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OPTIMISING AI-BASED DIALOGUE SYSTEMS FOR LANGUAGE LEARNING IN KAZAKHSTAN: A LINGUISTIC APPROACH

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ABSTRACT: The purpose of this study was to investigate the processes associated with the development and optimisation of chatbots in compliance with language rules. Using linguistic analysis, this study examined the key characteristics of chatbot use, particularly considering the linguistic features of the Kazakh language in the context of teaching English. The stages of chatbot development include analysing user needs, conceptual and structural design, preparation of learning materials, multimedia integration, testing, personalisation, feedback analysis, algorithm improvement, and platform integration. Optimisation steps encompass user data analysis (requests, errors), enhancement of natural language processing (NLP), adaptive content delivery, performance monitoring, and continuous refinement. A survey of 50 students from two Kazakh gymnasium schools revealed that Duolingo was preferred for phonetics (43% and 41%), grammar (53% and 59%), and vocabulary (48% and 39%). Mondly and HelloTalk were favoured for syntax (36-39%), while Mondly, HelloTalk, and Tandem were most effective for constructing coherent speech (35-46%). These results underscore the

varying strengths of chatbots across linguistic domains. Optimising Kazakh-language chatbots such as Soyle Bot, Bilim Class, and Qazaq Grammar Chat requires consideration of the agglutinative structure, morphological richness, and dual alphabet systems (Latin and Cyrillic). Effective strategies include gamification, multimedia integration, content localisation, alignment with educational standards, and personalisation.

KEYWORDS: Pronunciation, morphology, syntactic units, chatbot-based learning, multilingual AI.

OPTIMIZACIÓN DE LOS SISTEMAS DE DIÁLOGO BASADOS EN IA PARA EL APRENDIZAJE DE IDIOMAS EN KAZAJISTÁN: UN ENFOQUE LINGÜÍSTICO

RESUMEN: El objetivo de este estudio fue investigar los procesos relacionados con el desarrollo y la optimización de chatbots en conformidad con las normas lingüísticas. A través de un análisis lingüístico, se examinaron las principales características del uso de chatbots, prestando especial atención a los rasgos lingüísticos del idioma kazajo en el contexto de la enseñanza del inglés. Las etapas del desarrollo de los chatbots incluyen el análisis de las necesidades del usuario, el diseño conceptual y estructural, la preparación de materiales de aprendizaje, la integración multimedia, las pruebas, la personalización, el análisis de retroalimentación, la mejora de algoritmos y la integración en plataformas. Los pasos de optimización abarcan el análisis de datos de los usuarios (solicitudes, errores), el perfeccionamiento del procesamiento del lenguaje natural (PLN), la entrega adaptativa de contenido, el monitoreo del rendimiento y el perfeccionamiento continuo. Una encuesta a 50 estudiantes de dos escuelas-gimnasio kazajas reveló que Duolingo fue preferido para la fonética (43% y 41%), la gramática (53% y 59%) y el vocabulario (48% y 39%). Mondly y HelloTalk fueron preferidos para la sintaxis (36-39%), mientras que Mondly, HelloTalk y Tandem resultaron más eficaces para la construcción del discurso coherente (35-46%). Estos resultados destacan las distintas fortalezas de los chatbots en diferentes dominios lingüísticos. La optimización de chatbots en idioma kazajo, como Soyle Bot, Bilim Class y Qazaq Grammar Chat, requiere tener en cuenta la estructura aglutinante, la riqueza morfológica y los sistemas duales de alfabetos (latino y cirílico). Las estrategias eficaces incluyen la gamificación, la integración multimedia, la localización de contenido, la alineación con los estándares educativos y la personalización.

PALABRAS CLAVE: Pronunciación, morfología, unidades sintácticas, aprendizaje basado en chatbots, IA multilingüe.

OPTIMISATION DES SYSTÈMES DE DIALOGUE BASÉS SUR L'IA POUR L'APPRENTISSAGE DES LANGUES AU KAZAKHSTAN : UNE APPROCHE LINGUISTIQUE

RÉSUMÉ: Cette étude vise à analyser les processus liés au développement et à l'optimisation des chatbots conformément aux règles linguistiques. À l'aide d'une analyse linguistique, elle examine les principales caractéristiques de l'utilisation des chatbots, en tenant particulièrement compte des spécificités linguistiques de la langue kazakhe dans le contexte de l'enseignement de l'anglais. Les étapes du développement d'un chatbot comprennent l'analyse des besoins des utilisateurs, la conception conceptuelle et structurelle, la préparation des supports pédagogiques, l'intégration multimédia, les tests, la personnalisation, l'analyse des retours, l'amélioration des algorithmes et l'intégration aux plateformes. Les étapes d'optimisation incluent l'analyse des données utilisateurs (demandes, erreurs), l'amélioration du traitement automatique du langage naturel (TALN), la distribution de contenus adaptatifs, le suivi des performances et le perfectionnement continu. Une enquête menée auprès de 50 élèves de deux gymnases kazakhs a révélé que Duolingo était préféré pour la phonétique (43 % et 41 %), la grammaire (53 % et 59 %) et le vocabulaire (48 % et 39 %). Mondly et HelloTalk étaient privilégiés pour la syntaxe (36-39 %), tandis que Mondly, HelloTalk et Tandem étaient les plus efficaces pour la production d'un discours cohérent (35-46 %). Ces résultats soulignent les forces variées des chatbots selon les domaines linguistiques. L'optimisation des chatbots en langue kazakhe tels que Soyle Bot, Bilim Class et Qazaq Grammar Chat doit tenir compte de la structure agglutinante, de la richesse morphologique et de la double utilisation des alphabets latin et cyrillique. Les stratégies efficaces incluent la ludification, l'intégration multimédia, la localisation des contenus, l'alignement sur les normes éducatives et la personnalisation.

MOTS-CLÉS: Prononciation, morphologie, unités syntaxiques, apprentissage par chatbot, IA multilingue.

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1. Introduction

The rapid advancement of artificial intelligence (AI) has profoundly reshaped human-machine interaction, particularly through the development of dialogue systems such as chatbots. These systems are now widely applied in various sectors, including education, business, and customer service, owing to their capacity to simulate human communication. Their effectiveness, however, largely depends on their ability to generate linguistically appropriate and contextually relevant responses tailored to the linguistic and cultural norms of specific user groups.

In the domain of language learning, the integration of AI-driven dialogue systems presents both opportunities and challenges. Linguistic optimisation, comprising morphological, syntactic, and pragmatic adjustments, is essential to ensure that such systems support effective and naturalistic communication. Moreover, cultural and linguistic localisation becomes crucial when adapting chatbots for languages with limited digital resources, such as Kazakh. The necessity of aligning chatbot output with the structural, semantic, and stylistic features of the target language thus demands a close collaboration between computational linguistics, educational technology, and AI engineering (Kemelbekova et al., 2024).

Previous research has examined a number of chatbot functionality facets, providing insightful information about system design and performance assessment. The CARE technique, for example, was presented by Feng et al. (2024) and evaluates chatbot performance in commercial settings by emphasising factors including coherence, accuracy, responsiveness, and engagement. Although their paradigm is less sensitive to linguistic and pedagogical aspects, it offers an organised prism through which chatbot utility may be assessed in customer-facing applications. By investigating multimodal dialogue systems that combine textual inputs and visual cues, Agarwal et al. (2022) advanced the area and brought attention to the expanding trend of context-aware conversational bots. To improve syntactic fluency in machine-generated texts, Ortiz-Garces et al. (2024) studied syntactic processing in natural language systems with an emphasis on computational modelling of sentence structures. Even though these contributions highlight important advancements in technology, they frequently put functional measures ahead of the complex requirements of linguistic norm compliance, especially in multilingual or educational settings. Consequently, these studies do not adequately theorise and operationalise the interaction between linguistic theory and chatbot development.

