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SUN'IY INTELLEKTGA ASOSLANGAN PEDAGOGIK MODEL ORQALI TALABALARNING YOZISH VA GAPIRISH KO'NIKMALARINI RIVOJLANTIRISH

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Annotatsiya

Mazkur tadqiqot ingliz tilini chet tili sifatida o'qitish sharoitida sun'iy intellekt asosidagi pedagogik model yordamida talabalarning yozish va gapirish ko'nikmalarini rivojlantirishda sun'iy intellektning o'rnini o'rganadi. Taklif etilgan model diagnostik, o'quv, interaktiv, teskari aloqa va adaptiv komponentlarni o'z ichiga olib, shaxsiylashtirilgan ta'lim, real vaqt rejimida baholash hamda ko'nikmalarni uzluksiz rivojlantirish imkonini beradi. Tadqiqot natijalari mazkur model o'quvchilarning yozma nutqdagi aniqligi, mantiqiyligi va gapirishdagi ravonligini sezilarli darajada oshirishini, shu bilan birga ularning mustaqil ta'lim olish qobiliyati va o'quv jarayonidagi faolligini kuchaytirishini ko'rsatdi.

Kalit so'zlar: sun'iy intellekt, til o'rganish, ingliz tili, yozish ko'nikmasi, gapirish ko'nikmasi, pedagogik model, adaptiv ta'lim, avtomatlashtirilgan teskari aloqa..

РАЗВИТИЕ ПИСЬМЕННОЙ И УСТНОЙ РЕЧИ СТУДЕНТОВ ПОСРЕДСТВОМ ПЕДАГОГИЧЕСКОЙ МОДЕЛИ НА ОСНОВЕ ИСКУССТВЕННОГО ИНТЕЛЛЕКТА

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Аннотация

Данное исследование рассматривает роль искусственного интеллекта в повышении уровня письменной и устной речи студентов посредством разработки педагогической модели на основе ИИ в условиях обучения английскому языку как иностранному. Предлагаемая модель включает диагностический, обучающий, интерактивный, оценочно-обратный и адаптивный компоненты, обеспечивающие персонализированное обучение, оценивание в реальном времени и непрерывное развитие навыков. Результаты исследования показывают, что модель значительно улучшает точность и связность письменной речи, а также беглость устного высказывания, одновременно повышая автономность обучающихся и их вовлечённость в учебный процесс.

Ключевые слова: искусственный интеллект, изучение языка, английский язык, письменная компетенция, устная компетенция, педагогическая модель, адаптивное обучение, автоматизированная обратная связь..

DEVELOPING STUDENTS' WRITING AND SPEAKING PROFICIENCY THROUGH AN ARTIFICIAL INTELLIGENCE BASED PEDAGOGICAL MODEL

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Abstract

This study examines the role of Artificial Intelligence in enhancing students' writing and speaking proficiency through the development of an AI-based pedagogical model in English as a Foreign Language settings. The proposed model integrates diagnostic, instructional, interactive, feedback, and adaptive components to provide personalized learning, real-time assessment, and continuous skill development. The findings indicate that the model significantly improves learners' writing accuracy, coherence, and speaking fluency while increasing learner autonomy and engagement.

Keywords: Artificial Intelligence, language learning, English, writing proficiency, speaking proficiency, pedagogical model, adaptive learning, automated feedback.

The rapid advancement of Artificial Intelligence has significantly transformed contemporary educational practices, particularly in the field of language learning. In recent years, AI-driven technologies have been increasingly integrated into language education to enhance students' productive skills, namely writing and speaking. These skills are widely recognized as complex and cognitively demanding, requiring not only linguistic knowledge but also the ability to organize ideas, communicate effectively, and adapt language use to different contexts. Despite continuous methodological improvements, many students

especially in English as a Foreign Language settings still experience significant difficulties in developing writing and speaking proficiency. Traditional instructional approaches often fail to provide individualized feedback, sufficient practice opportunities, and real-time performance analysis.

