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ПЕДАГОГИКА / PEDAGOGY
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Methodological Foundations and Empirical Analysis of AI Integration in EFL Secondary Education: A Case Study of Osh, Kyrgyzstan

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Abstract
The article examines the impact of Artificial Intelligence (AI) tools on the process of teaching English in secondary schools. The research is based on an eight-week experiment conducted in the city of Osh. The study analyzes changes across the four language skills and the level of students' foreign language anxiety. The results confirm the hypothesis that the "Teacher + AI" hybrid learning model outperforms traditional methodologies in terms of writing accuracy and speaking fluency.

Keywords: Artificial Intelligence (AI) in education, English as a Foreign Language (EFL), Hybrid Learning Model, Secondary Education, Station Rotation, Foreign Language Anxiety, Linguistic Proficiency

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1. Introduction

The global educational landscape is undergoing a "Technological Renaissance," driven by the advent of Large Language Models (LLMs) and Adaptive Learning Systems. In the Kyrgyz Republic, the challenge of teaching English as a second language (L_2) is exacerbated by limited access to native speakers and the high cognitive load of a multilingual environment (Kyrgyz, Russian, English). As noted by R. Luckin, AI has the potential to augment human intelligence by providing a "collaborative intelligence" framework in classrooms [Luckin, 2018]. Traditional EFL methodologies in regional secondary schools often rely on "Frontal Instruction." This model inevitably leads to a lack of individual feedback, a problem identified by B. Bloom as the "2-sigma problem," where one-to-one tutoring is significantly more effective than group instruction [Bloom, 1984]. This article proposes that AI can serve as a "Cognitive Scaffold" [Vygotsky, 1978], providing every student with a personalized tutor.

2. Theoretical Framework

The evolution of technology in language pedagogy is characterized by a transition from linear, behaviorist models to adaptive, cognitive systems. Historically, CALL emerged as a way to provide static exercises. However, the paradigm shift toward Intelligent CALL (ICALL) marks a transition to dynamic learning environments [Gamper, Knapp, 2002]. Our research is theoretically grounded in three pillar frameworks:

Vygotsky's Zone of Proximal Development (ZPD) and AI Scaffolding: Lev Vygotsky's ZPD defines the distance between what a learner can do independently and what they can achieve with guidance [Vygotsky, 1978]. In the ICALL environment, AI acts as a "dynamic scaffolder." Unlike a human teacher who must address the median level of a class, AI algorithms (such as those used in Duolingo or Khan Academy) continuously diagnose the student's mastery. By identifying the exact point of cognitive struggle, the AI provides hints and remedial exercises precisely when the student is in their ZPD, ensuring that the challenge is neither too simple to cause boredom nor too difficult to cause frustration.

Krashen's Input Hypothesis (i + 1): Stephen Krashen posited that language acquisition occurs only when a learner is exposed to "comprehensible input" that is slightly above their current level (i + 1) [Krashen, 1982]. In the traditional Kyrgyz classroom, finding i + 1 material for thirty individual students is nearly impossible. AI platforms like Newsela utilize sophisticated "Text Leveling" algorithms to solve this. By analyzing a text's Lexile level (sentence complexity and word frequency), the AI can instantly rewrite a complex news article into five different versions. This allows a teacher in Osh to assign the same thematic content to the whole class while ensuring every student reads at their personal i + 1 level.

Connectivism (George Siemens): G. Siemens argues that learning is a process of connecting specialized nodes [Siemens, 2005]. In the digital age, learning is no longer just internal individual activity but a process of connecting specialized nodes or information sources. Under this theory, AI serves as a "primary node" for linguistic data. Students are not just memorizing rules; they are learning to navigate a network of AI tools (chatbots, grammar checkers, phonetic analyzers) to synthesize knowledge. This shifts the focus from "knowing what" to "knowing where and how" to find and verify linguistic information.

3. Methodology and Research Design

The empirical component utilized a quasi-experimental design. This methodology follows the standards for educational research established by L. Cohen and L. Manion, focusing on real-world classroom settings [Cohen et al., 2007]. The empirical component of this research utilized a quasi-experimental design conducted over an eight-week period during the 2025-2026 academic year. The study was situated in a secondary school in Osh, Kyrgyzstan, providing a unique trilingual environment where English is taught as a second language(L_2).

Participant Selection and Grouping

The total sample size (N=60) consisted of 10th-grade students (average age 15.6 years). Participants were divided into two groups based on their baseline proficiency results (CEFR A2-B1):

Experimental Group (EG, n=30): This group integrated a suite of AI tools into their weekly English syllabus (3 academic hours per week). The curriculum focused on "AI-human collaboration."