Scholars have also expressed interest in the educational potential of AI-powered chatbots, especially when it comes to second language learning. In their investigations of chatbot integration into language learning classrooms, Wiboolyasarin et al. (2024) and Son et al. (2023) showed that conversational practice increased student motivation, retention, and interactivity. Their research validates the usefulness of chatbots as adjunctive resources that improve interaction and ease language exposure outside of the classroom. By placing AI chatbots within the framework of sustainable education, Kamalov et al. (2023) adopted a more comprehensive stance, arguing that automation can support equal and scalable access to educational materials. Kartal and Yesilyurt (2024) traced the development of AI applications in language instruction and discovered new themes and research clusters by conducting a thorough bibliometric study of the literature from 1995 to 2022. Even

with this expanding corpus, research on the structural linguistic alignment of chatbot responses is still noticeably lacking, especially when it comes to tackling the particular limitations presented by minority or under-resourced languages. Without challenging the deeper linguistic architectures necessary for high-fidelity language modelling in educational AI systems, the majority of current research treats language learning as a functional domain.

Studies by Kadyrbek et al. (2023) and Kemelbekova et al. (2024) have started to discuss region-specific uses of AI in language instruction in the Central Asian context. The application of speech recognition technology for English language learners in Kazakhstan was the main focus of Kadyrbek et al., who placed a strong emphasis on system usability and speech-to-text accuracy. In order to provide useful insights on deployment problems, Kemelbekova et al. investigated AI-supported instruction techniques and their compatibility with Kazakhstan's national educational strategies. Both studies, however, pay little attention to the underlying linguistic logic of the Kazakh language and instead focus mostly on functional and infrastructure issues. In order to produce grammatically and semantically correct outputs, AI-based systems need specialist linguistic optimisation due to Kazakh's agglutinative morphology, flexible word order, and coexistence of Latin and Cyrillic orthographies. For traditional chatbot designs, which are usually trained on corpora of Indo-European languages, these characteristics pose serious challenges. Thus, there is still a significant gap in the application of morphosyntactic, semantic, and pragmatic aspects of linguistic theory to the creation of AI dialogue systems that are suited to the Kazakh language. In order to close this gap and advance the theoretical and practical aspects of AI-mediated language training in multilingual situations, the current study aims to bridge the gap between computational design and linguistic adaptation.

The purpose was to investigate the linguistic aspects and methods of optimising dialogue systems based on artificial intelligence to improve their quality and compliance with linguistic norms. The main objectives set in this study were as follows: to investigate the main linguistic aspects affecting the operation of dialogue systems; to analyse modern approaches used in the development and optimisation of chatbots; to identify the features of linguistic norms and cultural differences that must be considered when developing chatbots in the Kazakh language.

2. Materials and Methods

The key features of dialogue systems based on artificial intelligence were identified. In this context, the way in which AI enables the modelling of the interaction between user and system was investigated. Machine learning methods that allow the

system to adapt and improve based on the collected data, and the role of neural networks in text analysis and generation, were also considered. Attention was focused on such theoretical issues as the possibilities of managing chatbot dialogue, improving the language learning process, integrating chatbots into additional language education, the basics of adaptability and personalisation of chatbots, and the use of dialogue systems to create social intelligence.

Next, linguistic aspects that played an important role in the functioning of dialogue systems were investigated, in particular, from the standpoint of semantics, grammar, and syntax. In this paper, the basics of optimising chatbots for learning foreign languages were noted, among which were considered such as personalisation of learning, the ability to work on pronunciation, the use of gamification, contextual prompts. The stages of chatbot development and optimisation were also investigated, which included improving the quality of natural language, continuous learning based on new data and user queries, and optimising the architecture of query processing, namely, splitting queries into separate blocks.

Next, the stages of chatbot development were considered, from planning and creating a basic structure to integrating more complex functions such as contextual understanding and dialogue generation. Optimisation included improving speech recognition algorithms, increasing the accuracy of responses, and adapting to different communication scenarios. An important point was the use of feedback and error analysis, which improves the quality of the system and increases its reliability. It was also necessary to consider the speed of the chatbot and its ability to respond to requests in real time.

After that, the possibilities of using chatbots to learn foreign languages, their features, and advantages for students in Kazakhstan were described. An analysis of the functionality of various chatbots, such as Duolingo, Babbel, Mondly, HelloTalk, Busuu, Tandem, and Replika, was presented, and their features were highlighted. The potential of using chatbots with a Kazakh interface for teaching English was considered, which helped to overcome language barriers.

To evaluate the perceived effectiveness of various chatbot applications in developing distinct language skills, a structured survey was conducted in September 2024 across two Kazakhstani educational institutions: Municipal State Institution “School-Gymnasium No. 13” and Municipal State Institution “Gymnasium No. 27”. The participants comprised a total of 50 senior-level students (Grade 10-11), with 25 students from each school voluntarily participating in the study. The primary objective of this survey was to assess the students’ evaluations of chatbot-assisted learning in relation to five core linguistic competencies: phonetics, grammar, vocabulary, syntax, and the construction of coherent speech.

Respondents were presented with five closed-ended questions, each targeting one of the linguistic domains: “Which chatbot do you find most effective for training phonetic skills?”, “Which chatbot do you find most effective for training grammatical skills?”, “Which chatbot do you find most effective for training lexical skills?”, “Which chatbot do you find most effective for training syntactic skills?”, “Which chatbot do you find most effective for building connected speech?”. For each item, students selected their preferred chatbot(s) from a predefined list comprising Duolingo, Babbel, Mondly, HelloTalk, Busuu, Tandem, and Replika.

The data collected were analysed quantitatively, with responses aggregated to calculate the percentage distribution of chatbot preferences within each linguistic domain. This enabled a comparative analysis of user-perceived effectiveness across different platforms. The findings served to inform recommendations for the optimisation of domestic Kazakh-language chatbots, including Soyle Bot, Bilim Class, and Qazaq Grammar Chat, by highlighting which functionalities are most valued by students.

All procedures performed in the study were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments.

3. Results

3.1. Linguistic challenges in multilingual chatbot development

An artificial intelligence-based dialogue system is a software solution capable of interacting with users through natural language. Such systems are used in a wide variety of fields, ranging from virtual assistants (for example, Siri, Alexa) to chatbots for business and education (Ni et al., 2023). The main components of the dialogue system include natural language processing, in particular text and speech recognition, grammar and syntax analysis, text generation (creating a response based on a query, using predefined templates or generative models), contextual processing (considering previous messages to maintain a dialogue, building a logical response chain), knowledge base (databases, Internet, special documents), learning module (ability to improve the quality of responses through interaction analysis) (Nsaif et al., 2024).