In this regard, AI-based tools offer new pedagogical possibilities by enabling personalized learning environments, automated feedback systems, and adaptive instruction. Technologies such as natural language processing, speech recognition, and intelligent tutoring systems allow for continuous monitoring and evaluation of students' performance, thereby fostering more effective skill development. These innovations contribute to the emergence of AI-enhanced pedagogical models that support both teachers and learners in achieving better educational outcomes. However, despite the growing interest in AI integration, there remains a lack of comprehensive pedagogical models that systematically address the development of both writing and speaking skills within a unified framework. Therefore, this study aims to develop and implement an Artificial Intelligence–based pedagogical model designed to enhance students' writing and speaking proficiency. The proposed model seeks to combine technological affordances with pedagogical principles to create an effective, scalable, and learner-centered approach to language instruction.

The proposed pedagogical model is designed to enhance students' writing and speaking proficiency through the integration of Artificial Intelligence technologies within a structured and learner-centered instructional framework. Grounded in the principles of language learning, the model combines competency-based education, personalized learning, and adaptive instruction to address the limitations of traditional teaching approaches, particularly in developing productive language skills.

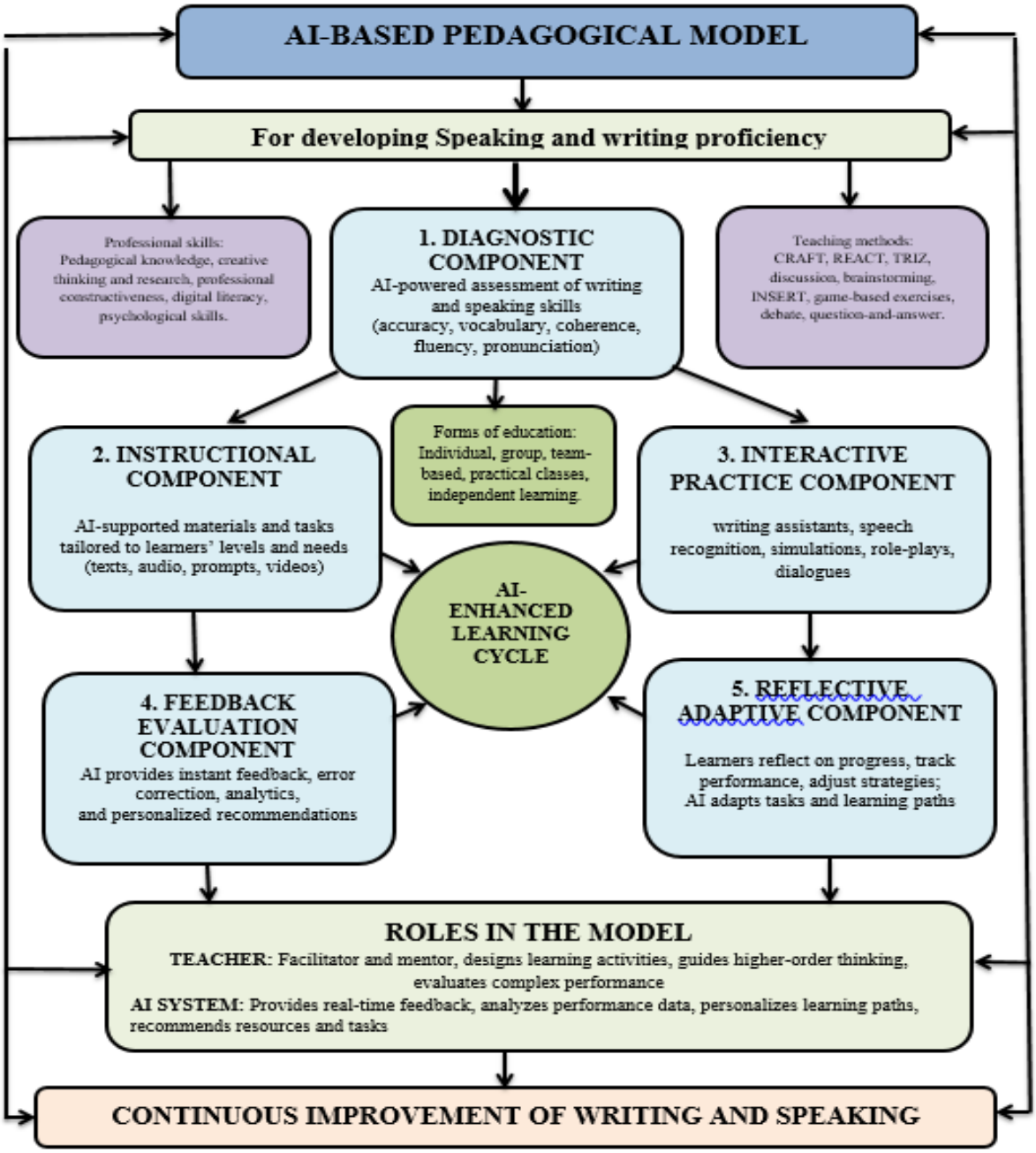
At its core, the model operates as a multi-component system that functions through a continuous and iterative learning cycle. The process begins with a diagnostic stage, in which students' initial levels of writing and speaking proficiency are assessed using AI-powered tools. These tools analyze key linguistic indicators such as grammatical accuracy, lexical richness, coherence, fluency, and pronunciation. Based on the results, learners are grouped according to their proficiency levels, allowing for differentiated and targeted instruction. Following diagnosis, the instructional component provides learners with tailored content delivered through AI-supported platforms. This includes structured writing tasks, speaking prompts, model texts, and audio-visual materials. The content is dynamically adapted to each learner's level and progress through intelligent algorithms, ensuring that students are consistently engaged with materials that match their abilities and learning needs.

