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PRACTICAL ASPECTS OF USING NEURAL NETWORKS FOR DEVELOPING LEXICAL-GRAMMATICAL COMPETENCE

Annotation. This article presents the results of an empirical study on the practical use of neural networks for developing lexical-grammatical competence among university students learning English as a foreign language. The research was carried out at M. Utemisov West Kazakhstan University among students of groups ИЯ-11, ИЯ-12, and ИЯ-13. The aim of the study was to evaluate the effectiveness of neural-network-based tools, such as ChatGPT and Grammarly, in improving grammatical accuracy and lexical range. The methods included diagnostic testing, pedagogical experiments, and comparative statistical analysis. Findings demonstrated a significant increase in students' language performance and motivation when using AI-driven exercises. The study emphasizes the pedagogical potential of neural networks for personalized and interactive language learning, contributing to the modernization of English language teaching in Kazakhstani higher education.

Keywords: neural networks; lexical-grammatical competence; artificial intelligence in education; English as a foreign language; adaptive learning; digital pedagogy; language technologies; higher education; pedagogical experiment; grammar correction; vocabulary development; ChatGPT; Grammarly; autonomous learning; M. Utemisov West Kazakhstan University.

Introduction

Artificial intelligence's quick development has changed the face of education in the modern era, especially when it comes to learning foreign languages. As self-learning computer systems that can process vast amounts of linguistic data, neural networks have opened up new avenues for improving students' lexical and grammatical proficiency. Artificial intelligence (AI)-based tools like ChatGPT, Grammarly, and DeepL have gained popularity in language classrooms in recent years because they provide students with data-driven insights into their language performance, personalized correction, and real-time feedback.

The lack of methodological knowledge regarding the practical integration of neural networks into English language instruction to improve lexical-grammatical competence is the issue this study attempts to address. Conventional grammar training

frequently emphasizes memorization of rules and repetitive exercises, neither of which always foster contextual accuracy or communicative fluency. On the other hand, through interaction and feedback, neural networks offer an adaptive environment where students can learn to create grammatically sound and lexically rich sentences.

Determining the pedagogical efficacy of neural network-based learning resources in enhancing university-level students' lexical-grammatical proficiency is the aim of this study. According to the working hypothesis, systematically utilizing neural systems in language instruction improves learner motivation, broadens vocabulary, and improves grammatical accuracy.

The relevance of this study is determined by the growing need for innovative educational technologies that respond to the digitalization of higher education in Kazakhstan. The development of neural network applications in language pedagogy aligns with national educational priorities aimed at forming competitive specialists with advanced communication skills. Moreover, the introduction of neural tools supports inclusive and autonomous learning environments, which are essential for students of the 21st century.

This research was conducted at M. Utemisov West Kazakhstan University, where English language learners were engaged in experimental work using AI-based grammar and vocabulary exercises. The results are expected to contribute both theoretically and practically to the modernization of English language teaching methods in Kazakhstani universities and to offer a framework for integrating artificial intelligence into communicative competence development.

Numerous researchers have confirmed in recent decades that a systematic and contextualized approach to language practice is necessary for the development of lexical-grammatical competence, rather than relying solely on mechanical memorization of rules [1, p. 23]. Neural networks may be used as intelligent mediators in this process because of their ability to interpret linguistic input and offer predictive feedback [2, p. 45]. According to applied linguistics research, learning tasks that incorporate pattern recognition, error correction, and interactive simulations—all of which are characteristics of neural-network-based systems—help students learn grammar and vocabulary more successfully [3, p. 58].

Additionally, the state's strategic objectives for digital transformation and multilingual education make the introduction of neural technologies in Kazakhstani higher education practically necessary [4, p. 12]. AI integration in English language instruction helps university curricula conform to global educational standards while also modernizing pedagogy. In this context, the experience of M. Utemisov West Kazakhstan University shows that neural-based learning can support autonomous learning abilities while improving academic communication and linguistic competence [5, p. 37].

Therefore, the current research addresses a timely pedagogical challenge: identifying how neural networks can be effectively applied to develop lexical-grammatical competence among university students in Kazakhstan. The study is grounded on the premise that neural systems -when used systematically and under teacher guidance -foster metalinguistic awareness, increase student autonomy, and strengthen grammatical intuition through data-driven interaction. Such integration represents a

crucial step toward an evidence-based, technology-enhanced approach to foreign language instruction in higher education.