Linguistics plays a key role in creating dialogue systems, providing tools for analysing, understanding, and generating text (Hoang et al., 2023). The main linguistic tasks include morphological and syntactic analysis, which allows the chatbot to correctly recognise the structure of sentences, identify parts of speech and their grammatical functions, semantic analysis, which is responsible for understanding

the meaning of messages, including the interpretation of synonyms, polysemous words and idioms, pragmatic analysis, which helps to consider the context of communication, user intentions, and hidden meanings. From the standpoint of developing dialogue systems, considering linguistic aspects, such points should be noted (Caldarini et al., 2022). Natural language processing is the foundation of any dialogue system. It includes tokenisation and lemmatisation, in particular, it provides for dividing the text into words (tokens) and reducing them to their initial form (lemmas), analysing the grammatical structure, which manifests itself in identifying connections between words in a sentence, recognising intentions, namely determining the user's goals, such as requesting information or performing an action (Lin et al., 2023).

Chatbots must follow grammatical and spelling rules to make their messages look professional and trustworthy (Kapoor et al., 2025; Riznyk and Riznyk, 2024). For this purpose, syntactic trees are used to construct sentences, databases of grammatical rules to verify the correctness of texts, and corpus studies to identify linguistic trends. It is necessary to consider the language features and variations. Many languages are characterised by dialects and jargons that can affect the understanding and generation of text (Jannach and Chen, 2022). Examples include differences in English (British and American), differences in regional dialects of Russian, and the use of informal speech in messengers (slang, abbreviations). Systems for recognising and normalising informal expressions, contextual translation, and language adaptation are being developed to handle such variations (Porwol et al., 2022). Optimisation of dialogue systems is closely linked to improvements in contextual processing, semantic modelling, and language adaptation. Among the most effective techniques in this domain are advanced machine learning architectures such as long short-term memory (LSTM), bidirectional encoder representations from transformers (BERT), and generative pre-trained transformers (GPT). Each of these architectures addresses different dimensions of natural language understanding and generation, which are critical for accurate and responsive chatbot performance in educational settings.

LSTM networks, a type of recurrent neural network, are specifically designed to manage sequential dependencies in language data. Their ability to retain relevant information across longer sequences makes them suitable for maintaining context within a conversation. In chatbot applications for language learning, LSTMs help ensure syntactic coherence and appropriate response timing. For instance, when a student provides a fragmented or delayed input, the LSTM model can use prior tokens to infer user intent and generate a grammatically correct and contextually relevant response. BERT represents a major advancement in language understanding through its use of bidirectional attention mechanisms. Unlike traditional models that process

text unidirectionally, BERT examines both left and right contexts of a word (Prokhorchuk, 2023). This enables more accurate syntactic parsing and semantic disambiguation. For Kazakh-specific chatbot training, multilingual variants such as KazBERT or mBERT are essential. These models facilitate tasks like part-of-speech tagging, named entity recognition, and error detection. Such tasks are critical for the accurate processing of agglutinative forms and case-inflected structures in the Kazakh language.

GPT models, such as GPT-3.5 and GPT-4, contribute to the generation side of chatbot responses. Trained on massive text corpora, these transformers generate fluent, human-like output by predicting the next word in a sequence given the prior context. In educational chatbot systems, GPT can be employed to generate grammatically and stylistically appropriate example sentences, contextual dialogues, and real-time feedback. When fine-tuned with culturally and linguistically appropriate datasets, including Kazakh-English parallel corpora, GPT-based chatbots can produce adaptive responses that respect local idioms, morphosyntactic conventions, and user proficiency levels. Integrating these architectures into the chatbot optimisation pipeline involves layering: LSTM may be used for memory and dialogue management, BERT for context interpretation and query classification, and GPT for natural language generation. This hybrid configuration enables chatbots to perform complex language-related tasks such as recognising learner errors, offering corrective feedback, and adjusting dialogue tone based on user input. In multilingual environments like Kazakhstan, these capabilities are further enhanced through fine-tuning on locally relevant corpora and applying transfer learning methods that compensate for limited native data resources.

3.2. Principles and stages of chatbot optimisation for language education

In a linguistic context, it is also important to consider error recognition and processing. Users often make mistakes in the text: spelling, grammar, or semantic. Algorithms such as auto-correction, contextual clarification of meaning, and generation of clarifying questions are needed to process them. Multi-language support requires adaptability from the dialogue system. The problems associated with multilingualism are as follows: polysemy (different meanings of one word), differences in syntax, ambiguities in translation. The solution is GPT type models trained on multilingual buildings. Key challenges include ambiguity and context (some words and expressions have different meanings depending on the context), ambiguous queries (users often do not formulate questions clearly enough, which makes them difficult to interpret), cultural and social differences (differences in communication style, etiquette and expectations can affect the perception of a

chatbot). To train a Russian-speaking chatbot, it is necessary to take into account complex grammar, cases, and conjugations of verbs. It is important that bots offer practice in the use of cases and verb forms. The key aspects in learning Chinese are tones and hieroglyphs. Chatbots for Chinese often offer practice on memorising characters and correct pronunciation. Chatbots for English often use listening exercises and spoken phrases adapted to different accents and dialects (for example, British or American). Learning French and Spanish requires practice with articles, noun genera, and verb conjugation, which should also be considered in chatbots.

Optimisation of chatbots for learning foreign languages requires considering many factors that can significantly improve learning efficiency. An important aspect is to create adaptive and personalised approaches for users to make the learning process more flexible and engaging. Adaptability to the user's level of knowledge means that the chatbot should automatically adapt to the user's level of knowledge, offering materials that match their current progress. For example, for beginners, a bot can start with the basics (alphabet, basic phrases), and for more experienced users, with more complex grammatical structures and colloquial expressions. The personalisation of training consists in the fact that the chatbot must take into account the interests and goals of the user, offering content appropriate to his personal preferences. For example, if a person is learning a language for travel, the bot can offer dialogues related to airports, restaurants, etc. Questions and exercises can be adapted to the user's interests, which increases motivation and engagement.

It is important that chatbots include the ability to work with pronunciation. This can be tracked through speech recognition or by providing the user with the correct audio device to synchronise their speech with. To learn languages with strongly pronounced phonetics (for example, English, French, Chinese), it is possible to use exercises to train accents, intonation, and precise pronunciation. The use of gamification helps to make learning more fun (Nurakenova and Nagymzhanova, 2024; Diachuk, 2024). The introduction of game elements such as scores, levels, rewards, and challenges motivates users. The user can earn points for correct answers and go through various difficulty levels, which increases competitiveness and makes learning more dynamic. It is important to use different types of content to gain an in-depth understanding of the language. The inclusion of videos, audio, pictures, and texts helps the user to perceive information from different angles. Images for associations can be used to learn new words or phrases, and videos with live speech examples can be used to better understand grammar.

Chatbots should provide contextual hints and grammatical explanations when the user is facing difficulties (Jerome et al., 2025; Dashko, 2023). This may be an explanation of the use of a particular tense or case, and examples of phrases. It is

important that the bot explains the errors using the rules, and not only corrects them. It is necessary to include mini-lessons on grammar or phrases when the user makes mistakes, with a detailed explanation of the reasons. It is also possible for the chatbot to support multiple interface languages, which will make it accessible to a wider audience. For a user who is starting to learn a language, it may be useful for the bot to first use its native language for explanations, and then gradually switch to the language being studied. It is necessary to switch between languages based on the user's level of knowledge and needs. The chatbot should simulate real conversational situations where the user can practice the language in context. For example, a bot can act out scenarios such as ordering at a restaurant, interviewing, or buying tickets. The user can practice questions and answers, and reactions to typical situations.