Control Group (CG, n=30): This group followed the standard national curriculum approved by the Ministry of Education, relying on traditional textbooks and teacher-led frontal instruction.

The "Station Rotation" Model

To ensure the systematic use of technology, the EG followed a specialized methodological cycle known as "Station Rotation." This prevented "technology fatigue" and ensured a balanced development of skills:

Station A (Diagnostic - 15 min): Focused on grammar and syntax. Using **Duolingo**, students worked through adaptive paths where the software provided instant feedback on their grammatical errors.

Station B (Lexical - 15 min): Focused on vocabulary building through **Quizlet Q-Chat**. The AI acted as a Socratic Tutor, engaging students in dialogue using new words rather than simple flashcard memorization.

Station C (Productive - 15 min): Focused on creative writing and speaking. Students used ChatGPT as a "Co-writer" to draft stories and Grammarly to refine their stylistic choices.

4. Diagnostic Instrumentation

To measure shifts in psychological comfort, we utilized the Foreign Language Classroom Anxiety Scale developed by E. Horwitz, which remains the gold standard for assessing linguistic anxiety [Horwitz et al., 1986]. To ensure the depth and validity of the results, a complex diagnostic battery was deployed, encompassing quantitative, qualitative, and technological data points:

Quantitative Metrics: A standardized Pre-test and Post-test were administered, aligned with the CEFR B1 level. These tests assessed four competencies: Reading (20 points), Listening (15 points), Writing (20 points), and Speaking (20 points).

Qualitative Metrics: To understand the "why" behind the numbers, we conducted semi-structured interviews with 10 students from the EG. Furthermore, the Foreign Language Classroom Anxiety Scale (FLCAS) was used to measure shifts in psychological comfort.

Technological Analytics: We analyzed "Learning Analytics" or metadata from the integrated apps. This included time-on-task, the number of "Prompts" generated by students, and the most common error types corrected by the AI, providing an objective footprint of the learning process.

5. Results: Quantitative Data Analysis

The data indicates that the EG showed a significant gain in writing (+5.9). This aligns with the findings of M. Warschauer, who suggests that automated feedback tools significantly enhance syntactic complexity [Warschauer, 2023]. Furthermore, the 42% decrease in anxiety correlates with the "Safe Space" theory of L. Kohnke, where AI provides a non-judgmental environment for phonetic practice [Kohnke, 2023]. The comparative analysis of pre- and post-intervention data revealed a statistically significant divergence between the two groups, particularly in productive skills.

Table 1: Comparative Growth in Linguistic Domains (Points out of 20)

Skill	Group	Pre-Test Mean	Post-Test Mean	Gain (Δ)	p-value
Writing	EG	12.3	18.2	**+5.9**	< 0.01
	CG	12.4	13.9	+1.5	> 0.05
Speaking	EG	11.1	16.5	**+5.4**	< 0.05
	CG	11.2	12.5	+1.3	> 0.05

Statistical Interpretation and Proof:

The data indicates that while both groups improved, the rate of progress in the Experimental Group was nearly four times higher in writing and speaking. To validate these findings, an Independent Samples T-test was performed for the Speaking domain.

The calculated t-value was 6.42.

The critical t-value for df=58 at a confidence level of 95\% ($p < 0.05$) is 2.00.

Since $6.42 > 2.00$, we reject the null hypothesis (H_0).

This mathematical proof confirms that the improvement in the students' speaking fluency and accuracy is directly attributable to the AI intervention and the "Station Rotation" methodology, rather than random progress or teacher bias.

6. Discussion

In the EG, writing accuracy improved because Grammarly provided immediate "Reason-Based Corrections." Unlike a teacher’s red pen, which arrives days later, AI correction happens in the "Cognitive Moment." Students demonstrated a 34% increase in the use of complex syntactic structures (subordinate clauses).

Analysis of the FLCAS surveys showed that students in the EG felt 42% less anxious when speaking. The ability to practice pronunciation with ELSA Speak or ChatGPT Voice allowed students to overcome the "fear of public failure." By the time they presented to the teacher, they had already received five cycles of AI feedback.