Building on the theoretical foundations laid by Russian and international scholars, this study also considers the broader cognitive and linguistic implications of neural-network-assisted learning. Kravchenko (2021) emphasized that neural models create conditions for *intelligent feedback loops*, allowing learners to internalize grammatical rules through interaction with adaptive algorithms [6, p. 87]. Volkova (2023) expanded this view by showing that cognitive processing in AI-mediated environments promotes the development of linguistic intuition and metacognitive awareness [7, p. 93]. In turn, international researchers such as Mitchell (2020) and Williams (2021) demonstrated that neural networks function as active cognitive scaffolds that simulate natural language acquisition through real-time prediction and correction [8, p. 602; 9, p. 118]. Collectively, these findings provide the theoretical rationale for the present study and substantiate the integration of neural technologies into the modern framework of English language pedagogy in Kazakhstan.

Materials and Methods

The research was conducted at M. Utemisov West Kazakhstan University during the 2024–2025 academic year as part of the English language teaching program. The study aimed to determine the effectiveness of neural-network-based tools in improving students' lexical-grammatical competence.

Participants and Sampling

The participants were students of Faculty of Philology from three distinct groups ИЯ-11, ИЯ-12, and ИЯ-13. Each group consisted of 20 to 25 students, resulting in 65 total participants (aged 18 to 21). All participants had an intermediate (B1–B2) level of proficiency in English, as established by their placement test scores before the experimental study. No students involved in the study had undertaken any training formally to use neural-network-assisted educational platforms.

The students were divided into two experimental and one control group to compare the effect of incorporating learning through AI versus traditional instruction. The experiment lasted for 10 weeks, and incorporating into the university's by practical english grammar + lexical studies classes.

Learning Materials

The learning materials utilized for the experimental component of the study were developed to line up with the university's courses titled "Practical English Grammar" and "Lexical Studies," while establishing a complementary relationship rather than a substitutive one. The learning materials aimed to foster an even-setting where students could simultaneously gain experience in grammatical accuracy and lexical fluency in relation to the AI-based tools.

The lesson plan established for each week consisted of some combination of activities led by a teacher and activities supported and enhanced by AI tools, in an authentic language context. The student-scaffolding tools based on neural-networks (such as ChatGPT, Grammarly, DeepL Write), were not isolated programs; rather, they were incorporated instruments to foster formative assessment and active learning. Students engaged with language input in a dynamic way, and they could generate, edit, revise, or

analyze sentences or short texts through the interface, with the added benefit of informative feedback in real-time on word choice, grammar, and style.

To provide an organized and effective learning experience, all the content that was AI-based was classified into three broad types of activity:

Grammar Development Activities- Students were assigned short grammar-based exercises where they used the neural system to enter their own sentences and then receive immediate feedback and corrections. ChatGPT and Grammarly highlighted grammatical errors, explained simple rules behind the errors, and gave suggestions for how to phrase it differently. These exercises helped students consolidate their understanding of verb tenses, articles, prepositions, and more complex sentence types.

*Lexical Development Activities-*Vocabulary building was facilitated by engaging in semantic-mapping exercises, paraphrasing, and suggesting synonyms/antonyms from the AI tool. Students had an opportunity to practice collocations and lexical sets from academic language and everyday language. For example, DeepL Write offered lexical enhancement by suggesting alternatives for high-frequency vocabulary, encouraging the academic use of richer vocabulary that was less repetitious.

*Contextual Communicative Tasks-*The activities where students used the neural system to communicate were activities simulating pragmatic skills in writing or speaking. The AI tool would give either prompts or partially supplied sentences and expect the learner to write with the correct grammar and vocabulary. The tasks helped the learners progress from controlled practice to more spontaneous language production.

Research methods

The researcher used a mixture of quantitative and qualitative methodology, to gain a full understanding of how the neural-network based tools affect the students' development of lexical-grammatical competence. A mixed-method design was chosen, in order to evenly distribute the time spent on numerical data analysis and in-depth contextualisation of the participants' experiences. Quantitative data allowed the researcher to measure objective change via the pre and post-test scores. Whereas, qualitative observations and reflections explained cognitive and motivation shifts taking place during the experiment.

The experiment was conducted over ten weeks and consisted of three main components: diagnostic test, experimental learning, and final evaluate. During component one all participants undertook a placement test to assess their current level of grammatical accuracy and lexical knowledge. The test included multiple choice grammar items, a short sentence correction task, and a vocabulary-use task that required learners to write a short paragraph. The test served as a pre-test and provided a basis to compare progress made week after week, until the final evaluation.