The chatbot can also be integrated with social networks or other platforms so that users can communicate with native speakers, participate in groups and forums, and share progress. Integration with services such as Telegram, Facebook or WhatsApp helps to learn in a more familiar environment and involve other people in the communication process. Table 1 shows the stages of chatbot development and optimisation.

Chatbot optimisation includes several key aspects that help to improve efficiency, accuracy, and user interaction. The first area of optimisation is to improve the quality of natural language, namely the use of machine learning algorithms such as GPT to understand language and process text queries. This allows the chatbot to correctly understand the context of requests, analyse the essence of the question, and answer it in natural language. The second area is related to training and adaptation: chatbots need constant training based on new data and user requests. This allows them to adapt to changes in language, new topics and contexts. Additional data sources can be used, knowledge bases can be updated, and the chatbot interface can be reviewed to improve interactions. The third area is the optimisation of the query processing architecture, namely, the division of requests into separate blocks (for example, FAQ requests, consultation requests, support requests), allows for more efficient processing and structuring of information.

Improving the efficiency of data verification is essential, as chatbots must be capable of validating the accuracy of user-entered data (such as email addresses and phone numbers) to ensure reliable request processing. Equally critical is the implementation of a multi-channel interaction strategy, enabling chatbot accessibility across diverse platforms including websites, mobile applications, and messaging services. Such diversification enhances user engagement by accommodating individual communication preferences.

Table 1. Stages of chatbot development and optimisation.

Stages of development	Stages of optimisation
User needs analysis: target audience research, identification of needs and problems that a chatbot should solve (for example, help with grammar, vocabulary, pronunciation)	Data analysis and collection: Analysing data about user behaviour, their requests, types of errors and preferences, and the effectiveness of current chatbot functions (for example, frequency of use, engagement, and task success)
Development of the concept and structure: definition of key functions (e. g. exercises, tests, dialogues), structures of user interactions (e. g. dialogue scripts, learning routes)	Processing and analysing user interactions: studying the patterns of user interaction with a bot, which helps to identify weaknesses in the interface and content.
Collection and preparation of teaching materials: adaptation of texts, audio, video, exercises, tests	Learning and improving the natural language processing model: optimisation of algorithms, improving the chatbot's ability to recognise synonyms, dialects, and differences in sentence construction
Developing a natural language processing model: processing and understanding user requests	Personalisation of content and interactions: adaptation of answers and tasks depending on the student's level, for example, automatic adjustment of the difficulty of exercises, adjustment of topics and types of tasks depending on the user's progress.
Integration of multimedia elements: inclusion of audio and video materials, images and graphics	Integration of multimedia elements: audio and video materials, pictures and infographics
Testing and debugging: identify problems with the bot, its interface or content, and improve interaction	Using feedback and analysing results: regularly collecting and analysing feedback
Personalisation of training: selection of topics, complexity of tasks, or adjustments to teaching methods.	Algorithm testing and adjustment: continuous testing of various versions of the chatbot with updated algorithms
Receiving and analysing feedback: identifying weaknesses and making adjustments	Updating the database and materials: updating the knowledge base, including new topics, words, and phrases
Constant updating and improvement: updating materials, improving language processing algorithms	Performance optimisation: improving the chatbot's response speed, eliminating technical errors, improving the user interface, and working with the server
Scaling and integration with other platforms: integration with mobile applications, messengers, educational platforms	Monitoring and continuous improvement: analytics of user data and behavioural patterns

However, as AI-driven educational chatbots become increasingly embedded in pedagogical processes, ethical concerns surrounding data privacy, algorithmic fairness, and student autonomy must be prioritised. Privacy and data protection mechanisms must not only secure the storage and processing of personal information but also ensure compliance with globally recognised legal standards, such as the General Data Protection Regulation (2016) and the California Consumer Privacy Act (2024). These regulations mandate transparency in data usage and uphold individuals' rights to control their personal data, which is especially significant when minors are involved in educational settings. Moreover, algorithmic bias presents a significant ethical risk. If training data do not adequately represent the diverse linguistic and cultural backgrounds of students, AI systems may inadvertently reinforce stereotypes or exclude marginalised groups (Spaska et al., 2025; Kondratenko and Kondratenko, 2015). This can exacerbate educational inequalities. Ensuring fairness requires ongoing auditing of algorithms and dataset inclusivity, particularly in multilingual contexts such as Kazakhstan.

Another crucial concern is the potential over-reliance of students on chatbot systems. While chatbots can support autonomous learning, their ubiquitous presence may lead to reduced development of critical thinking, problem-solving, and spontaneous communication skills. Educational institutions must therefore balance the integration of chatbot technologies with human-guided instruction to maintain pedagogical integrity. Analytical tools are indispensable for monitoring user behaviour, identifying common queries, evaluating response accuracy, and diagnosing systematic errors. Continuous analysis and iterative improvements to chatbot architecture and content, through code refinement and adaptive algorithms, are key to enhancing both functionality and ethical responsibility. A comprehensive optimisation strategy must incorporate not only technical performance metrics but also the ethical imperatives of transparency, fairness, and the preservation of human agency in learning environments.

3.3. User evaluation and application of chatbots in the educational context

Chatbots for learning foreign languages, considering their features, can be very useful tools for practice, developing communication skills, and strengthening grammatical knowledge. It is important that chatbots consider language features such as sentence structure, grammar, phonetics, and vocabulary.

Duolingo is a widely used chatbot designed for structured language learning across a variety of languages including English, French, German, Spanish, and Chinese. It employs a gamified model that integrates grammar exercises, listening comprehension tasks, and translation-based activities. Its adaptive algorithm continuously adjusts task difficulty based on user progress, thereby maintaining an optimal challenge level. Lessons are divided into thematic units, and users receive immediate feedback on performance. Duolingo's chatbot also includes speech recognition to support pronunciation training and uses spaced repetition to reinforce vocabulary retention. Figure 1 presents the interface of the Duolingo chatbot.

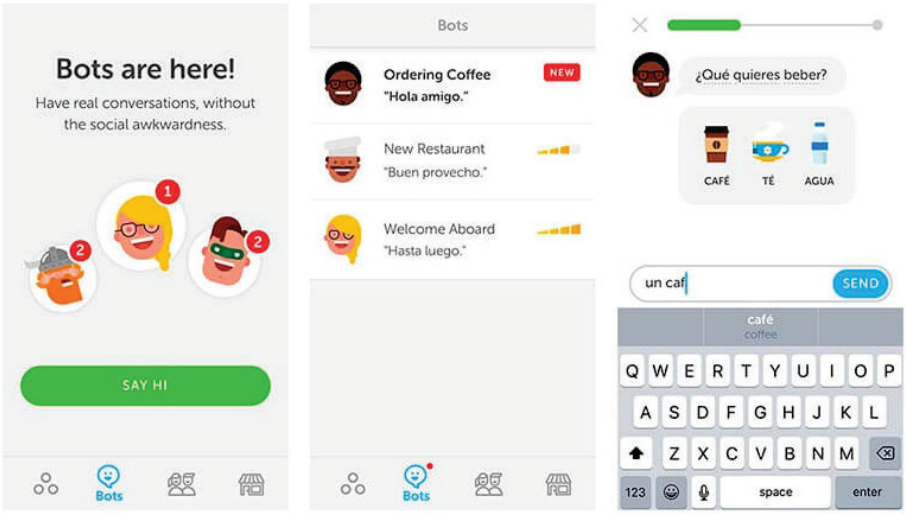

Figure 1. Duolingo chatbot interface. Source: compiled by the authors based on Patel (2023).

