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INTEGRATING SMART ASSISTANTS INTO KAZAKH LANGUAGE LEARNING: IMPACTS ON LEARNER ENGAGEMENT

The rapid advancement of digital technologies has significantly transformed contemporary educational practice, contributing to the emergence of smart education as a learner-centred and technology-enhanced model of instruction. This article examines the effectiveness of smart assistants in language learning, with particular emphasis on the development of listening, speaking, and pronunciation skills. The study employed a quasi-experimental mixed-methods design and involved undergraduate students divided into experimental and control groups. The experimental group completed language-learning activities supported by smart assistants (including guided speaking practice and pronunciation training), whereas the control group followed traditional instructional methods.

Quantitative data were collected through pre- and post-tests, while qualitative data were obtained via questionnaires and semi-structured interviews. This design made it possible to compare not only measurable learning outcomes but also students' attitudes, motivation, and affective factors associated with oral communication. The results indicated that students who used smart assistants demonstrated stronger gains in communicative skills than those taught traditionally. In addition, the use of smart assistants was associated with increased learning motivation, reduced speaking anxiety, and greater confidence in oral interaction. The study concludes that smart assistants can function as an effective supplementary tool in blended-learning contexts by supporting personalisation, flexibility, and accessibility. Although limitations remain, particularly in speech-recognition accuracy and the depth of context-sensitive feedback, these technologies offer substantial pedagogical potential and expand opportunities for modern language education.

Keywords: smart education, smart assistants, language learning, digital technologies, speaking skills, blended learning.

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Қазақ тілін оқыту үдерісіне смарт ассистенттерді кіріктіру: білім алушылардың оқу белсенділігіне әсері

Цифрлық технологиялардың қарқынды дамуы қазіргі білім беру тәжірибесіне елеулі өзгерістер енгізіп, білім берудің тұлғаға бағытталған және технологиялық тұрғыдан жетілдірілген моделі смарт білім берудің қалыптасуына негіз болды. Бұл мақалада екінші және шет тілдерін меңгеру үдерісінде смарт ассистенттердің тиімділігі, әсіресе тыңдалым, сөйлеу және айтылым дағдыларын дамытудағы ықпалы қарастырылады. Зерттеу квазиэкспериментттік аралас әдіснамаға сүйеніп жүргізілді және бакалавриат студенттері эксперименттік және бақылау топтарына бөлінді. Эксперименттік топ смарт ассистенттерді қолдана отырып тілдік тапсырмалар орындаса, бақылау тобы дәстүрлі оқыту әдістерімен білім алды.

Сандық деректер алдын ала және қорытынды тесттер арқылы, ал сапалық деректер сауалнама мен жартылай құрылымдалған сұхбаттар арқылы жинақталды. Мұндай әдіснама нәтижелерді ғана емес, студенттердің оқу тәжірибесін, мотивациясын және сөйлеуге қатысты эмоциялық күйін де салыстыруға мүмкіндік берді. Нәтижелер смарт ассистенттерді қолданған студенттердің тілдік дағдыларды меңгеру деңгейі дәстүрлі тәсілмен оқытылғандарға қарағанда жоғары екенін көрсетті. Сонымен қатар, смарт ассистенттер оқу ынтасын арттырып, сөйлеу кезіндегі психологиялық кедергілерді төмендетіп, ауызша коммуникациядағы сенімділікті күшейтті. Қорытынды бойынша, смарт ассистенттер аралас оқыту ортасында тиімді қосымша құрал бола алады: олар оқу үдерісін дараландыруға, икемділікті және қолжетімділікті арттыруға мүмкіндік береді. Дегенмен сөйлеуді тану дәлдігі мен контекстік кері байланыстың тереңдігі сияқты шектеулер бар,

соған қарамастан бұл технологиялар смарт білім беруді жетілдіруге және заманауи тілдік оқытуды дамытуға елеулі үлес қоса алады.

Түйін сөздер: смарт білім беру, смарт ассистенттер, тіл оқыту, цифрлық технологиялар, сөйлеу дағдылары, аралас оқыту.