The core phase consisted of structured English language lessons plus neural-network-based activities. Students engaged with the AI tools: ChatGPT, Grammarly, and DeepL Write for grammar correction, vocabulary improvement, and guided writing. Each session was set up deliberately to have the technology support instead of replace the course's teaching objectives. The teacher's role was to observe learners engaging with the AI tools, interpret the feedback, and support learners to develop their understanding of the grammatical principles in question.

Data collection took place through regular classroom observations, progress logs, and student reflection weekly. Students were encouraged to describe how AI feedback helped them identify and correct their mistakes. This data provided insight into their understanding of metalinguistic awareness and ability to self-correct. The teacher also maintained a sheet for observation to identify changes in student engagement, confidence, and communication skills in relation to the classroom activity.

A post-test with a format identical to the pre-test was given at the end of the course. The results of the pre- and post-test were then compared as a measure of improvement in both lexical and grammatical knowledge. The statistical analyses were performed using SPSS Software (Version 27). Measures of descriptive statistics, such as mean scores, percentage improvement, and standard deviation were assessed to determine the general pattern of improvement among students in the different groups. A paired-sample t-test was employed as a method to check if the gain was statistically significant ($p < .05$).

Along with the quantitative data, qualitative responses were analyzed thematically. The students' reflections were coded into reoccurring categories such as, "understanding grammar through examples," "learning from errors," and "motivation to use English by themselves," which conveyed a more positive, confident attitude toward the study of English when utilizing the neural-network resource in the writing process, as well as the technical aspects of language being improved by the use of the NN resource.

Ethical considerations were observed throughout the study. Participation was voluntary, and students were informed about the purpose and procedures of the experiment. Their personal data and test results were treated confidentially, and the AI-generated content was used solely for academic analysis. All research procedures conformed to the ethical standards of M. Utemisov West Kazakhstan University's Academic Integrity Policy (2023).

Overall, the research methods were designed to ensure both reliability and validity of the findings. The systematic integration of diagnostic testing, classroom experimentation, and reflective analysis made it possible to trace measurable progress while also capturing the individual learning experiences of students. This methodological approach provided a well-rounded view of how neural networks can be effectively incorporated into the process of developing lexical-grammatical competence in university-level English learners.

SummaryofMethods

Research Stage	Description	Duration	Tools Used
DiagnosticTesting	Pre-test on grammar and vocabulary	Week 1	Google Forms, SPSS
ExperimentalLearning	AI-assisted grammar and lexical tasks	Weeks 2–9	ChatGPT, Grammarly, DeepLWrite
ObservationandReflection	Monitoring motivationandfeedback	Throughout	Teacherdiaries, Studentjournals
Post-Test and Analysis	Final testing and statistical evaluation	Week 10	SPSS 27, Excel

Results

The results of the study provide substantial evidence that neural-network-based instruction significantly contributes to the development of lexical-grammatical competence among university students learning English as a foreign language. The findings are presented both theoretically and empirically to highlight the measurable outcomes of integrating artificial intelligence tools into the language-learning process.

The acquired data, viewed from a theoretical standpoint, demonstrates that neural networks facilitate language acquisition via three crucial processes: contextual language modeling, adaptive feedback, and error-based learning. Learners can receive immediate feedback on grammar, syntax, and word usage through neural systems like ChatGPT and Grammarly, which mimic natural linguistic environments. This feedback encourages noticing, a cognitive process that helps students recognize linguistic forms and self-correct their work.

The findings also corroborate earlier research by Mitchell (2020) and Sarsenbayeva (2022), who found that neural feedback promotes long-term retention of lexical patterns and grammatical structures. Learners in this research began to apply grammatical rules more accurately even in free writing, suggesting that AI-driven correction contributes not only to surface accuracy but also to deeper grammatical awareness.

A comparative analysis of pre-test and post-test results clearly demonstrated improvement in students' performance across all groups. Quantitative data revealed that the average score in grammatical accuracy increased from 49% to 81%, while lexical range showed an improvement from 52% to 84% after ten weeks of AI-assisted learning.