7. Challenges and Ethical Considerations: Navigating the Digital Transition

The methodological integration of Artificial Intelligence into the secondary schools of Osh is not a frictionless process. While the quantitative data confirms a trajectory of growth, the qualitative observations during the eight-week study highlighted significant systemic hurdles. In the specific socio-economic context of Osh, two major issues were identified as primary barriers to universal AI adoption:

The Digital Divide and Socio-Economic Disparity: Although the school provided a controlled environment for the "Station Rotation" model, the longitudinal effects revealed a discrepancy in engagement levels. Students with high-speed home internet and personal devices demonstrated slightly higher levels of "Digital Autonomy" and consistency. In contrast, students relying solely on school infrastructure faced a steeper learning curve. This gap suggests that for AI to be truly effective in Kyrgyzstan, it must be accompanied by state-level efforts to ensure digital equity, preventing a new form of educational stratification where linguistic proficiency becomes tied to technological wealth.

Prompt Literacy and the Cognitive Gap: A critical finding of the study was the initial struggle with "Prompting." Students often approached AI with overly simplified or vague requests (e.g., *"Write a story"*), resulting in generic outputs that did not foster linguistic growth. It was observed that the quality of the AI's "Scaffolding" is directly proportional to the quality of the student's "Prompt." This led to the fundamental conclusion that Prompt Engineering—the ability to provide structured, contextual, and goal-oriented instructions to an AI—must be integrated as a core teacher competency. Teachers at schools, institutions in Kyrgyzstan must shift from teaching "answers" to teaching the "art of the question."

8. Conclusion

In final analysis, Artificial Intelligence serves as a powerful "Force Multiplier" for the EFL classroom in Kyrgyzstan. The empirical evidence presented in this research demonstrates that AI effectively manages the "Mechanical" aspects of language acquisition—grammar drilling, repetitive phonetic modeling, and real-time spell-checking. These are tasks that traditionally consumed a disproportionate amount of a teacher's time, often at the expense of deeper communicative practice.

By delegating these algorithmic tasks to AI, the human teacher is liberated to focus on High-Order Pedagogy. This includes the exploration of cultural nuance, the development of empathy through literature, and the fostering of critical thinking—elements of philology that remain beyond the reach of current generative models. For the secondary schools of Osh, the path forward is not a total replacement of the teacher, but the adoption of a Hybrid Model.

This model respects both the immense technological potential of AI and the irreplaceable value of human connection. The integration of AI in the Kyrgyz educational system should be viewed as a partnership: the AI provides the "structure and feedback," while the teacher provides the "inspiration and context." As we move into an era of digital-first education, the success of our students will depend on our ability to navigate this frontier, ensuring that technology serves as a bridge to global communication rather than a barrier to original thought.

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Орто мектепте англис тилин чет тили катары окутууда жасалма интеллектти интеграциялоонун методологиялык негиздери жана эмпирикалык талдоосу: Кыргызстандагы Ош шаарынын мисалында

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Аннотация
Макалада жасалма интеллект инструменттеринин орто мектептерде англис тилин окутуу процессине тийгизген таасири каралат. Изилдөө Ош шаарында жүргүзүлгөн сегиз жумалык экспериментке негизделген. Анда кеп ишмердүүлүгүнүн төрт түрүндөгү өзгөрүүлөр жана окуучулардын психологиялык тынчсыздануу деңгээли талданат. Жыйынтыктар «Мугалим + Жасалма интеллект» гибриддик окутуу модели жазуунун тактыгы жана сүйлөөнүн эркиндиги боюнча салттуу методикалардан жогору турарын далилдейт.

Ачкыч сөздөр: билим берүүдөгү жасалма интеллект (ЖИ), англис тили чет тили катары, гибриддик окутуу модели, орто билим берүү, станциялардын ротациясы, чет тилин үйрөнүүдөгү тынчсыздануу, лингвистикалык компетенттүүлүк

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Методологические основы и эмпирический анализ интеграции искусственного интеллекта в обучении английскому языку в средней школе: на примере города Ош, Кыргызстан

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Аннотация
В статье рассматривается влияние инструментов искусственного интеллекта на процесс обучения английскому языку в средних школах. Исследование опирается на восьминедельный эксперимент в г. Ош. Анализируются изменения в четырех видах речевой деятельности и уровень психологической тревожности учащихся. Результаты подтверждают гипотезу о том, что гибридная модель обучения «Учитель + ИИ» превосходит традиционные методики по показателям точности письма и беглости речи.

Ключевые слова: искусственный интеллект в образовании (ИИ), английский язык как иностранный, гибридная модель обучения, среднее образование, ротация станций, психологическая тревожность в обучении языку, лингвистическая компетенция