. (2025), the experimental group students were offered training through Meta Quest 3 headsets and the Virtual Speech platform. Criteria such as speaking speed, eye contact, listenability, filler words, substance and body language were used to assess communication abilities. Significant progress was made by the experimental group, demonstrating the effectiveness of the created learning environment. According to these findings, AI and VR can improve learning outcomes by providing engaging experiences and real-time feedback.

Another research work describes an AI-powered language learning system that blends gamification and immersive VR technology to investigate different methods in language instruction. The system was created for learners of Japanese and recreates a virtual version of Tokyo, where users can communicate with AI-driven characters, buy items in shops and ask for directions. By placing students in everyday situations, it helps them to develop practical communication skills and provides useful vocabulary support and immediate feedback. The program also strengthens language learning by offering contextualized conversations and adjusting the difficulty of tasks and vocabulary depending on the learner's progress. The study showed that students became more motivated and demonstrated noticeable improvements in their language proficiency (Zhang, 2025).

Moreover, Godwin-Jones (2025) states that AI-powered VR is probably going to have a significant impact on language acquisition in the long run, offering learners fascinating new options and encouraging educators to reconsider conventional methods of instruction. Such prospects provide a compelling rationale for further research into the pedagogical applications of these technologies.

Despite the growing interest in AI and VR technologies in language education, their effectiveness is not always consistent and remains subject to ongoing debate. For example, Makransky et al. (2021) demonstrated that while immersive VR environments significantly increase learners' engagement, motivation, and sense of presence, they do not necessarily lead to improved learning outcomes compared to less immersive formats. Similarly, Yu et al. (2025) found that higher levels of immersion do not automatically result in better knowledge acquisition, as the effectiveness of VR depends on instructional design and the type of learning outcomes targeted.

In addition to VR-related limitations, the use of AI in education also raises important concerns. Klimova and Pikhart (2025) emphasize that although AI tools offer opportunities for personalized and interactive learning, their excessive use may lead to digital fatigue, technostress and reduced face-to-face communication. Such tendencies may negatively affect students' interpersonal skills and emotional intelligence, potentially resulting in social isolation.

All these findings suggest that the pedagogical value of AI and VR technologies is not determined solely by their technological capabilities but largely depends on how they are integrated into the learning process. This highlights the need for structured and pedagogically grounded approaches to their implementation.

In this regard, beyond its theoretical contribution, this study offers important practical implications for language education. The proposed AI-VR framework can be applied to design authentic, context-rich learning experiences that replicate real-life scenarios, which will be particularly useful for educators and scholars involved in advancing foreign language education in Kazakhstan and worldwide.

Materials and Methods

The study employed a pre-test–post-test design with a single group of 35 participants. All students were exposed to the AI- and VR-enhanced instructional intervention, and their communicative performance was assessed at two stages: prior to and following the intervention.

The intervention was conducted over a 15-week instructional period. During this time, students regularly engaged in AI-mediated communicative activities, including constructing dialogues and participating in interactive tasks using ChatGPT (GPT-4 model, OpenAI). To enhance contextualization and support deeper engagement, immersive virtual environments were integrated into the learning process. These environments provided situational contexts that encouraged more meaningful interaction and facilitated the development of communicative competence. This design made it possible to track the dynamics of students' performance over time and to identify measurable progress in communicative skills as a result of the implemented instructional approach.

Research design. The study employed a pre-test–post-test design with a single group of participants. All students were exposed to the AI- and VR-enhanced instructional intervention, and their performance before and after the intervention was compared. Such a design allows for clearly tracking the dynamics of students' communicative competence and identifying measurable progress within the group over time. The chosen methodology prioritizes accessibility, using widely available digital tools that do not require specialized equipment, thereby facilitating practical implementation in diverse educational contexts, including tertiary education institutions in Kazakhstan. In this study, VR is understood in a broader pedagogical sense as the use of interactive virtual environments that simulate real-life communicative contexts. The tools employed (e.g., Google Earth, 360 Cities, and The Secret Door) provide visual and situational immersion without the use of specialized hardware such as head-mounted displays.