The next stage focuses on interactive practice, where students actively develop their skills through continuous engagement with AI-based tools. In writing, learners use intelligent assistants that provide real-time corrections, suggestions, and enhancements. In speaking, they engage with speech recognition systems, simulated dialogues, and role-play activities that allow them to practice pronunciation, fluency, and communicative competence. This stage emphasizes repetition, interaction, and immediate feedback, which are essential for effective language acquisition.

A central element of the model is the feedback and evaluation component, which leverages AI technologies such as natural language processing and speech analysis. Students receive instant, detailed, and personalized feedback on their performance, including error correction, performance analytics, and targeted recommendations for improvement. This continuous feedback loop not only accelerates learning but also reduces the limitations associated with delayed or subjective teacher feedback. The model further incorporates a reflective and adaptive dimension, encouraging learners to engage in self-monitoring and self-regulation. Students are provided with progress tracking tools and performance dashboards, enabling them to analyze their strengths and weaknesses over time. Based on this data, both learners and the system adjust learning strategies and tasks, creating a highly adaptive and individualized learning experience. Functionally, the model operates through a cyclical process consisting of diagnosis, instruction, practice, feedback, reflection, and adaptation. This iterative mechanism ensures continuous improvement and allows for measurable development of writing and speaking proficiency. Importantly, the model redefines the roles of both teachers and technology. While AI systems handle real-time feedback, data analysis, and personalization, the teacher assumes the role of a facilitator, mentor, and evaluator of higher-order cognitive and communicative skills.

The integration of Artificial Intelligence into language learning has become a rapidly expanding area of research, particularly in relation to the development of students' writing and speaking proficiency. A growing body of international scholarship highlights the transformative potential of AI-driven technologies in enhancing productive language skills through personalization, automation, and real-time feedback. Among prominent scholars, John McCarthy, who originally conceptualized the term Artificial

Intelligence, laid the theoretical foundation for intelligent systems that later evolved into educational applications. Building on such foundations, researchers like Ken Beatty have explored the role of Computer-Assisted Language Learning (CALL), emphasizing how digital technologies facilitate interactive and autonomous learning environments. Similarly, Geoffrey Hinton contributed to the development of neural networks, which underpin many modern AI tools used in language processing and speech recognition. In the context of writing development, Jill Burstein has conducted extensive research on automated writing evaluation systems, demonstrating their effectiveness in providing immediate and consistent feedback. Her work highlights how AI can support learners in improving grammar, coherence, and overall writing quality.



Furthermore, Daniel Cassany emphasizes the importance of digital literacy and interactive writing practices, noting that technology-enhanced environments foster greater learner engagement and skill development. Regarding speaking proficiency, studies by Suresh Canagarajah underline the significance of communicative competence and contextualized language use, while recent AI-based research focuses on speech recognition and pronunciation training tools. These tools enable learners to

receive immediate feedback on fluency, intonation, and accuracy, thereby enhancing speaking performance in a more individualized manner. Recent empirical studies further confirm that AI-supported learning environments significantly improve students' performance in both writing and speaking by offering adaptive learning pathways and continuous assessment mechanisms. However, despite these advancements, many studies tend to focus on isolated skills rather than providing a unified pedagogical model that integrates both writing and speaking development.