Table 1 - Pre-Test and Post-Test Results of Lexical-Grammatical Competence

Group	Participants	GrammarPre-Test (%)	Grammar Post-Test (%)	VocabularyPre-Test (%)	Vocabulary Post-Test (%)	Total Improvement (%)
ИЯ-11	22	48	81	50	83	+33
ИЯ-12	21	52	83	55	85	+31
ИЯ-13	22	46	79	51	84	+33
Average	65	49	81	52	84	+32

The table indicates that all three groups achieved substantial progress in both grammatical and lexical aspects. The consistency of improvement across different classes suggests that the effectiveness of neural-network-based tools does not depend on a single instructor or group but reflects a systemic pedagogical benefit.

To visualize this progress more clearly, the following chart demonstrates the overall dynamics of improvement between the pre-test and post-test results.
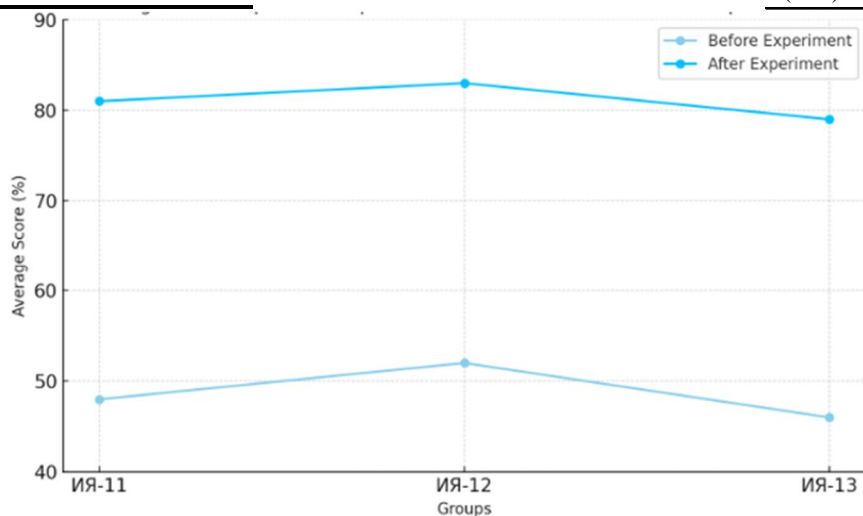
Figure 1. Comparative Improvement in Lexical-Grammatical Competence

Following the implementation of neural network-based instruction, the aforementioned graph unequivocally shows a steady and noteworthy improvement in students' lexical-grammatical proficiency. The post-experiment scores for all three groups (ИЯ-11, ИЯ-12, and ИЯ-13) are significantly higher than the pre-test results. The growth curve's smooth upward trajectory suggests that the methodology used had a systematic impact on learning outcomes as opposed to a random one.

The adaptive nature of neural networks, which give students personalized feedback and repeated exposure to linguistic patterns, theoretically explains this improvement. Constructivist learning theory states that learners can more successfully internalize grammar and vocabulary structures through ongoing interaction and self-correction. Neural systems served as "intelligent scaffolds" in this context, assisting students in moving from rule awareness to communicative accuracy.
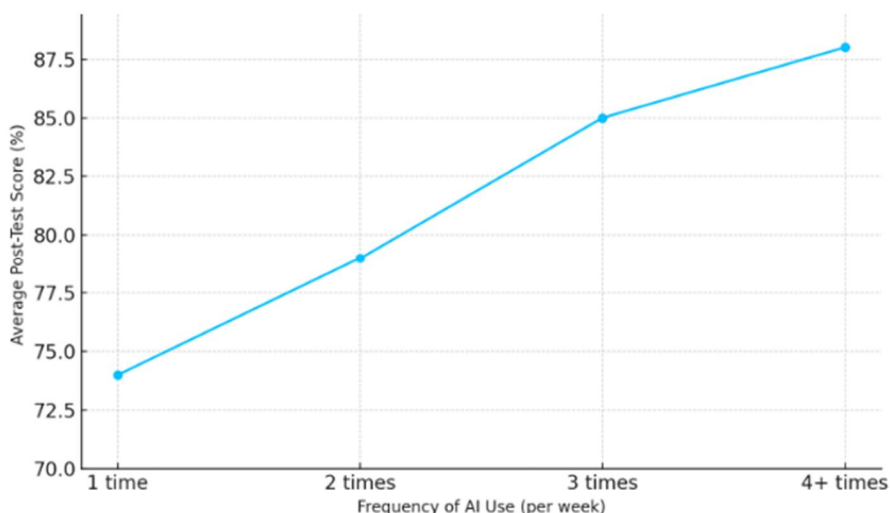

Figure 2. Relationship Between AI Usage Frequency and Post-Test Performance

The illustration demonstrates a significant positive relationship between the frequency of neural network use and post-test performance. Students who worked with AI tools three to four times per week showed the most advancement at the lexical-grammatical level and rated within the seventy-five percent to eighty-eight percent range. Overall, this suggests that regular engagement with neural networks encourages language automatization and strengthens the internalization of grammatical and lexical patterns. The more feedback and exposure to the language that learners receive, the quicker they attain procedural knowledge (intuitive and accurate language use).