Accordingly, the study focuses on accessible forms of virtual immersion that support communicative practice, rather than fully immersive VR systems.

Objectives. The primary aim of this research is to assess the effectiveness of AI- and VR-enhanced learning activities in fostering communicative competence among university students and determine their role in creating an FLLE in university classrooms.

Participants. The study involved a group of students of Pavlodar Pedagogical University named after Alkey Margulan, with a total of 35 participants. The experimental group received instruction integrating AI and VR technologies. All participants were comparable in terms of their general English proficiency level, academic background, and age range, ensuring the reliability of the results. The participation in the experiment was voluntary, and students were informed about the research objectives prior to data collection.

Instruments. To carry out the intervention, particular attention was given to the use of the AUTOMAT framework, which served as the foundation for designing structured prompts provided to students. Within this framework, ChatGPT was employed to facilitate dialogic interaction and conversational practice, enabling students to engage in simulated real-life communication even in the absence of native speakers. At the same time, immersive technologies such as Google Earth, 360 cities and the Secret Door were utilized to create authentic environments. Additionally, to evaluate the students' communicative abilities, a grading rubric was adapted and modified on the basis of earlier rubrics (Vercellotti & McCormick, 2021; Kanoksilpatham & Takrudkaew, 2025). The 20-point rubric evaluates four elements: fluency, accuracy, lexical range and communication. Each is scored on a five-band scale (table 1).

Table 1
Scoring rubric to evaluate student' interaction

Criteria	5	4	3	2	1
Fluency	Speaks smoothly, with no pauses and/or hesitations.	Speaks with one or two pauses and/or hesitations which do not affect understanding.	Speaks with some pauses and/or hesitations which sometimes affect understanding.	Speaks with frequent pauses and/or hesitations which often affect understanding.	Speaks with many pauses and/or hesitations which severely affect understanding.
Accuracy	Accurate grammar with no errors. Sentences are well-structured and correct.	Accurate grammar with only minor errors, which do not impede communication.	Fairly accurate grammar with some noticeable errors, which sometimes impede communication	Inaccurate grammar with frequent mistakes, which often impede communication	Major inaccuracies in grammar that severely impede communication
Lexical range	Uses a wide range of vocabulary, including most of the recently introduced words/phrase from the unit. Vocabulary fits the context.	Uses a good range of vocabulary, including several recently introduced words/phrase from the unit. Vocabulary generally fits the context.	Uses a limited range of vocabulary, including some of the recently introduced words/phrase from the unit. Vocabulary sometimes fits the context.	Uses a limited range of vocabulary, including a few or no recently introduced words/phrase from the unit. Vocabulary often does not fit the context.	Uses only basic vocabulary, with no evidence of recently introduced words/phrase from the unit. Vocabulary does not fit the context.
Communication	Actively keeps the	Mostly keeps the	Sometimes keeps the	Rarely keeps the	Cannot keep the

	conversation going by asking and answering questions. Speaks with a natural and fluent rhythm. Demonstrates interest in the interlocutor's responses and maintains good eye contact.	conversation going by answering questions and sometimes asking back. Speaks quite naturally. Demonstrates interest in the interlocutor's responses and maintains good eye contact.	conversation going, but often gives short answers. Eye contact and interest in the interlocutor's responses are inconsistent.	conversation going; gives very short answers, avoids eye contact and hardly demonstrates interest in the interlocutor's responses.	conversation going; gives one-word answers or stays silent, avoids eye contact and doesn't demonstrate interest in the interlocutor's responses.
--	--	--	---	--	--