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Интеграция смарт-ассистентов в обучение казахскому языку: влияние на учебную вовлечённость

Стремительное развитие цифровых технологий существенно изменило современную образовательную практику, способствуя формированию смарт-образования как личностно ориентированной и технологически обогащённой модели обучения. В статье рассматривается эффективность использования смарт-ассистентов в обучении языку с акцентом на развитие навыков аудирования, говорения и произношения. Исследование выполнено в рамках квазиэкспериментального дизайна смешанных методов и проведено среди студентов бакалавриата, разделённых на экспериментальную и контрольную группы. Экспериментальная группа обучалась с применением смарт-ассистентов в языковых заданиях (в том числе в тренировке устной речи и произносительных навыков), тогда как контрольная группа использовала традиционные методы обучения.

Количественные данные были получены посредством входного и итогового тестирования, а качественные – через анкетирование и полуструктурированные интервью, что позволило сопоставить результаты обучения и субъективные впечатления студентов. Полученные данные показали, что использование смарт-ассистентов способствует более заметному развитию коммуникативных умений по сравнению с традиционными подходами, а также повышает учебную мотивацию, снижает речевую тревожность и усиливает уверенность в устной коммуникации. Сделан вывод о том, что смарт-ассистенты являются эффективным вспомогательным инструментом в условиях смешанного обучения. Несмотря на ограничения, связанные с точностью распознавания речи и контекстной глубиной обратной связи, данные технологии обладают высоким педагогическим потенциалом и расширяют возможности современной языковой подготовки.

Ключевые слова: смарт-образование, смарт-ассистенты, обучение языку, цифровые технологии, речевые навыки, смешанное обучение.

Introduction

To ensure effective educational processes, it is essential to integrate modern teaching technologies into the education system. In the current digital era, smart education has become an increasingly recognized and widely adopted form of learning, particularly among young generations. This trend highlights the fact that technology-oriented education enables the delivery of more accessible, efficient, learner-centred learning. Smart education might be understood as an innovative approach to learning that transforms traditional instructional practices by offering more interactive, collaborative and visually enriched methods, thereby enhancing learner engagement and enabling teachers to better understand students' abilities, learning preferences and motivational factors (Zhi Ting Zhu et al., 2016).

Smart education represents a learning model aligned with the demands of the digital age, promoting active participation and meaningful interaction in the learning process. At the same time, the growing volume and diversity of educational data pose significant challenges for information systems and instructional design research. These challenges stimulate the development of new concepts and innovative technological solutions that support the continuous improvement of educational processes.

Given the rapid pace of technological advancement, education, like many other fields, has undergone substantial transformation through the adoption of smart and modern technologies. Recent developments in teaching technologies and digital tools have created new opportunities for educational institutions. Although many technological innovations were previously underutilized, events such as the COVID-19 Pandemic in 2020 necessitated the immediate adoption of smart tools and digital technologies to support the continuity and effectiveness of learning.

The relevance of this study lies in the widespread use of smart devices and the growing demand for flexible, personalized language learning. Learners increasingly require tools that enable them to study

independently at any time and from any location. In this context, smart assistants provide immediate, interactive, and voice-based feedback, aligning closely with contemporary learners' expectations and learning habits.

The aim of this study is to investigate and evaluate the effectiveness of smart assistants in supporting target language learning with particular emphasis on the development of listening, speaking and pronunciation skills.

Innovative and interactive technologies are increasingly applied to develop key language skills allowing students to experience smart education through diverse digital tools. Advanced technologies such as augmented reality, virtual reality and the metaverse have introduced significant potential into educational systems. However, concerns remain regarding human factors, including resistance to change and insufficient adaptability, which may hinder the effective integration of these technologies into educational practice.

Smart assistants encompass a wide range of technologies, including Duolingo, Grammarly, domain-specific conversational agents, chatbots, and similar tools. These technologies are increasingly implemented and examined as supportive instruments in target language learning particularly for developing speaking, listening, pronunciation, vocabulary acquisition, and feedback mechanisms. Research in this domain includes empirical studies, systematic and narrative reviews as well as theoretical analyses.