In the context of Uzbekistan, research on the integration of modern pedagogical technologies into language education has also gained momentum. Scholars such as Nodira Musurmanova have investigated innovative approaches to developing students' communicative competence, emphasizing the role of interactive and student-centered methods. Similarly, Gulchekhra Bakhramova has explored the effectiveness of digital tools in enhancing language skills, highlighting the importance of integrating technology into teaching practices. In addition, Dilfuza Khasanova has contributed to the study of language teaching methodologies, focusing on improving lexical and communicative competence through innovative strategies. Despite the growing body of local research, the application of AI technologies specifically for the integrated development of writing and speaking skills remains underexplored in the Uzbek educational context. Most studies focus on general language teaching methods or individual skills without leveraging the full potential of AI-driven systems for adaptive learning and continuous feedback.

Methodology. This study aims to develop an Artificial Intelligence–based pedagogical model for enhancing students' writing and speaking proficiency and to empirically evaluate its effectiveness in English as a Foreign Language settings. The research is grounded in a comprehensive methodological framework integrating Artificial Intelligence technologies with modern language teaching approaches. A quasi-experimental research design was employed to assess the impact of the proposed model through a comparative analysis of experimental and control groups. The study was conducted in three stages: diagnostic, formative, and final (control). At the diagnostic stage, a total of 60 students participated, including 31 in the experimental group and 29 in the control group. The main objective of this stage was to determine the baseline level of students' writing and speaking proficiency. Data were collected using placement tests, writing tasks, speaking assessments, and evaluation rubrics. The assessment focused on key indicators such as grammatical accuracy, lexical diversity, coherence, fluency, pronunciation, and communicative effectiveness. The results demonstrated no statistically significant differences between the groups at the initial stage, ensuring the validity and reliability of the experimental design. During the formative stage, the instructional process for the 31 students in the experimental group was organized based on the developed AI-based pedagogical model, while the 29 students in the control group were taught using traditional teaching methods. In the experimental group, AI-supported tools such as writing assistants, speech recognition systems, and adaptive learning platforms were actively implemented. Students engaged in structured writing tasks, interactive speaking activities, simulations, and role-plays supported by real-time feedback mechanisms. Additionally, learner-centered strategies such as task-based learning, problem-solving activities, and reflective practices (including self-assessment and progress tracking) were systematically integrated. The teacher acted as a facilitator and mentor, while AI systems provided continuous performance analysis, personalized learning pathways, and instant feedback. At the final (control) stage, the same 60 students (31 from the experimental group and 29 from the control group) were reassessed using the same diagnostic instruments. The results were compared with the initial data to identify changes in students' writing and speaking proficiency. Statistical analysis was conducted using mean scores, variance, standard deviation, and Student's t-test to determine the significance of differences between the groups.

Proposed assessment criteria

Mark	Criteria
5	The student demonstrates a high level of writing and speaking proficiency across all key components (linguistic accuracy, lexical richness, coherence, fluency, pronunciation, and communicative effectiveness). The student independently applies AI-based tools (e.g., writing assistants, speech recognition) for self-assessment and improvement, shows creativity in language use, adapts communication to different contexts, and effectively utilizes automated feedback to enhance performance.
	Correct answers 25-30

4	The student demonstrates sufficiently developed writing and speaking proficiency, with core linguistic and communicative components in place, though some areas (e.g., coherence, fluency, or pronunciation) still require improvement. The student can use AI-supported tools with minor guidance, applies knowledge in familiar contexts, and responds to automated feedback, but independence and creativity are not fully demonstrated.
	Correct answers 20-25
3	The student demonstrates partially developed writing and speaking proficiency, with noticeable gaps in linguistic accuracy, lexical diversity, fluency, or pronunciation. Knowledge is applied at a reproductive level, AI-based tools are used only with significant guidance, and the student shows limited ability to act on automated feedback or self-monitor progress.
	Correct answers 15-20
2	The student demonstrates insufficient writing and speaking proficiency. Core components (grammatical accuracy, fluency, pronunciation, coherence, lexical richness) are at a low level. The student experiences difficulty understanding and producing language independently, shows low motivation, rarely uses AI-powered tools, and does not benefit from automated feedback.
	Correct answers 0-15

Now we present the statistical analysis of the obtained results.