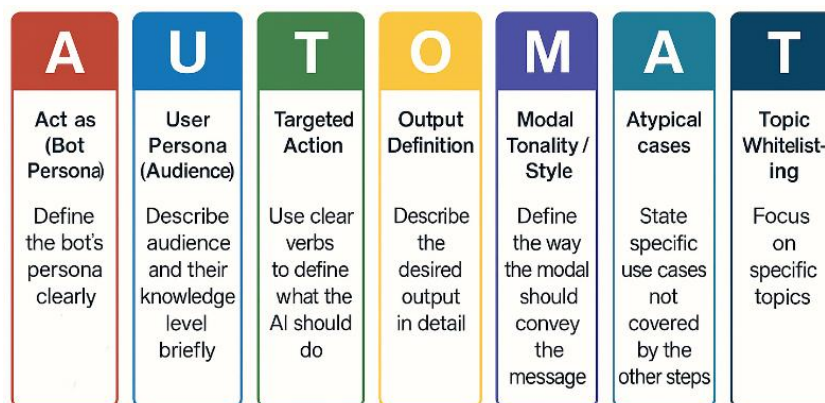
Procedure. The experimental procedure was organized in three consecutive stages (pre-test, intervention, post-test) to ensure systematic evaluation of students' communicative competence.

Pre-test stage. At the beginning of the experiment, students' communicative competence was measured through an oral interaction task. Each participant engaged in a structured dialogue that was evaluated according to predetermined criteria (fluency, accuracy, lexical range and the ability to maintain interaction). This assessment established the baseline level of communicative skills prior to the intervention.

Intervention stage. In the second stage, students participated in a series of instructional sessions designed to enhance their communicative competence. During these classes, they were introduced to the AUTOMAT framework as a guiding structure for generating prompts in ChatGPT. This framework allowed students to create coherent dialogues and polylogues while engaging in conversational practice with AI.

The AUTOMAT framework, originally introduced and popularized by M. Vogel (2024) in his practical guide on prompt engineering, allows a structured approach to designing effective prompts. Its application in the present study ensured consistency in prompt formulation and provided students with a step-by-step guide for engaging in authentic, goal-oriented conversations with ChatGPT. The detailed breakdown of the acronym AUTOMAT is illustrated in Figure 1.

Figure 1
The description of the AUTOMAT acronym components



In practice, this involves defining the assistant's role (A), who it's interacting with (U), the purpose of the interaction (T), what information it should deliver (O), how it should communicate (M), how to handle unusual situations (A), and what topics are relevant (T). Such

a structure guarantees clarity, consistency, and pedagogical efficiency when using ChatGPT as a tool for language learning.

Following the introduction of the AUTOMAT framework, the experimental activities were designed to integrate its application into practical classroom sessions. Within the thematic unit, the students were provided with a set of vocabulary words and key phrases directly related to the topic. Prior to the experimental task, systematic preparatory work was conducted: the target vocabulary was introduced, practiced, and reinforced through a range of lexical, grammatical and pronunciation exercises. This ensured that students acquired not only the semantic understanding of the terms but also the ability to apply them in communicative contexts. For instance, as part of the “Health and Medicine” module, students were required to construct a dialogue with ChatGPT on the topic “At the Doctor’s Office” employing the previously practiced vocabulary such as *to feel unwell, to have a fever, to examine, symptoms, to take one’s pulse and temperature, to take one’s blood pressure, to ache, to prescribe medication, side-effects, tablets/pills, treatment options, to have some more tests, get better, (to have) a check-up*. The example of the prompt is given in table 2:

Table 2

A sample prompt constructed on the basis of the AUTOMAT framework

You should act as a family doctor in a medical consultation (A). The student will act as a patient describing his/her health problems (U). Generate a role-play dialogue between a doctor and a patient, help the student to practice vocabulary related to Health and Medicine such as *to feel unwell, to have a fever, to examine, symptoms, to take one’s pulse and temperature, to take one’s blood pressure, to ache, to prescribe medication, side-effects, tablets/pills, treatment options, to have some more tests, get better, (to have) a check-up* (but not necessarily in this order). Check if the student uses medical vocabulary correctly, applies proper grammar, and keeps the dialogue coherent (T). The doctor should ask questions, provide advice, and simulate an authentic medical interaction (O). The doctor is polite, professional, empathetic, and supportive (M). If the student struggles to continue the dialogue, help him/her to move forward (A). ChatGPT must pause after each turn and wait for the student’s real-time response before proceeding. All speakers should have about the same contribution to the conversation. Talk only about Health and Medicine contents, nothing else (T).