Materials and methods

The present study adopted a quasi-experimental mixed-methods design aimed at examining the pedagogical effectiveness of smart assistants in foreign language learning. The quantitative component focused on measuring changes in learners' listening, speaking and pronunciation skills, while the qualitative component explored learners' attitudes, motivation and experiences when interacting with smart educational technologies. This design allowed for a comprehensive evaluation of both learning outcomes and affective factors.

The study involved 40 undergraduate students enrolled in a foreign language program at a higher education institution. Participants were selected based on similar language proficiency levels, which were determined using a standardized placement test prior to the study. Participants were assigned to control and experimental groups based on pre-existing class structures. Therefore, the study followed a quasi-experimental design. The students were assigned to an experimental group (n=20) and a control group (n=20). All participants were 17-21 years old and had prior experience employing digital technologies for educational purposes, although none had previously used smart assistants for structured language learning.

The research was conducted in a blended learning environment combining face-to-face instruction and independent online practice. Classroom sessions were held twice a week, while independent learning activities were assigned for out of class practice. Both groups followed the same curriculum and learning objectives; however, the instructional tools and modes of practice differed between groups.

The experimental group used smart assistant-based applications, including voice-enabled conversational agents and chatbot platforms integrated with mobile devices. These tools supported:

- interactive spoken dialogues;
- listening comprehension exercises with authentic audio input;
- pronunciation practice with vocabulary reinforcement through contextualized tasks.

The control group used traditional learning materials such as printed textbooks, audio recordings and teacher-led oral practice without smart assistant support.

The experiment lasted eight weeks and consisted of three stages.

At the pre-experimental stage, both groups completed diagnostic assessments to evaluate baseline listening, speaking and pronunciation skills. A motivation questionnaire was administered to identify initial attitudes toward language learning.

Throughout the experimental stage, the experimental group engaged in smart-assistant supported activities during and outside class sessions. The students were asked to complete at least three practice sessions on their own using smart assistants. The control group took part in traditional classroom activities including listening tasks as pair work and oral drills led by the instructor.

At the post-experimental stage, the students completed an achievement test parallel in structure and difficulty to the pre-test. The experimental group additionally completed a post-intervention questionnaire and participated in semi-structured interviews.

To ensure comprehensive data collection, multiple instruments were employed:

- language proficiency tests consisting of listening comprehension tasks, speaking prompts and pronunciation assessment rubrics;
- pronunciation evaluation rubrics, focusing on segmental features (sounds) and suprasegmental features (stress and intonation);
- questionnaires, designed to measure learner motivation, engagement, perceived usefulness, and ease of use of smart assistants;
- semi-structured interviews, conducted with selected participants to gain deeper insights into learner experiences and challenges.

Quantitative data were analysed using descriptive statistical methods, including mean scores and gain scores. Comparative analysis was carried out to examine differences between pre-test and post-test results between groups. Qualitative data obtained from questionnaires and interviews were analysed through thematic content analysis, allowing the identification of recurring themes related to motivation, autonomy, anxiety reduction and usability of smart assistants.

Ethical guidelines were strictly followed throughout the study. Participants were informed about the purpose of the research and provided informed consent prior to participation. Confidentiality and anonymity were ensured and participants were informed of their right to withdraw from the study at any stage without any academic consequences.

To enhance the reliability of the study, standardized assessment criteria and consistent testing conditions were applied across both groups. A set of tests was selected to assess the learners' skills and abilities.

Literature review

According to Olga Nezhiva, smart tools can support conversation practice and pronunciation by providing opportunities for autonomous learning at a convenient time and pace. Such tools may also reduce speaking anxiety as learners can practice individually without fear of negative evaluation. However, several limitations remain, including inaccuracies in speech recognition, occasional lack of meaningful interaction, weak instructional design, and the ambiguous role of teacher in technology-mediated learning environments (Nezhyva, 2021).