Babbel is a chatbot primarily focused on developing conversational competence and grammatical accuracy (Figure 2). It offers personalised lessons across several languages such as Spanish, Italian, and Polish, with a curriculum structured around real-life communication scenarios (e.g., travel, business meetings, shopping). Babbel provides detailed grammatical explanations, contextual examples, and voice-recorded dialogues. Unlike Duolingo, it emphasises syntactic precision and practical phrase usage over gamification. Speech recognition is integrated to help users improve pronunciation, and users are encouraged to construct sentences based on visual and audio prompts, enhancing both receptive and productive skills.

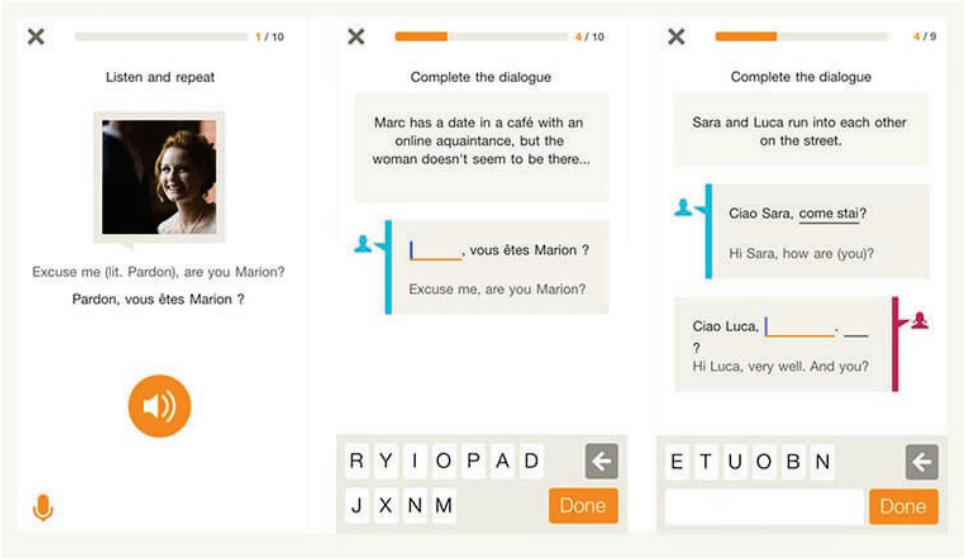

Figure 2. Babbel chatbot interface. Source: compiled by the authors based on Patel (2023).

Mondly leverages artificial intelligence to tailor content to the user's proficiency level and learning goals (Figure 3). It supports over 30 languages and provides practice through simulated dialogues and chatbot-led scenarios, including situational contexts such as tourism, workplace communication, and cultural exchange. The chatbot includes speech recognition for pronunciation training and augmented reality features in its mobile app, which allow immersive learning experiences. Mondly also integrates visual elements such as thematic vocabulary cards to reinforce lexical acquisition, and offers grammar review sessions embedded within conversational flows.

Busuu is a chatbot that supports both independent learning and interactive feedback. It includes grammar tutorials, listening and writing tasks, and pronunciation exercises that reflect regional variations and cultural specifics. A notable feature is its community-based learning model: users receive corrections from native speakers on their written and spoken outputs, fostering authentic language interaction. Lessons are organised around CEFR levels and include visual grammar guides, vocabulary review with spaced repetition algorithms, and situational dialogues. The chatbot tracks user errors and adapts subsequent tasks accordingly.

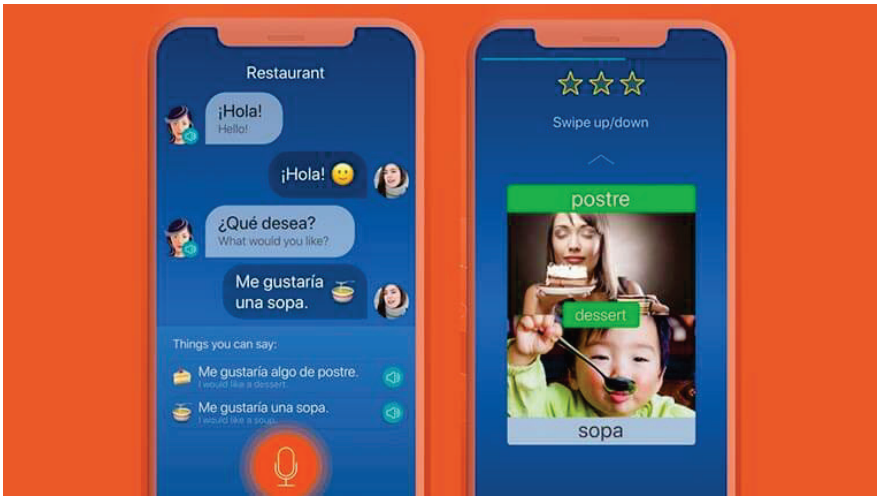

Figure 3. Mondly chatbot interface. Source: compiled by the authors based on Patel (2023).

HelloTalk functions primarily as a social chatbot that connects users with native speakers via text, voice, and video messaging. It supports over 100 languages and integrates instant translation, speech-to-text, transliteration, and grammar correction tools to scaffold intercultural communication. The chatbot's correction features allow users to learn through their own errors in real time, and conversations can be saved and reviewed. Unlike structured platforms like Duolingo, HelloTalk focuses on freeform conversation, language immersion, and social engagement to develop communicative fluency and pragmatic competence.

Tandem operates similarly to HelloTalk in facilitating peer-to-peer communication but places greater emphasis on structured learning goals. It supports audio and video chats with native speakers and includes a tutor marketplace for professional lessons. The chatbot component assists users with linguistic accuracy by offering real-time suggestions, contextual phrase alternatives, and automated corrections. Additionally, it helps users craft a personalised language learning path based on declared objectives (e.g., academic writing, colloquial fluency, exam preparation). Cultural awareness is promoted through thematic exchanges and curated language challenges.

Replika is an AI-driven chatbot that simulates emotionally intelligent, free-flowing conversation in multiple languages. Originally developed for mental health and companionship, it has been adapted for language practice by allowing users to engage in dynamic dialogues that evolve with repeated use. The system uses deep learning to

adjust to the user's communication style, vocabulary level, and interests. Unlike task-oriented chatbots, Replika fosters narrative-style exchanges, encourages reflective responses, and incorporates emotional tone recognition to increase learner engagement. It is particularly effective for practising informal, spontaneous language use.

A survey was conducted at Municipal State Institution "School-Gymnasium No. 13" and Municipal State Institution "Gymnasium No. 27" to investigate the relationship between the use of chatbots: Duolingo, Babbel, Mondly, HelloTalk, Busuu, Tandem, Replika for the development of phonetic, grammatical, lexical, syntactic skills and the construction of coherent speech (Table 2). This is necessary to understand the effectiveness of using chatbots.

Table 2. Student survey results.