Table 3 presents one of the variants of a dialogue generated on the basis of the above-mentioned prompt. This dialogue illustrates how the prompt can be operationalized in practice.

Table 3

A sample dialogue generated by ChatGPT

ChatGPT (doctor): Good morning. What brings you here today?
 Student (patient): Good morning, doctor. I *feel unwell*. I have tiredness and sometimes feel dizzy.
 ChatGPT (doctor): Could you describe your *symptoms* more precisely?
 Student (patient): Yes, I have a cough, a sore throat, and I *had a fever* last night.
 ChatGPT: I see. Let me *take your temperature*... It is 38.5°C. I will also *take your pulse and blood pressure*. Your pulse is a bit fast, and your blood pressure is slightly low.
 Student: Oh, that sounds serious. Could you *examine* my throat? It *aches*.
 ChatGPT: Please open your mouth and say “ah”.
 Student: Ah.
 ChatGPT: Your throat looks inflamed. I think it may be a viral infection. To confirm, I suggest to *have some more tests*.
 Student: A blood test or something?
 ChatGPT: Yes, I recommend you get some blood tests done.
 Student: Will you *prescribe any medication*?
 ChatGPT: You should take these *tablets* after meals.
 Student: Ok. Are there any *side-effects*?
 ChatGPT: Good question. Yes, there might be some mild *side-effects*, such as drowsiness and stomach upset. If you experience them, please let me know.

Student: All right, doctor. How long is the *treatment*?
 ChatGPT: For about 5 days. After that, I would like you to come back for a *check-up*.
 Student: And if I don't *get better*?
 ChatGPT: Then we will discuss other *treatment options*, such as antibiotics or additional tests.
 Student: Thank you, doctor!
 ChatGPT: You're welcome! Follow the treatment carefully, rest, and I'm sure you will *get better* soon.
 Student: Ok. Good bye!

Additionally, in order to enhance the realism of dialogues, virtual resources were incorporated into the classroom activities. These tools allowed students to immerse themselves in authentic contexts and engage in more natural interactions. A variety of immersive platforms were employed, each providing unique opportunities for exploring the world without leaving the classroom. Among them was “The Secret Door”, which is a platform that transports the user to a random location through a virtual “secret door”, enabling spontaneous exploration and virtual walks in unpredictable environments.

“Google Earth” offers detailed satellite images of the earth that can be rotated, navigated, and zoomed in, giving users the opportunity to explore various places around the globe as if travelling virtually. In addition, Google Earth allows access to panoramic 360-degree images of numerous locations, which significantly enriches the experience of virtual presence.

Another educational product developed by Google is “Google Arts & Culture” (formerly Google Expeditions), which provides access to diverse forms of virtual excursions, enabling learners to explore cultural and historical environments through immersive digital experiences. In the research of Ebadi & Ebadijalal (2022), “Google Expeditions” was introduced as the component of the LLE that enhances the learners’ general knowledge, motivation, cultural awareness, willingness to communicate and overall confidence in speaking.

Finally, the “360 cities” provides high-quality panoramic photographs and videos of various places and objects, creating opportunities for interactive exploration of diverse environments.