Analysis of the results at the beginning of the experimental study.

Name of the educational institution	The number of students	Average overall score according to the criteria	The number of students	Total conditional value.
RANCH university	Experimental group 31 participants	Excellent (5)	6	3,61
		Good (4)	10	
		Satisfactory(3)	12	
		Unsatisfactory (2)	3	
	Control group 29 participants	Excellent (5)	5	3,64
		Good (4)	10	
		Satisfactory (3)	11	
		Unsatisfactory (2)	3	

Based on the data in Table 2, the analysis of the initial results of the experimental testing is presented in numerical values and percentages.

Analysis of the initial results of the experimental testing (in numbers and percentages).”

Groups	**The number of students**	Learning outcomes (in numbers and percentages)			
		Excellent	**Good**	**Satisfactory**	**Unsatisfactory**
Experimental group	**31**	6 / 19	10 / 32	12 / 39	3 / 10
Control group	**29**	5 / 17	10 / 34	11 / 38	3 / 11

We present the data in a graphical form.

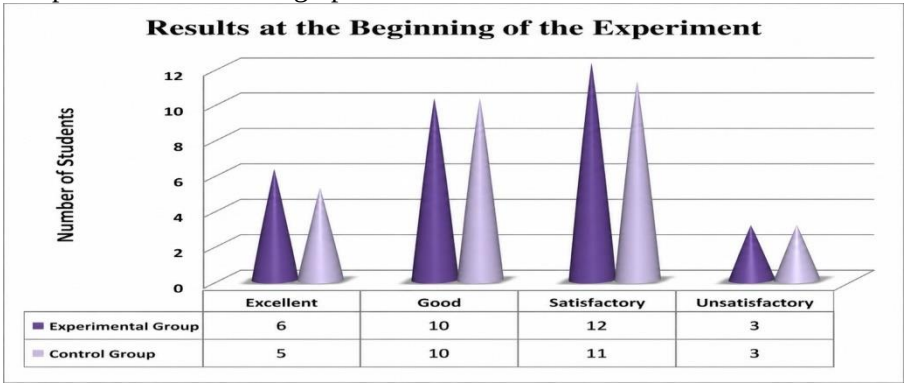


Figure 2. Results at the beginning of the experiment.

According to the results obtained prior to the experimental intervention, it was determined that there were no statistically significant differences between the experimental and control groups in terms of learners' knowledge, skills, and competencies. This finding indicates the initial equivalence of the groups and ensures the internal validity of the subsequent experimental procedures. In order to provide an objective evaluation of this condition, a statistical analysis was conducted, as only statistically substantiated conclusions can confirm the scientific, pedagogical, technological, and methodological validity of the experimental work. To perform the statistical analysis at both the ascertaining (diagnostic) and control stages, Student's *t*-test was employed. This method enables the identification and objective comparison of indicators recorded in two independent groups. In accordance with the principles of mathematical statistics, the empirical data obtained from the experimental and control groups were treated as samples, and grouped variational series were constructed based on four performance levels: excellent, good, satisfactory, and unsatisfactory. For the purpose of quantitative analysis, numerical values were assigned to each performance level as follows: excellent – 5 points, good – 4 points, satisfactory – 3 points, and unsatisfactory – 2 points. The statistical indicators and the corresponding number of students in the experimental group were denoted as Xi and ni, respectively, while those in the control group were represented as Yj and mj. Based on these designations, grouped variational distributions were constructed for both groups. Subsequently, the collected numerical data were analyzed using mathematical-statistical methods, including the calculation of mean values, variance, and standard deviation. The application of Student's *t*-test allowed for determining the statistical significance of differences between the groups, thereby ensuring the reliability and objectivity of the research findings.