Title of the linguistics section	**Municipal State Institution "School-Gymnasium No. 13"**						
	Duolingo	**Babbel**	**Mondly**	**HelloTalk**	**Busuu**	**Tandem**	**Replika**
Phonetics	43%	-	-	-	29%	28%	-
Grammar	53%	31%	-	11%	-	5%	-
Vocabulary	48%	36%	-	-	16%	-	-
Syntax	-	-	36%	29%	-	21%	14%
Building coherent speech	-	-	37%	35%	-	28%	-
Title of the linguistics section	**Municipal State Institution "Gymnasium No. 27"**						
	Duolingo	**Babbel**	**Mondly**	**HelloTalk**	**Busuu**	**Tandem**	**Replika**
Phonetics	41%	29%	-	-	21%	-	9%
Grammar	59%	23%	-	-		18%	-
Vocabulary	39%	37%	-	-	24%	-	-
Syntax	-	-	39%	36%	-	12%	13%
Building coherent speech	-	-	46%	-	-	29%	25%

The data presented in Table 2 reveal several important trends regarding the perceived effectiveness of different chatbots across various linguistic competencies. Duolingo emerged as the most preferred platform for phonetics and grammar, with 43% and 53% of students from School-Gymnasium No. 13, and 41% and 59% from Gymnasium No. 27 respectively indicating its effectiveness in these domains. This preference may be attributed to Duolingo's structured and repetitive training modules, which support the acquisition of pronunciation and grammatical rules. For vocabulary development, Duolingo and Babbel were again notable, although there was a slightly more distributed preference among respondents, suggesting that vocabulary acquisition may be supported by a variety of platforms. When examining syntactic training, Mondly and HelloTalk were the most frequently cited tools, possibly due to their dialogue-based approaches that offer contextualised grammar and sentence structure exercises. Interestingly, for the construction of coherent speech, Tandem and HelloTalk were preferred, especially among students from Gymnasium No. 27, where HelloTalk was favoured by 46% of respondents. This may reflect the impact of real-time interaction with native speakers provided by these apps. The results indicate that while no single chatbot excels in all areas, different applications offer specific strengths aligned with particular linguistic competencies.

Using chatbots to teach English in lessons in Kazakhstan can significantly improve the learning process by providing students with interactive and personalised lessons. Kazakhstan, as a multilingual country, can use chatbots with a Kazakh interface so that students can practice English without experiencing language barriers (Dubovyk, 2024). Among the advantages of chatbots for learning English in Kazakhstan are the following. Firstly, multilingualism: using the Kazakh language in the interface helps students to navigate the learning process more easily without losing confidence when completing assignments in English. Interactivity is conditioned by the fact that chatbots can offer students assignments, train grammar, vocabulary, and pronunciation in a playful or conversational way.

Learning with chatbots can take place at any time, which is ideal for self-study. AI can adapt tasks depending on the student's level, creating personalised learning routes. Chatbots can simulate conversational situations such as ordering food, shopping, travelling, which allows students to prepare for real communication in English. Examples of tasks that can be integrated into chatbots for teaching English in Kazakhstan can range from grammar exercises to dialogue situations. Table 3 shows examples of exercises.

Table 3. Examples of exercises using various chatbots.

Task	Exercise
Duolingo Choosing the right translation Filling in the gaps	"I am a student" A) Мен студентпін B) Мен дәрігермін C) Мен оқытушымын
	Менің атым (My name is)
Babbel User is asked to act out a conversation in the store Build a sentence from words	Seller: Can I help you? User chooses the answer: A) Мен нан іздеп жүрмін (I am looking for bread) B) Сағат қанша? (What time is it?)
	[оқимын, Мен, кітап]
Mondly Word cards Pronunciation practice	The word in Kazakh is shown: үй (house). Sser selects an English translation from the options: A) house B) book C) school
	User needs to say, "I like apples." The app checks pronunciation
HelloTalk Correction of the text	Topics for discussion: "Describe your day" ("Сипаттаңыз күніңізді")
	The user writes, "I am not understand." Chat corrects: "I do not understand"
Busuu User is invited to listen to the dialogue and write a translation of the name into English.	A: What is your name? B: Менің атым Айша (My name is Aisha)
Tandem Live communication	The user describes the photo sent to the students: "Бұл алма. Ол қызыл және дәмді" Translation: "This is an apple. It is red and tasty"
Replika Role-playing game	Chatbot asks, "What do you usually eat for breakfast?" The user replies: "I eat bauyrsak and drink tea" The bot continues: "What is bauyrsak?"

In order to effectively use chatbots in lessons in Kazakhstan, teachers can integrate them into various types of classes. For example, they can be used as supplementary exercises for independent work. Chatbots can be used as part of a lesson where students work in pairs or groups, using the bot to practice speaking. Bots can play audio or video with real-life conversations, allowing students to practice listening comprehension and pronunciation. Among the key development prospects are the following. The first is the improvement of natural language processing models, the use of models tailored to the cultural and social context, and the introduction of multimodal analysis technologies (accounting for text, voice, and images). Natural text generation involves the development of algorithms that ensure the most natural

construction of sentences, the creation of emotionally intelligent systems capable of recognising and expressing emotions. Personalisation of communication is related to the customisation of the style and subject of the dialogue, depending on the user's preferences.

3.4. Adaptation of NLP models for the Kazakh language

Optimisation of chatbots for working with the Kazakh language requires considering its unique linguistic features, such as its agglutinative structure, rich morphology, lexico-semantic nuances, and the specifics of alphabets (Latin, Cyrillic). The main aspects of optimisation include the following. Creating an effective chatbot for the Kazakh language requires a special approach that considers both linguistic and cultural aspects. The Kazakh language has a rich morphology, complex rules of word formation, and unique cultural features that must be considered during development. The morphological and syntactic adaptation of chatbots for the Kazakh language assumes agglutinativity, which involves adding suffixes to the root of the word. The chatbot must consider all possible declensions and conjugations of words, the variability of words, for example, singular and plural, forms of politeness.

The algorithm must be adapted to the phonetic features of the Kazakh language to work with voice messages. It is also necessary to consider the presence of two alphabets (Latin and Cyrillic) so that the chatbot can work with both writing systems. It is also mandatory to mention traditions, national concepts, and cultural norms. For example, knowledge of greeting customs or respectful addresses. It is also necessary to correctly process forms of politeness, such as the use of "сіз" (you-all) and "сен" (you). The Kazakh-Russian bilingualism parameter should be taken into account. The chatbot must handle switching between Kazakh and Russian, which is typical for many users. The chatbot should be configured to work with borrowed words often used in Kazakh speech. It is necessary to consider words with multiple meanings to correctly interpret user queries.

Among the technical solutions, the following can be presented: the use of NLP tools for the Kazakh language, in particular Kazakh-BERT for pre-trained language models for the purpose of analysing the Kazakh language, OpenNLP and SpaCy for morphological and syntactic analysis with refinement for Kazakh morphology. It is necessary to create a database with basic lexical units, including dialects and regional features, and use open sources such as the Kazakh National Corpus. In the context of machine learning, it is suitable to train a chatbot on Kazakh speech corpora to understand the context and idioms, and to use transfer learning methods to improve

the processing of rare words. Testing and localisation involve elements such as continuous native testing and user feedback to identify bugs and improvements.