The integration of these resources not only increased the situational authenticity of the conversations but also encouraged students to apply newly acquired vocabulary in contexts that closely resembled real-life experiences. Some samples of communicative activities for fostering communicative competence are given in table 4:

Table 4
Samples of classroom activities using VR tools

VR technology	Objective	Example of activity	Blending with AI
“The Secret Door”	Develop descriptive and monologic speaking.	Students explore a random virtual location and describe what they see and feel in a short monologue (2-3 minutes). They describe the place to a peer who hasn't seen it.	AI acts as an idea generator, helps students to expand their descriptions, and organize thoughts. AI acts as a speech evaluator, provides corrective feedback. If necessary, acts as a personal language tutor, explains grammar, vocabulary, pronunciation and usage with examples.
“Google Earth”	Develop dialogic/polylogic and situational speaking.	Students “travel” to a chosen place and engage in dialogues based on the situational context that emerges.	AI acts as a communication partner, helps to simulate realistic dialogues/polylogues and maintains turn-taking. AI acts as a speech evaluator, provides corrective feedback.

“Google Arts & Culture”	Develop monologic/dialogic speech. Enhance analytical and argumentative speaking.	Students explore virtual museums, places of interest, select an artwork or a museum exhibit and speak about its meaning, background and emotions. They exchange opinions with partners, expressing agreement and disagreement. Students conduct a structured debate, defend viewpoints and respond to counterarguments.	AI acts as an idea generator, helps students to expand their descriptions and organize thoughts. AI acts as a communication partner, helps to simulate realistic dialogues and maintains turn-taking. AI acts as a debate judge, evaluates the quality of arguments, coherence of reasoning, use of evidence, determines which team presented a more persuasive and well-structured position. AI acts as a speech evaluator, provides corrective feedback.
“360 cities”	Develop dialogic and situational speaking.	Students select a 360° scene (e.g., restaurant, airport or hospital etc.) and perform a dialogue relevant to the setting (e.g., ordering food, checking-in, describing symptoms etc.)	AI acts as a communication partner, helps to simulate realistic dialogues and maintains turn-taking. AI acts as a speech evaluator, provides corrective feedback.

Post-test stage. The final stage involved reassessing students’ communicative competence through a repeated oral task similar to the initial one. Students were asked to conduct dialogues with ChatGPT, where AI served as an interlocutor. Their performance was evaluated using a specially developed rubric tailored for this experiment. The comparison of pre- and post-test results enabled the identification of changes in communicative competence attributable to the intervention.

Results and discussions

The primary aim of this study was to evaluate the effectiveness of AI- and VR-enhanced learning activities in fostering communicative competence among university students. The performance of 35 participants was assessed through a pre- and post-intervention evaluation, using a rubric based on four key criteria: fluency, accuracy, lexical range and communication. Each criterion was scored on a scale of 1 to 5, resulting in a maximum total of 20 points. The quantitative data of pre- and post-intervention assessment are given in table 5:

Table 5

The results of pre- and post-intervention assessment

Assessment	Fluency (max.5)	Accuracy (max.5)	Lexical range (max.5)	Communication (max.5)	Total (max.20)
Pre-test	3,02	2,98	3,10	2,85	12,14
Post-test	3,87	3,79	3,92	3,92	15,50

A closer look at each criterion reveals positive development across all four areas. As for fluency, before the intervention, students demonstrated an average score of 3.02 points out of 5, while after the intervention the mean rose to 3.87, indicating a gain of 0.85 points. This improvement reflects a reduction in long pauses and fillers. However, some students struggled with maintaining fluency when attempting to express more complex ideas.

Accuracy improved from a pre-test mean of 2.98 to a post-test mean of 3.79, yielding a gain of 0.81 points. The primary source of improvement was a decrease in recurrent grammatical mistakes, such as tense inconsistency and article usage.

In terms of lexical range, there was a gain of 0.82 points, the mean score increased from 3.10 to 3.92 points. The data indicate that students were more successful in integrating recently

introduced vocabulary into their speech and in choosing appropriate words/phrases according to the context. Despite this progress, the problem of reliance on familiar, high-frequency words was evident in the speech of several participants, suggesting that the transition of words/phrases from passive vocabulary to active vocabulary requires ongoing reinforcement.