The use of intelligent digital tools has demonstrated improved outcomes in listening comprehension when compared to traditional instructional methods. In addition, studies conducted by George and Maya indicate that these tools enhance learner motivation, authenticity of interaction, and learning flexibility (Terzopoulos & Satratzemi, 2020).

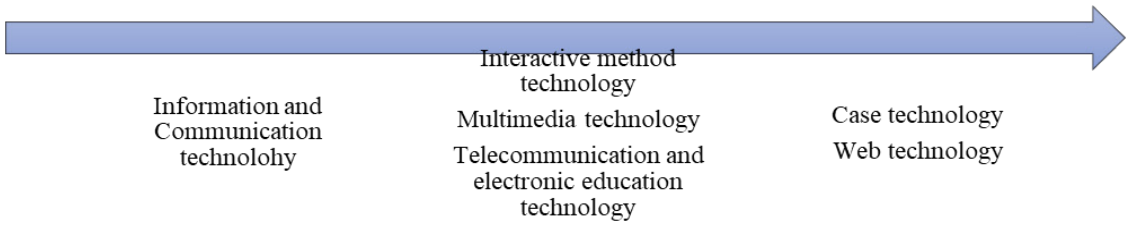
In the process of teaching the Kazakh language, particular emphasis is placed on developing students' ability to understand educational material consciously and meaningfully. Linguistic facts and concepts should not be acquired through rote memorization, instead learners are expected to comprehend their structure, function and usage in a delicate manner. Conscious learning requires systematic and well-organized instructional practices (Abdigaliyeva, 1999).

The rapid adoption of innovative technologies has become an expected development in modern education. Despite this, the emergence of mobile devices and widespread Internet access has driven significant technological progress that extends beyond conventional frameworks. Consequently, these technologies represent emerging approaches within smart education and warrant further discussion.

Modern technologies have revolutionized teaching practices across various disciplines in higher education. Through the integration of digital tools into the educational process, instructors are able to design interactive and engaging learning materials. For example, platforms such as Duolingo and Grammarly enable the creation of interactive digital textbooks and practice-based tasks. Furthermore, the application of virtual reality (VR) and augmented reality (AR) allows educators to design immersive learning experiences, such as exploring complex mathematical or scientific concepts within three-dimensional environments. Online discussion boards and chat tools also facilitate collaboration, peer learning and collective knowledge construction. Overall, educational technologies provide teachers with opportunities to create effective and motivating learning experiences (Gagné et al., 2005).

Although augmented reality and virtual reality share certain features, they represent distinct technologies. AR enhances the real world by overlaying digital information and elements onto the physical environment, often utilizing technologies such as GPS camera-based systems. In contrast, VR immerses users in a fully simulated environment where they can interact with and manipulate computer generated sensory devices. Examples of VR applications include modern gaming consoles and immersive simulation systems. These technologies are often discussed within the broader framework of mixed reality, as illustrated in Figure 1.

Figure 1
The various types of modern technology



Note: Compiled by the authors.

The advantages of a smart learning environment are associated with improved access to knowledge resources and the effective use of advanced mobile technologies. Such environments enable learners to actively participate in educational and developmental activities. A smart learning environment provides academic settings with intelligent educational activities as described in the framework proposed by Kukulska Hulme (Kukulska-Hulme, 2017).

A considerable number of researchers have devoted attention to instructional methodological dimensions of teaching culture in higher education. In the work of Petrova, it is emphasized that developing logical thinking alone is insufficient; equal importance should be given to the application of appropriate logical methods. More specifically, instructional practices must be organized in accordance with the principles of logic. Meanwhile, Rainer and Pablo proposed a classification of teaching methods based on the nature of students' cognitive activity highlighting the active role of learners in the educational process (Winkler, 2020).

One of the defining characteristics of modern educational organizations is the introduction of innovative practices aimed at fostering both critical and creative thinking. Such approaches allow educators to flexibly access relevant sources of information and adapt instruction to learners' needs. A wide range of positive strategies supports the implementation of innovative management and teaching forms, including theoretical presentation of content and various modeling techniques to represent phenomena and processes (Hashemi, & Ghasemi, 2011).