The Kazakh language has a standard word order (subject – object – verb), which differs from Russian or English. The solution may be to set up NLP models for the correct recognition and generation of sentences, considering the features of the structure. In the Kazakh language, many words have cultural or ethnic connotations. The solution to this issue may be the creation of specialised dictionaries with contextual meanings. Modern Kazakh uses both Cyrillic and Latin letters. Users can enter text in different systems. The solution is to support automatic text conversion between alphabets. Due to complex endings and affixes, the basic classification algorithms can get confused. A solution may be to use machine learning models (for example, BERT, configured for the Kazakh language) to accurately determine intentions. The Kazakh language has regional specifics in pronunciation and vocabulary. Adding data from different regions to training sets can be a solution to this problem. Many Kazakh-speaking users use elements of the Russian language in their correspondence. The solution to this problem is to introduce mechanisms that understand both mixed text and pure Kazakh.

Another problem is the lack of training data for the Kazakh language. The solution is to create and annotate corpus data, participate in projects such as Mozilla's Common Voice or local initiatives. Tools and technologies used: Hugging Face provides models such as KazBERT, trained for the Kazakh language, TensorFlow and PyTorch are used to configure their own models, Google AutoML Translation can help with basic translation and NLP tasks, KazNLP provides local solutions for working with the Kazakh language. Promising areas in the context of the Kazakh language can be considered such as interface localisation (creating an intuitive interface reflecting cultural characteristics), the use of user tests (regular testing of the bot with native speakers to improve), integration with local platforms (chatbots integrated into messengers popular in Kazakhstan, for example, Telegram, WhatsApp).

Chatbots for learning foreign languages have appeared in Kazakhstan, which integrate artificial intelligence technologies adapted to local educational needs. Bilim Class student chat is an educational bot created for students and schoolchildren in Kazakhstan. It provides assistance in completing homework in foreign languages, explaining grammar rules, and selecting exercises for practice. Soyle Bot has been launched in the Telegram application, with which you can replenish the reserve of Kazakh vocabulary. Qazaq Grammar Chat helps to learn Kazakh and English in parallel. Among the main functions are the following: translation of phrases, explanation of grammar rules, study of Kazakh-English vocabulary. It is also suitable

for bilingual education. Askify.kz, a chatbot developed on the basis of OpenAI's Davincii algorithm, can be useful for teaching Kazakh. It should be noted that applications such as Til-Qural, Aıtý, Qazaq Lab, Soyleseyik, Qazaq Genius, Qonzhyq are used for teaching foreign languages.

The best practices of international solutions can be used to optimise Kazakhstani chatbots for the purpose of learning foreign languages. For example, personalisation of learning can be applied, in particular, using AI to analyse the user's knowledge level and automatically adapt content, adding the option to select learning objectives (spoken language, exam preparation, business English, etc.), and embedding a progress tracking system. Duolingo automatically determines the level of knowledge using a test before starting the course. Kazakh chatbots can enable a similar feature adapted to local educational standards (for example, the Common European Framework of Reference for Languages). The practice of multimedia integration involves the introduction of audio and video tutorials to improve speech perception, and the addition of speech recognition functions to train pronunciation. Elsa Speak helps to improve pronunciation through speech analysis. Kazakh bots can use similar technologies for Kazakh-English and Kazakh-Chinese language pairs.

Gamification of the learning process involves the introduction of gameplay (points, rewards, levels) for motivation, the addition of group tasks or competitive elements (Ibatov et al., 2021; Kokareva, 2023). Memrise offers game exercises in which the user competes with others. Kazakh bots can adapt them for local audiences by adding, for example, Kazakh proverbs to exercises. The tactics of content localisation include the need to consider the features of the Kazakh language and mentality, adding examples from the daily life of Kazakhstanis, including culturally significant topics. Busuu offers courses with local examples. Kazakh chatbots can adapt lessons to the realities, for example, include topics about nauryz, yurts, and traditional cuisine.

Access to tutors provides for the addition of live communication with the teacher through the bot, the introduction of a homework check function. Preply allows contacting teachers. Kazakh solutions can provide this service with the participation of local educators. Learning through context involves integrating a bot in messengers to practice language in real conversations, adding a script for real situations (conversations in a store, travels). HelloTalk actively promotes correspondence with native speakers. Kazakh bots can offer a chat in English to discuss popular topics in the country, such as national holidays. The use of a cognitive and communicative approach is associated with the development of skills through dialogues, the inclusion of tasks that require reflection, for example, text analysis or discussion of topics. ChatGPT provides interactive learning through dialogue (Duro and Kondratenko,

2015; Golovach, 2023). Kazakh chatbots can use a similar approach to train communication skills. Integration with the educational system provides for the connection of chatbots with the Unified National Testing (UNT), Test of English as a Foreign Language or International English Language Testing System to help students prepare for exams, and integration with Kazakh distance learning platforms (BilimLand, Kundelik.kz). Khan Academy offers materials for preparing for the Scholastic Aptitude Test. Kazakh bots can provide similar resources for preparing for the UNT.

Optimisation of Kazakh chatbots is possible through the integration of AI for personalisation, localisation, and gamification, the connection of multimedia technologies and live teachers. These changes will make learning more efficient and attractive to users. It is especially important to consider the unique grammatical and syntactic features of the language, such as agglutination in Kazakh or the analytical structure of English. This allows creating chatbots that not only effectively understand queries, but also generate responses that comply with the norms and style of the language. In addition, such systems play an important role in education by popularising language learning and providing accessible tools for practice. The inclusion of cultural features and local context in the development process helps to increase the trust and interest of users, especially in languages with limited digital resources.

4. Discussion

The integration of AI-based dialogue systems, especially chatbots, in language teaching is becoming an increasingly popular area of research. The implementation of such systems in English language teaching has brought significant advantages, including personalised learning, instant feedback, and the ability to simulate real-world communication scenarios. In the context of Kazakhstan, where English is taught as a foreign language and linguistic diversity is an important aspect, optimisation and careful development of chatbots become key to ensure that they effectively meet the needs of students while respecting the linguistic and cultural norms of the country.

Chatbots, which are AI-based dialogue systems, are already being recommended as an effective tool for improving language learning by providing students with a platform to practice spoken, auditory, and written skills in a controlled environment. According to Bibauw et al. (2022), chatbots can simulate conversations with humans, creating a space for students where they can practice English. This observation appears particularly pertinent to the context of Kazakhstan, where

opportunities for authentic English-speaking communication may be constrained, and students often lack consistent exposure to immersive language environments.

Based on the results obtained, one of the main advantages of using chatbots in language teaching is the opportunity for students to practice the language without fear of judgement or embarrassment, which often occurs during live communication. The opinion of Zhang and Huang (2024) says that chatbots based on large language models can positively influence the assimilation of the vocabulary of a second language, it is also relevant for Kazakhstan, where English is taught as a second or foreign language. In particular, the practice of vocabulary and grammar using an AI system is associated with improving the process of memorisation and assimilation of material.

However, the effectiveness of chatbots in language learning depends not only on their ability to simulate conversations. An important aspect is their development and content, especially in the context of linguistic features and cultural norms. In addition, the studies by Cislowska and Pena-Acuna (2024) and Chen et al. (2024) noted that the integration of chatbots into additional language education requires a careful approach to the linguistic and cultural context of students. Kazakhstan is a multilingual country in which Kazakh and Russian are the official languages, and English is taught as a foreign language in schools and universities. The linguistic diversity of the country creates both opportunities and challenges for the development and optimisation of chatbots for teaching English (Rybchynska, 2023). It is important that chatbots consider the specific needs of students with different language backgrounds.