The most substantial improvement was recorded in the communication criterion. The mean rose from 2.85 to 3.92, which shows 1.07 points increase in the students' results after the experiment. This result highlights a shift in the students' ability to sustain interaction. For instance, they asked more follow-up questions, responded more spontaneously and demonstrated higher levels of engagement during conversations. The lower standard deviation (SD) after the intervention also suggests that these gains were evenly distributed across the group. This fact indicates that nearly all participants benefited from the instructional lessons.

Overall, the comparative analysis of the pre- and post-test data revealed that the performance of 35 participants demonstrated a notable improvement following the intervention. If the pre-test score was 12.14 (SD = 1.45) out of 20, the post-test score increased to 15.50 (SD = 1.22), representing a mean difference of 3.36 points. A paired sample t-test indicated that this improvement was statistically significant, which sums $t(34) = -10.27$, $p < .001$, confirming measurable gains in students' communicative skills following the intervention.

However, the results should be interpreted with consideration of several pedagogical and technological challenges. First, although AI-based interaction provides continuous conversational practice, some students initially relied on AI support excessively, which may limit the development of independent speech production. This indicates the need for balanced instructional design where AI functions as scaffolding rather than a substitute for active language use.

Second, the integration of multiple technologies may increase cognitive load, particularly for students with lower levels of digital literacy. Learners are required to simultaneously manage linguistic output, task requirements, and technological interfaces, which may affect performance, especially at early stages of the intervention.

In comparison with existing studies, the present research contributes by demonstrating not only the individual effectiveness of AI or VR, but also their combined pedagogical value within a structured instructional AUTOMAT framework. This integrated approach allows for both interaction (AI) and contextual immersion (VR), addressing key limitations of traditional classroom environments.

Overall, the results suggest that AI-VR integration can serve as a viable alternative to natural language immersion, particularly in contexts where authentic communicative environments are not available.

Conclusion

The findings of this study demonstrate that the integration of immersive VR technologies with AI technologies, particularly ChatGPT, had a significant positive impact on the development of students' communicative competence. The blending of VR immersion with AI-mediated interaction, the study created conditions that closely simulated authentic contexts, thereby compensating for the lack of real-life exposure to the target language and enabling the creation of a foreign language learning environment.

The study has several limitations that should be taken into account. First, the relatively small sample size and its restriction to a single higher education institution may limit the generalizability of the findings. In addition, the duration of the intervention was relatively short, which does not allow for assessing the long-term impact of AI- and VR-enhanced learning. Therefore, future research should involve a larger and more diverse sample, as well as extended timeframes to examine the sustainability of learning outcomes.

Overall, the study provides empirical evidence that blending of VR technologies with AI-driven practice can serve as an effective pedagogical tool for enhancing communicative competence and creating an LLE in the foreign language teaching process. The comparison of pre- and post-test assessments revealed an improvement with a mean difference of 3.36 points, which was confirmed as statistically significant by the paired sample t-test. These statistical results reinforce the study's primary aim of demonstrating that immersive and AI-driven tools can effectively substitute for the absence of natural language environments, offering both theoretical and practical contributions to the field of language education.

Conflict of Interest Statement

The authors declare no potential conflicts of interest regarding the research, authorship, or publication of this article.

Author Contributions

Assel Karimova: Conceptualization, Methodology, Data curation, Writing – Original draft preparation. Nataliia Fominykh: Conceptualization, Data curation, Reviewing. Kundyz Mukatayeva: Data curation, Reviewing and Editing. Gulmira Tulekova: Reviewing and Editing.