According to Prachi Goyal, both chatbots and virtual assistants offer substantial potential for engaging students, enhancing their skills and competencies. Furthermore, the integration of these technologies into educational contexts can result in more enjoyable and effective learning experiences (Goyal et al., 2023).

In recent years, technological advancements have significantly increased accessibility of AR and VR technologies. As reported by Shankar, a large proportion of users already possess VR and AR compatible smart devices, reducing the need for expensive and specialized equipment. These technologies are particularly effective for instructional demonstrations and training in large indoor environments. Additionally, they are increasingly applied not only in education, but also in fields such as healthcare, remote assistance and digital commerce (Shakhina et al., 2023).

Despite these advantages, the literature also identifies several challenges associated with AI-assisted language learning. These include limited theoretical grounding, methodological inconsistencies, and the need for more rigorous experimental designs. Additionally, concerns related to technological limitations, data privacy, and teacher readiness continue to influence the effective implementation of AI tools in educational settings.

Overall, the existing research demonstrates that intelligent personal assistants and AI-based technologies have considerable potential to enhance language learning processes. However, further studies are required to strengthen the empirical evidence, explore long-term effects, and develop comprehensive pedagogical frameworks for integrating AI into language education.

Results and discussion

The efficiency of smart assistants in supporting foreign language learning was evaluated through a comparison of test results across all assessed skills between the experimental and control groups. The quantitative findings demonstrate noticeable differences in learning outcomes between the two groups after the experimental intervention.

Table 1 presents the comparative results of the pre-test and post-test mean scores for both groups.

Table 1
Comparison of Post-test and Pre-test mean scores of experimental and control groups

Group	Pre-test score	Post-test score	Mean gain
Experimental group	62.4	78.9	+16.5
Control group	61.8	68.2	+7.4

Note: Compiled by the authors.

As illustrated in Table 1, both groups demonstrated progress after the instructional period, confirming that systematic language instruction contributes positively to skill development. However, the experimental group exhibited a considerably higher mean gain (+16.5) compared to the control group (+7.4). This difference suggests that smart assistants had a substantial effect on improving learners' overall language performance.

A more detailed analysis of the quiz components revealed that the most significant improvements in the experimental group occurred in pronunciation accuracy and listening comprehension. Learners demonstrated clearer articulation, improved stress and intonation patterns, and enhanced ability to recognize spoken language in authentic contexts. Speaking fluency also improved, particularly in terms of response speed and lexical appropriacy. In contrast, the control group showed improvement primarily in listening comprehension, while progress in pronunciation and spontaneous speaking remained limited.

Questionnaire results further supported these findings. The majority of learners in the experimental group reported higher levels of motivation and engagement during learning activities. Over 80% of participants indicated that voice-based interaction and instant feedback encouraged more frequent practice, while approximately 75% reported a reduction in speaking anxiety. Learners also highlighted the accessibility of smart assistants, noting the ability to practice independently outside the classroom as a major advantage.

Qualitative data obtained from interviews revealed that students perceived smart assistants as a supportive, non-judgmental learning tool. Many participants emphasized that repeated practice with immediate corrective feedback helped them become more confident in their speaking abilities and more attentive to pronunciation accuracy.

To ensure the robustness of the findings, an independent samples t-test was conducted to compare the performance of the control and experimental groups. The results indicated a statistically significant difference between the groups ($p < 0.05$). Furthermore, the effect size analysis (Cohen's d) demonstrated a moderate to large effect, confirming the effectiveness of smart assistant integration in language learning.

The outcomes of the present study provide strong evidence that smart assistants can significantly enhance foreign language learning outcomes when integrated into instructional practice. The superior performance of the experimental group confirms the effectiveness of smart assistants as a pedagogical tool for developing listening, speaking and pronunciation skills (Huang, 2025).