Experimental group **Control group**

$$\begin{cases} x_i: & 2 & 3 & 4 & 5 \\ n_i: & 3 & 12 & 10 & 6 \end{cases} \qquad \begin{cases} y_i: & 2 & 3 & 4 & 5 \\ m_i: & 2 & 11 & 10 & 5 \end{cases}$$

We conduct a statistical analysis of the results obtained at the end of the experimental testing. First, we determine the average achievement indicators of the obtained results and check their effectiveness.

$$\bar{X} = \frac{1}{n}\sum_{i=1}^{4} n_i\, x_i = 3{,}61; \qquad \bar{Y} = \frac{1}{m}\sum_{i=1}^{4} m_i y_i = 3{,}64.$$

Thus, the results show that the average achievement level in the experimental group is identical to that of the control group, i.e., $\bar{x}=\bar{y}$. This result indicates that both groups demonstrated comparable levels of achievement prior to the experimental intervention., meaning that the mean score does not accurately reflect the learners' actual level of knowledge acquisition.

$$D_n^2 = \frac{\sum_{i=1}^{n} n_i (x_i - \overline{X})^2}{n-1} \approx 0{,}94 \qquad D_m^2 = \frac{\sum_{j=1}^{m} m_j (y_j - \overline{Y})^2}{m-1} \approx 0{,}89$$

Based on the values of sample variances, we calculate the variation indicators for both groups:

$V_x = \frac{\tau_n}{\bar{x}} \cdot 100\% = 28{,}51\%;\ V_y = \frac{\tau_m}{\bar{y}} \cdot 100\% = 27{,}90\%.$

Based on the above considerations, it is possible to formulate a statistical hypothesis assuming that the assessment results obtained from the experimental and control groups can be regarded as samples drawn from different populations due to the variation in evaluation approaches applied to each group. In other words, we test the hypothesis concerning the equality of the population means corresponding to the experimental and control groups.

$T = \frac{\bar{X}-\bar{Y}}{\sqrt{\frac{D_n^2}{n}+\frac{D_m^2}{m}}}.$

If the significance level of the statistical test is **α = 0.05**, and we take the critical value from the Student's t-distribution table as $\mathbf{t_{kr}}$ **= 1.96**, then we assume the following.

$$T = \frac{\bar{X} - \bar{Y}}{\sqrt{\frac{D_n^2}{n} + \frac{D_m^2}{m}}} = 0{,}175.$$

According to the statistical hypothesis testing, the critical value is 1,96. Since the calculated empirical value is less than the critical value, there is no sufficient basis to reject the null hypothesis. In other words, based on the Student–Fisher distribution, the obtained *t*-value is significantly lower than the threshold required for statistical significance. Therefore, at the initial stage of the experiment, the null hypothesis is accepted, indicating that there is no statistically significant difference between the

experimental and control groups. This confirms the equivalence of the groups prior to the intervention. Having established the homogeneity of the groups at the baseline stage, we proceed to the statistical analysis of the results obtained at the end of the experimental process. Using the aforementioned formulas, key statistical indicators were calculated, including mean academic performance, variance (dispersion), and the coefficient of variation. These indicators provide a comprehensive quantitative assessment of both the central tendency and the distributional characteristics of the data. The calculation of the mean values allows for determining the overall level of students' achievement in each group, while variance and standard deviation reflect the degree of dispersion of individual results around the mean. The coefficient of variation, in turn, serves as an important measure of relative variability, enabling the assessment of the stability and consistency of learning outcomes across groups. Thus, the application of these statistical methods ensures a rigorous and objective evaluation of the experimental results, forming a reliable basis for comparing the effectiveness of the proposed psychopedagogical model under conditions of artificial intelligence integration.

Analysis of the results at the end of the experimental testing.

Name of the educational institution.	The number of students	Overall average score according to the criteria	The number of students	Total conditional value
RANCH university	Experimental group: 31 participants.	Excellent (5)	11	4,2
		Good (4)	16	
		Satisfactory(3)	3	
		Unsatisfactory (2)	1	
	Control group: 29 participants.	Excellent (5)	6	3,7
		Good (4)	13	
		Satisfactory (3)	8	
		Unsatisfactory (2)	2	

Analysis of the results at the end of the experimental testing (in numbers and percentages).