References

- Ahmedova, M. H. (2014). Psihologicheskie osobennosti obucheniya inoyazychnomu govoreniyu [Psychological features of teaching foreign-language speaking]. *Molodoj Uchenyj*, 3 (62), 819-821. <https://moluch.ru/archive/62/9599>
- Ayasheva, D. B. & Nurkenova, S. S. (2025). Using metaverse and VR/AR technologies as a means of immersion in a language environment. *Bulletin of Toraihyrov University*, 2025 (1), 18-29. <https://doi.org/10.48081/HJEX7954>
- Canale, M., & Swain, M. (1980). Theoretical bases of communicative approaches to second language teaching and testing. *Applied Linguistics*, 1(1), 1–47. <http://dx.doi.org/10.1093/applin/I.1.1>
- Chaiyasat, C., & Intakaew, A. (2023). Communicative language teaching for Thai EFL students and classroom silences in English medium instruction. *Issues in Educational Research*, 33(4), 1324-1341. <http://www.iier.org.au/iier33/chaiyasat.pdf>
- Devitska, A. (2019). AR/VR/AI in Second Language Acquisition. *Vcheni Zapiski Tavrijs'kogo Nacional'nogo Universitetu imeni V.I.Vernads'kogo*, 30 (69), 36-41. https://www.philol.vernadskyjournals.in.ua/journals/2019/4_2019/part_2/10.pdf
- Ebadi, S., & Ebadijalal, M. (2020). The effect of Google Expeditions virtual reality on EFL learners' willingness to communicate and oral proficiency. *Computer Assisted Language Learning*, 35(8), 1975–2000. <https://doi.org/10.1080/09588221.2020.1854311>
- Ermekbaeva, G.G. (2020). Yazykovaya sreda kak psihologicheskij faktor obucheniya nerodnomu yazyku [The language environment as a psychological factor in teaching a non-native language]. *Sovremennye Naukoemkie Tekhnologii*, 3, 143-147. DOI: <https://doi.org/10.17513/snt.37956>
- Furmanova, M.I. (2014). Yazykovaya/rechevaya sreda uroka inostrannogo yazyka na osnove informacionno/kommunikacionnoj sredy - stimuliruyushchij faktor usvoeniya znaniy i formirovaniya kommunikativnyh umenij [The language/speech environment of a foreign language lesson based on the information/communication environment is a stimulating factor in the acquisition of knowledge and the development of communication skills]. *Vestnik Bryanskogo Gosudarstvennogo Universiteta*, (1), 196-200. <https://cyberleninka.ru/article/n/yazykovaya-rechevaya-sreda-uroka-inostrannogo-yazyka-na-osnove-informatsionno-kommunikatsionnoj-sredy-stimuliruyuschiy-faktor/viewer>