The development of AI dialogue systems for language teaching in Kazakhstan should consider the linguistic features of Kazakh, Russian, and English. For example, Kazakh and Russian have differences in grammatical structure from English, and students may have difficulty with aspects of English grammar that are not found in their native languages (word order, tenses, or articles). The opinion of Brabra et al. (2022) should be considered: the dialogue management capabilities of chatbots should be advanced enough to accommodate such language differences and provide contextually relevant feedback. For example, chatbots should be able to offer explanations or alternative phrases when students make common grammatical mistakes related to their native languages.

Kazakhstan's cultural heritage, which combines Eastern and Western traditions, adds another challenge to the development of AI dialogue systems. The ability of chatbots to understand and respect cultural nuances is key to effective language learning, especially when it comes to engaging students on an emotional level and developing intercultural competence (Nagimzhanova et al., 2019; Snihovska, 2023). Zhai and Wibowo (2023) emphasised the importance of

personalising AI systems to meet the specific needs of students. In the context of Kazakhstan, this idea is useful because students can come from different educational backgrounds and have different levels of English proficiency.

Based on the results of the study, it became clear that chatbots can serve as a valuable tool for familiarising students with various dialects of English, slang, and cultural realities. Xiao et al. (2024) explored the importance of emotional engagement in AI-based learning, noting that chatbots can improve motivation and learning outcomes by recognising and responding to students' emotions. In the context of Kazakhstan, where students may encounter a limited number of native speakers, chatbots should be designed to mimic empathy, humour, and cultural sensitivity. As stated by Zhai et al. (2024a), AI systems that can include humour and empathy create a more fun and supportive learning environment, motivating students to continue practising language even after mistakes. But it is impossible to agree that recognising these emotions would significantly improve the effectiveness of language learning.

Although AI-based dialogue systems have great potential, there are several problems with their effective use in English language teaching in Kazakhstan. One of the main challenges is the need to address the limitations of existing AI systems in understanding complex multi-way conversations. This problem was also considered in the study by Brabra et al. (2022), which examined dialogue management as a critical area requiring further improvements, especially in systems designed for educational purposes. In Kazakhstan, where students can have longer conversations with AI systems, it is important to ensure that the chatbot maintains the consistency and relevance of its responses, which is crucial for creating meaningful learning situations.

Chatbots can adapt their responses depending on the level of training and the context of communication with the user, as noted by Binhammad et al. (2024), which allows creating a more individualised approach and is especially important for students with different levels of knowledge and needs. Without a doubt, the use of machine learning and natural language processing technologies allows chatbots to effectively adapt to different linguistic and cultural contexts, as indicated in the study by Caldarini et al. (2022). This is really important for multilingual countries such as Kazakhstan, where students may encounter differences in vocabulary, accents, and cultural norms.

To optimise the use of chatbots in English language teaching in Kazakhstan, it is necessary to constantly improve dialogue systems based on feedback from students and teachers. This may include adjusting the complexity of the chatbot's language, integrating cultural elements relevant to Kazakhstan, and improving the emotional intelligence of speech recognition systems. As noted by Zhang et al. (2024), the use

of large language models and deep learning technologies can improve the adaptability and personalisation of chatbots, making them more effective for diverse groups of learners.

While chatbots can be useful in learning, the over-reliance on them is unacceptable. As stated by Zhai et al. (2024b), chatbots may limit the development of critical thinking and spontaneous communication, but in the context of investigating their positive impact, it is important to note that the use of chatbots can be balanced using technology with real conversations and interaction between students. However, dependence on chatbots can create the illusion of progress, but not develop real communication skills such as flexibility and adaptability in conversation. Another problem is the risk of over-reliance on chatbots, which can weaken students' cognitive abilities. As noted by Zhai et al., excessive reliance on chatbots may limit the development of critical thinking and the ability to engage in spontaneous live communication. This opinion can only be partially accepted. For example, in Kazakhstan, where real communication in English may be limited, it is necessary to balance the use of chatbots with conventional methods such as group discussions and peer-to-peer interaction so that students develop comprehensive language skills.

Chatbots can be useful for improving students' communication skills, as noted by Fujii et al. (2022) and Cai et al. (2022). Through interaction with chatbots, students can not only learn grammar, but also develop real communication skills, which is especially important for language learning. Chatbots can also help students to develop not only language but also social skills, according to the study by Lee et al. (2023). Dialogue systems with a hierarchical structure can significantly improve the perception of the material and help students to organise their knowledge correctly. However, insufficient attention is paid to the emotional and social aspects of learning: although chatbots can be effective in teaching grammar and vocabulary, they cannot completely replace live communication, which includes emotional intuition and social interactions.

Thus, creating effective chatbots requires an integrated approach that includes not only technological and linguistic solutions, but also a deep understanding of the cultural and emotional aspects of interaction. The development of technologies such as machine learning will continue to play a key role in optimising chatbots, allowing them to respond more accurately and flexibly to the needs of users from different cultural and linguistic contexts.

5. Conclusions

Dialogue systems based on artificial intelligence represent a transformative tool in modern communication, enabling effective interaction between users and technology. These systems rely on natural language processing algorithms to understand, analyse, and generate human-like communication. Their primary objectives include ensuring accuracy, naturalness, and adaptability within dialogues. Linguistically, they are shaped by phonetic, morphological, lexical, syntactic, and pragmatic factors, which are particularly important when designing systems for languages with complex grammatical structures or limited digital resources.

The development and optimisation of chatbots for language learning involve a sequence of stages, from identifying user needs and structuring interaction models to deploying natural language processing algorithms and integrating multimedia resources. Optimisation requires iterative improvements through user data analysis, algorithm refinement, content personalisation, and continuous feedback integration.

Quantitative findings from a survey of 50 students across two Kazakh schools, namely Municipal State Institution "School-Gymnasium No. 13" and "Gymnasium No. 27," revealed specific chatbot preferences for different linguistic domains. Duolingo emerged as the most effective tool for phonetics (43% and 41%), grammar (53% and 59%), and vocabulary acquisition (48% and 39%). Syntax learning was best supported by Mondly and HelloTalk, with effectiveness ratings ranging from 36% to 39%. For constructing coherent speech, Mondly, HelloTalk, and Tandem were preferred, with student preference rates between 35% and 46%. These results demonstrate that different chatbots possess varying strengths in developing particular language skills, which should be strategically considered in language curriculum design and chatbot integration.

Optimising chatbots for the Kazakh language requires attention to its agglutinative morphological structure, rich syntax, and the coexistence of Cyrillic and Latin alphabets. Additionally, incorporating cultural nuances and local idioms enhances chatbot relevance and educational effectiveness. The scarcity of digital linguistic resources for Kazakh makes the creation of local corpora and the application of transfer learning methods critical for developing functional AI systems. Kazakhstan has already introduced chatbots such as Soyle Bot, Bilim Class, and Qazaq Grammar Chat into its educational landscape. These tools are tailored to local linguistic needs and benefit from adopting international best practices including personalised learning paths, multimedia integration, gamification, cultural content localisation, and system compatibility with national education platforms.

In conclusion, AI-based dialogue systems offer significant potential in advancing language education and preserving linguistic diversity. Their application in Kazakhstan underscores the importance of combining technological, linguistic, and pedagogical strategies to develop adaptable, culturally aware, and pedagogically sound educational tools. The study's limitations, primarily the focus on two schools, suggest that future research should expand the sample size and include more diverse educational contexts. Prospective areas for development include the design of multilingual AI models, enhanced cultural adaptation features, and technical refinement for low-resource languages.

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