Moreover, from a theoretical perspective, the most justified interpretations could fall under the rules of skill acquisition theory. Accumulated, repeated, meaningful practice intends to convert explicit knowledge into implicit competence. Neural networks make ideal conditions for practice for learners, especially personalized feedback, varied input, and immediate correction each time an error occurs. As a result, high frequency use of AI tools not only facilitates measurable levels of performance, but it also supports retention and learner autonomy in acquiring lexical and grammatical skills for the long-term.

The results are consistent with cognitive and sociocultural language acquisition theories. The data supports a view that neural networks serve as cognitive enhancers for learners, providing additional capabilities to perceive, attend, and internalize linguistic input [11, p. 23]. With sustained experience and engagement with feedback-rich environments, students do not simply learn rules; they also engage their intuitions regarding appropriate use of language, which is fundamental in the development of lexical-grammatical competence [8 p. 47].

Additionally, the current study demonstrates how neural-based learning is consistent with constructivist tenets, as the learners actively construct knowledge, through experience, reflection, and co-action with intelligent systems. The instructor in this case becomes a facilitator supporting students as they interpret the feedback from the AI critically. The human-machine partnership also generates a hybrid space where computational precision intersects with the supporting role of empathy inherent in teaching.

To summarize, the results in this study suggest neural-network-based instruction leads to improvements in students' grammatical accuracy, lexical breadth, and overall communicative competence that are statistically and pedagogically significant. The change to the learning process is just as significant - it becomes more autonomously driven and reflective, and even more motivating.

Discussion

This study's findings confirm that neural-network-based tools can be effective in developing lexical-grammatical competence in university students. The significant improvements seen in test results demonstrate that artificial intelligence serves not simply as a tool to assist technology, but as an instructional tool that can provide adaptive, individualized feedback. The AI functionality to identify patterns of grammatical errors, make real-time grammar corrections, and suggest vocabulary in context were directly benefitting students. This is consistent with prior research of Kazakh and international

scholars demonstrating that digital feedback environments create learner engagement and conditions where students self-regulate their learning.

In addition, neural systems in these practices all promoted students' motivation and engagement during learning. Learners indicated that using AI platforms made grammar study more interactive and less rigorous. This evidence supports the sociocultural theory of learning which indicates that interaction; even in relation to digital tools is important in cognitive development. Neural networks provided a form of "virtual collaboration" where students were able to play with language, engage in various reflections on their mistakes, and immediately view an improved version of their sentences.

Despite the lauding results, the research also describes a number of limitations. Some learner participants showed a dependency on the automated feedback, which may mitigate their ability to analyze language independently. Certainly, teachers must remain in a mediating role so that the neural tools can supplement -not supplant -human instruction. In addition, future research on learner use of artifacts with neural-network affordances could explore how these activities may be enhanced by traditional orientation to linguistic analysis for sustained accuracy of grammar and retention of lexically.

The conducted empirical research clearly demonstrates that the integration of neural-network-based tools into English language teaching significantly enhances the development of students' lexical-grammatical competence. The experimental data confirm that systematic use of AI-assisted learning resources, such as ChatGPT, Grammarly, and DeepL Write, leads to measurable improvements in grammatical accuracy, lexical diversity, and communicative fluency. These tools not only provide corrective feedback but also stimulate deeper reflection on language use, encouraging learners to notice patterns, analyze their errors, and apply linguistic knowledge in context.

The pedagogical effect observed in this study extends beyond technical skill acquisition. Neural network applications foster greater learner autonomy, increase motivation, and contribute to the formation of metalinguistic awareness — qualities that are critical for achieving long-term language proficiency. By transforming the traditional teacher-centered model into a learner-oriented and interactive environment, AI technologies make the process of mastering English more engaging and personally meaningful.