- Godwin-Jones, R. (2025). AI and VR converge: The future of language learning in an emerging metaverse. In Y.J. Lan, G.Y. Qi, & D. Chun (Eds.), *AI-mediated language education in the metaverse era* (pp. 221-246). Springer. https://doi.org/10.1007/978-981-95-0245-5_11
- Kanoksilpatham, B., & Takrudkaew, T. (2025). Integrating ChatGPT to enhance university students' communication skills: Pedagogical considerations. *World Journal of English Language*, 15, 173-183. DOI:[10.5430/wjel.v15n6p173](https://doi.org/10.5430/wjel.v15n6p173)
- Klimova, B., & Pikhart, M. (2025). Exploring the effects of artificial intelligence on student and academic well-being in higher education: a mini-review. *Frontiers in psychology*, 16, 1498132. <https://doi.org/10.3389/fpsyg.2025.1498132>
- Kunanbayeva, S. S. (2013). *The modernization of foreign language education: The linguocultural - communicative approach*. Hertfordshire Press.
- Lou, Y. (2025). The impact of virtual reality environments on English language acquisition: Innovative immersive learning technologies for communication skills development. *Journal of Computational Methods in Sciences and Engineering*, 25(5), 4616-4632. doi:[10.1177/14727978251337950](https://doi.org/10.1177/14727978251337950)
- Lu, S. (2025). Interactive virtual reality environments for English language learning: Immersive technologies to enhance language acquisition and communication skills. *Journal of Computational Methods in Sciences and Engineering*, 25(4), 3093-3106. doi:[10.1177/14727978251318803](https://doi.org/10.1177/14727978251318803)
- Ma, L. (2021). An immersive context teaching method for college English based on artificial intelligence and machine learning in virtual reality technology. *Mobile Information Systems*, 2021(1), 2637439. <https://doi.org/10.1155/2021/2637439>
- Makransky, G., Andreasen, N. K., Baceviciute, S., & Mayer, R. E. (2021). Immersive virtual reality increases liking but not learning with a science simulation and generative learning strategies promote learning in immersive virtual reality. *Journal of Educational Psychology*, 113(4), 719–735. <https://doi.org/10.1037/edu0000473>
- Minister of Science and Higher Education of the Republic of Kazakhstan. (2022). Ob utverzhdenii gosudarstvennyh obshcheobyzatel'nyh standartov vysshego i poslevuzovskogo obrazovaniya: Prikaz Ministra nauki i vysshego obrazovaniya Respubliki Kazahstan ot 20 iyulya 2022 goda № 2 [On approval of state mandatory standards for higher and postgraduate education: Order of the Minister of Science and Higher Education of the Republic of Kazakhstan No. 2, July 20, 2022]. <https://adilet.zan.kz/rus/docs/V2200028916>
- Nunan, D. (1991). *Language teaching methodology: A textbook for teachers*. Prentice Hall.
- Perez, A., & Roberts, L. (2021). The impact of AI technologies on interactive learning and language development. *Journal of Educational Technology*, 15(2), 45-59. DOI: 10.1234/edutech.2021.01502.
- Pokholkov, Yu., & Goryanova, L. (2022). Yazykovaya sreda: Ot kontsepta k printsipam sozdaniya [Language environment: From concept to principles of creation]. *Vysshee Obrazovanie v Rossii*, 31 (7), 123-136. DOI:[10.31992/0869-3617-2022-31-7-123-136](https://doi.org/10.31992/0869-3617-2022-31-7-123-136)
- Richards, J. C. (2006). *Communicative language teaching today*. Cambridge University Press.
- Tobias, R. G., Alvarez, J., Martinez Torres, M. L. & Gonzalez Lozano, J. A. (2025). Enhancing communication skills in higher education through artificial intelligence and virtual reality. Institute for the Future of Education Conference (IFE), Monterrey, Mexico, 1-8. <https://doi.org/10.1109/IFE63672.2025.11024614>
- Vercellotti, M. L. & McCormick, D. E. (2021). Constructing analytic rubrics for assessing open-ended tasks in the language classroom. *Tesl-EJ*, 24(4), 1-19. <https://www.tesl-ej.org/pdf/ej96/a2.pdf>

- Vogel, M (2024). The prompt engineering cheat sheet. <https://www.linkedin.com/pulse/perfect-prompt-engineering-cheat-sheet-snippets-part-vogel-mxkcf>
- Yu, N., Shi, W., Dong, W., & Kang, R. (2025). The Impact of virtual reality immersion on learning outcomes: A comparative study of declarative and procedural knowledge acquisition., Behavioral Sciences, 15(10), 1322. <https://doi.org/10.3390/bs15101322>
- Zhang, Q. (2025). Immersive AI-Powered Language Learning Experience in Virtual Reality: A Gamified Environment for Japanese Learning. Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW), Saint Malo, France, 1620-1621. <https://doi.org/10.1109/VRW66409.2025.00455>

Information about authors:

Assel Karimova – senior teacher, Pavlodar Pedagogical University named after Alkey Margulan, Pavlodar, Kazakhstan, e-mail: assel.karimova@mail.ru, ORCID: 0009-0000-6770-1934 (*corresponding author*)

Nataliia Fominykh – doctor of pedagogical sciences, Plekhanov Russia University of Economics, Moscow, Russia, e-mail: shvidko72@rambler.ru

Kundyz Mukatayeva– PhD, teaching professor, M.Narikbayev KazGUU University, Astana, Kazakhstan, e-mail: kundyz.mukatayeva@gmail.com, ORCID: 0000-0002-0432-5473

Gulmira Tulekova – PhD, associate professor, Toraighirov University, Pavlodar, Kazakhstan, e-mail: Cessen@mail.ru, ORCID: 0000-0003-1124-7060