One of the key factors contributing to these results is the personalized and interactive nature of smart assistants. Unlike traditional classroom instruction which is often limited by time constraints and group dynamics, smart assistants allow learners to practice at their own pace and repeat tasks as required. This individualized exposure to language input is particularly beneficial for pronunciation training and listening comprehension, where frequent repetition and immediate feedback are crucial (Aggarwal et al., 2024).

The reduction of speaking anxiety observed among experimental group participants is another important outcome. The chance to practice orally without fear of negative evaluation from peers or instructors appears to create a psychologically safe learning environment. These findings align with communicative language teaching principles which emphasize learner confidence and willingness to communicate as key predictors of successful language acquisition (Clavel-Maqueda, 2025).

Meanwhile, the results indicate that smart assistants should not be considered a replacement for teachers. Despite their advantages, learners reported limitations related to speech recognition accuracy and the lack of deeper contextual or pragmatic understanding in conversations. These shortcomings highlight the continued importance of the teacher's role in scaffolding learning, clarifying complex linguistic phenomena, and fostering higher order communicative competence (Yang et al., 2025).

From a pedagogical perspective, the results suggest that smart assistants are more efficient when they are utilized as a form of integrated learning in which language acquisition is supported by modern technologies.

The combination of the two factors mentioned above encourages learners to engage more actively

in learning the target language, enhances their confidence in speaking, and supports teachers in presenting instructional content more effectively.

The concept of smart education includes a variety of learning systems that enable learners to acquire a language flexibly, conveniently, and at their own pace. However, teacher guidance remains necessary throughout the learning process. Together, these components support personalized learning and timely feedback, both of which are essential for improving educational quality and learner engagement.

In spite of the clear advantages of modern technologies, a contrast between traditional and innovative educational approaches continues to exist. Conventional education systems often face challenges in adapting to technological innovations due to methodological inertia, limited digital competence, or instructional constraints. Nevertheless, the integration of smart education technologies facilitates more effective organization of teaching and learning activities, enhances collaboration, supports autonomous learning and enables prompt adjustments to instructional strategies based on learners' needs.

In summary, the expanded findings confirm that smart assistants contribute meaningfully to modern language education by supporting learner-centered, flexible and technology enhanced instruction. Their pedagogical values lie not only in improving measurable outcomes but also in fostering positive affective factors such as motivation, confidence and engagement. These results reinforce the need for continued research into optimal strategies for integrating smart technologies into foreign language education.

Conclusion

The present study examined the pedagogical potential of smart assistants in supporting target language learning with particular emphasis on the development of listening, speaking and pronunciation skills. Against the background of the increasing integration of digital technologies into education, this study aimed to examine the impact of smart assistants on learning outcomes, learner engagement, and motivation within a modern educational framework.

Various types of smart technologies were employed throughout the study. A preliminary test was conducted to assess the learners' baseline performance. At the end of the experiment, a comparison table was used to summarize the results, showing that tools such as Duolingo and Grammarly can contribute to the target language learning process. As noted above, these tools gave learners a greater sense of independence and helped foster positive interaction between learners and instructors during class. The use of such technologies benefits both teachers and students by increasing confidence, flexibility, and time efficiency.

The study also identified several drawbacks related to the use of smart assistants including occasional inaccuracies in speech recognition, limited contextual depth in automated responses, and the need for developed instructional scaffolding. These challenges underline the necessity of ongoing technological development and pedagogical research to refine the integration of smart tools into educational practice. They serve as useful indicators of students' weaknesses and areas for improvement.

In conclusion, smart assistants represent a promising and effective component of smart education, contributing to learner-centred, flexible and technology-enhanced language instruction. Their implementation supports both academic achievement and learner engagement, aligning with contemporary educational demands and digital learning trends. Future research should focus on long-term effects, various learner populations and the integration of emerging technologies such as artificial intelligence-driven analytics, augmented reality, and adaptive learning systems to further enhance the effectiveness of smart assistant-supported language education.

Author Contributions

S.B. Bektemirova was responsible for conceptualization, methodology, and writing the original draft; G.U. Ualikhanova conducted the investigation and performed data curation.

Conflict of Interest

The authors declare no conflict of interest.

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