Groups	**The number of students**	**Learning outcomes (in numbers and percentages)**			
		Excellent	**Good**	**Satisfactory**	**Unsatisfactory**
Experimental	**31**	11 ~~34~~	16 ~~43~~	3 ~~18~~	1 ~~5~~
Control	**29**	6 ~~20~~	13 ~~30~~	8 ~~38~~	2 ~~13~~

We present the following graph

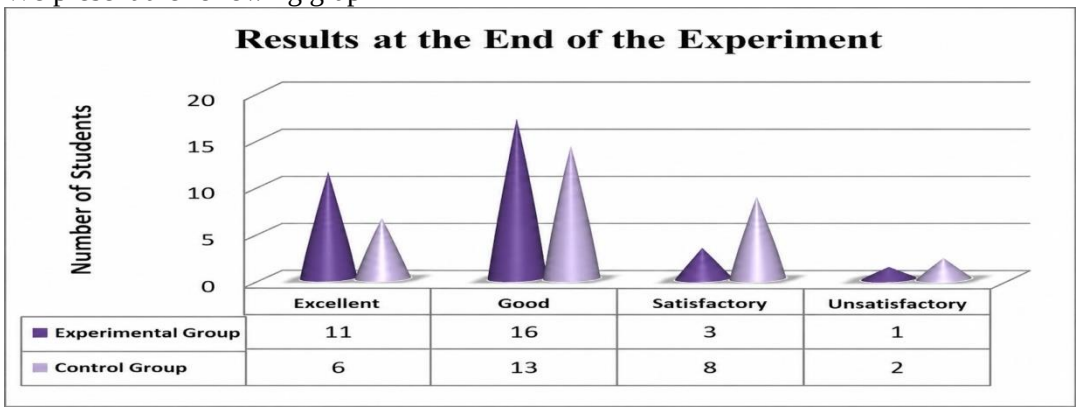


Figure 2. Results after the experiment

Experimental group

x_i:	2	3	4	5
n_i:	1	3	16	11

Control group

y_i:	2	3	4	5
m_i:	2	8	13	6

Results after the experimental work

Mean		Variance		Coefficient of Variation		t-value
Experimental	Control	Experimental	Control	Experimental	Control	
4,2	3,8	0,71	0,90	20,77	26,58	4,58

Result and discussion. The statistical analysis revealed that at the beginning of the experiment, there were no significant differences between the experimental (M=3.61) and control groups (M=3.64), as the t-value (0.175) was below the critical value (1.96), confirming group equivalence. However, after implementing the AI-based pedagogical model, the experimental group demonstrated significantly higher writing and speaking proficiency (M=4.2, variance=0.71, CV=20.77%) compared to the control group (M=3.8, variance=0.90, CV=26.58%). The calculated t-value of 4.58 exceeded the critical value of 1.96 ($p<0.05$), indicating a statistically significant improvement. The percentage of students achieving "excellent" results in the experimental group increased from 19% to 34%, while unsatisfactory results dropped from 10% to 5%, whereas the control group showed only modest gains (from 17% to 20% excellent, with 13% still unsatisfactory). These findings confirm that the proposed AI-based pedagogical model effectively enhances students' writing accuracy, coherence, fluency, and pronunciation through personalized learning, real-time automated feedback, and adaptive instruction. The lower variance and coefficient of variation in the experimental group further suggest that AI-based instruction promotes more stable and equitable learning outcomes across students with different proficiency levels. This study addresses a research gap in the Uzbek educational context, where the integration of AI for developing both writing and speaking skills within a unified framework has been underexplored. Overall, the results provide empirical evidence that the AI-based pedagogical model is significantly more effective than traditional instruction, supporting its potential for wider implementation in English as a Foreign Language settings.

Conclusion. This study developed an Artificial Intelligence–based pedagogical model to improve students' writing and speaking proficiency in English as a Foreign Language settings. The findings showed that the proposed model effectively enhanced learners' linguistic accuracy, fluency, coherence, and overall communicative competence. Students in the experimental group demonstrated greater improvement compared to those taught through traditional methods. The integration of AI-driven tools such as automated feedback, speech recognition, and adaptive learning created a personalized and learner-centered environment that supported continuous skill development. The model also promoted learner autonomy, self-regulation, and more consistent learning outcomes. This research addresses an important gap in the Uzbek educational context, where the unified use of AI for developing both writing and speaking skills has been limited. Future studies should explore the long-term impact of the model and its application in diverse educational settings.

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