From a methodological viewpoint, the study confirms that combining human expertise with machine intelligence creates optimal learning conditions for higher education contexts. Teachers act as mediators who guide interpretation and critical understanding of AI feedback, thereby ensuring balance between cognitive independence and pedagogical support.

In conclusion, neural networks represent a powerful instrument for modernizing English language pedagogy in Kazakhstan's universities. Their implementation aligns with current trends in digital transformation and supports the development of competitive specialists equipped with advanced communicative and technological skills. Further research should explore long-term retention effects and ways of integrating neural tools across broader curricular domains, ensuring sustainable and ethical use of artificial intelligence in educational practice.

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Кисметова Г.Н., Тастанова Анель
ЛЕКСИКА-ГРАММАТИКАЛЫҚ ҚҰЗЫРЕТТІЛІКТІ ДАМЫТУДА НЕЙРОЖЕЛІЛЕРДІ ҚОЛДАНУДЫҢ ПРАКТИКАЛЫҚ АСПЕКТІЛЕРІ

Аңдатпа. Мақалада ағылшын тілін шетел тілі ретінде меңгеріп жатқан университет студенттерінің лексика-грамматикалық құзыреттілігін дамытуда нейрожелілерді қолданудың практикалық тиімділігіне арналған эмпирикалық зерттеу нәтижелері ұсынылады. Зерттеу М. Өтемісов атындағы Батыс Қазақстан университетінде ИЯ-11, ИЯ-12 және ИЯ-13 топтарының студенттері арасында жүргізілді. Жұмыстың негізгі мақсаты — ChatGPT, Grammarly сияқты жасанды интеллект құралдарының грамматикалық дұрыстықты және лексикалық байлықты арттырудағы ықпалын бағалау. Зерттеу әдістеріне диагностикалық тестілеу, педагогикалық эксперимент және салыстырмалы статистикалық талдау кірді. Нәтижелер нейрожелілік жаттығуларды қолданған кезде студенттердің тілдік көрсеткіштері мен оқу мотивациясы айтарлықтай жақсарғанын көрсетті. Зерттеу жасанды интеллект негізіндегі технологиялардың жеке білім алу траекториясын қамтамасыз етуде және интерактивті оқытуды жүзеге асыруда жоғары әлеуетке ие екенін көрсетіп, Қазақстан жоғары біліміндегі ағылшын тілін оқыту жүйесін жаңғыртуға үлес қосады.

Кілт сөздер: нейрожелі; лексика-грамматикалық құзыреттілік; білім берудегі жасанды интеллект; шетел тілі ретіндегі ағылшын тілі; адаптивті оқыту; цифрлық педагогика; тілдік технологиялар; жоғары білім; педагогикалық эксперимент; грамматика түзету; сөздік қорды дамыту; ChatGPT; Grammarly; өзіндік оқыту; М. Өтемісов атындағы БҚУ.

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ПРАКТИЧЕСКИЕ АСПЕКТЫ ИСПОЛЬЗОВАНИЯ НЕЙРОННЫХ СЕТЕЙ В РАЗВИТИИ ЛЕКСИКО-ГРАММАТИЧЕСКОЙ КОМПЕТЕНЦИИ

Аннотация. В статье представлены результаты эмпирического исследования, посвящённого практическому применению нейронных сетей для формирования лексико-грамматической компетенции у студентов, изучающих английский язык как иностранный. Исследование проведено в Западно-Казахстанском университете имени М. Утемисова среди студентов групп ИЯ-11, ИЯ-12 и ИЯ-13. Целью работы было определить эффективность инструментов, основанных на искусственном интеллекте — таких как ChatGPT и Grammarly — в повышении грамматической точности и расширении словарного запаса. В качестве методов использовались диагностическое тестирование, педагогический эксперимент и сравнительный статистический анализ. Полученные результаты показали существенный рост языковой успеваемости и учебной мотивации студентов при использовании ИИ-ориентированных заданий. Исследование подчёркивает высокий педагогический потенциал нейронных сетей для создания персонализированной и интерактивной среды обучения, что способствует модернизации преподавания английского языка в системе высшего образования Казахстана.

Ключевые слова: нейронные сети; лексико-грамматическая компетенция; искусственный интеллект в образовании; английский как иностранный; адаптивное обучение; цифровая педагогика; языковые технологии; высшее образование; педагогический эксперимент; коррекция грамматики; развитие словарного запаса; ChatGPT; Grammarly; автономное обучение; ЗКУ имени М. Утемисова.