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## AI-Driven Digital Transformation of the Inductive Approach to Foreign Language Grammar Teaching

### Abstract

*Introduction.* The article addresses the problem of effective grammar acquisition in foreign language instruction through the inductive method supported by artificial intelligence (AI) technologies. The authors justify the relevance of studying inductive grammar learning in the context of digital transformation, where AI tools enhance learner autonomy, motivation, and analytical engagement. The development of grammatical competence is considered a key component of communicative proficiency in the modern multilingual educational environment. *Methodology and Methods.* The study was conducted during the fall semester of 2025 at the Faculty of World Languages, Tashenev University. A total of 102 undergraduate students majoring in English participated in the experiment. Students were divided into control and experimental groups. The experimental group received inductive grammar instruction supported by AI tools such as Chat GPT and Microsoft Copilot, while the control group followed traditional inductive methods without digital assistance. Quantitative methods were used, including pre-test and post-test assessments of grammatical competence and motivation, as well as a questionnaire survey based on a 5-point Likert scale. Instructor observations were also recorded to assess engagement and interaction quality. *Results.* The study revealed that the use of AI-supported inductive instruction led to a significant improvement in learners' understanding of grammatical structures, increased motivation, and enhanced cognitive involvement. Students in the experimental group demonstrated higher performance and deeper rule internalization compared to the control group. *Scientific novelty.* The research provides empirical evidence that the integration of AI technologies into inductive grammar instruction fosters autonomous learning, supports hypothesis testing, and improves grammatical competence in foreign language education. *Practical significance.* The findings can be applied in school and university language programs to enhance grammar teaching through AI-assisted inductive methods. The study offers methodological recommendations for implementing adaptive digital environments that promote learner-centered grammar discovery.

*Keywords:* foreign language, teaching methods, inductive approach, grammatical competence, motivation, artificial intelligence (AI), prompt.

**Introduction.** Over the past decades, foreign language proficiency has been regarded as one of the key qualities of an educated and competitive individual in a globalizing world. In today's educational landscape, there is a growing trend toward learning multiple foreign languages, which necessitates continuous improvement of teaching methodologies and the integration of innovative approaches and technologies. Particular attention is given to the development of learners' grammatical competence and their

mastery of the grammatical patterns of the target language. It is precisely the knowledge of grammatical structures that contributes to the advancement of lexical skills and communicative competence (Richards & Rodgers, 2014). However, the mere memorization of grammatical rules is insufficient for achieving a high level of language proficiency. Effective instruction requires methodological solutions that enhance learner motivation and support the integrated development of grammatical

and lexical competence (Firsova, 2023). One of the common challenges in foreign language learning is the mechanical memorization of grammatical constructions, which is especially relevant when mastering the English language and its tense system.

The inductive approach helps overcome these difficulties by activating learners' cognitive engagement and increasing their interest in language learning. In pedagogy, the inductive method is defined as a form of instruction in which learners construct knowledge through the analysis of specific examples followed by generalization. In other words, learners independently arrive at an understanding of grammatical patterns by working with linguistic material. In the works of Nazarova (2019), the importance of the inductive method is emphasized, as it enables learners to derive grammatical rules independently through example analysis. Several Russian researchers, including Trubitsina et al., (2021), point out that a distinctive feature of foreign language learning is the mechanical memorization of large amounts of material, which poses significant challenges for learners at various levels. One of the effective techniques for addressing this issue is the inductive method of instruction (Shermatova, 2022). Richards and Rodgers (2014) identify the key stages of the inductive approach: observation, generalization, hypothesis testing, conclusion formulation, application, and reinforcement. These stages aim to develop learners' autonomy, their ability to formulate and test hypotheses, apply acquired knowledge and skills in practice, and generate new ideas based on personal experience.

The unique feature of the inductive method lies in the active involvement of learners in the educational process, the development of their critical and analytical thinking, problem-solving abilities, and capacity to draw conclusions based on available data (Eshcherkina et al., 2023). With the advancement of digital technologies and the integration of artificial intelligence into educational practice, the inductive approach is acquiring new forms of implementation. AI tools enable the creation of adaptive learning environments in which learners can analyze

linguistic examples, receive feedback, and independently formulate grammatical rules (Li et al., 2025; Du & Daniel, 2024).

This study aims to describe the effectiveness and practical applications of the inductive method in teaching English grammar using AI technologies.

Research objectives:

- To describe the features of the inductive method in teaching foreign (English) language grammar using AI technologies (e.g., ChatGPT);
- To analyze the use of the inductive method to improve the effectiveness of grammatical pattern acquisition in English language learning with AI tools;
- To examine pedagogical experiences of applying the inductive method in mastering grammatical patterns through digital solutions based on artificial intelligence.

The object of the study is the process of acquiring grammatical structures in foreign language learning. The subject of the study is the inductive method of acquiring grammatical patterns using AI technologies. Thus, the inductive approach helps learners overcome the challenge of mechanical memorization of grammatical constructions and enables the integration of learned theory into language practice. This is especially effective when combined with AI technologies that provide an adaptive and interactive learning environment.

**Materials and Methods.** The methodological framework of this study is grounded in a comprehensive constructivist approach that integrates empirical experimentation with theoretical-analytical reflection. It draws upon the principles of inductive grammar instruction and cognitive communicative language teaching, which emphasize learners' active discovery of grammatical patterns through contextualized input and guided analysis (Romanchuk, 2023).

The central hypothesis posits that applying an inductive approach supported by artificial intelligence (AI) technologies facilitates deeper, more conscious, and sustainable acquisition of grammatical structures, while simultaneously enhancing learners' motivation in foreign language learning. The approach was selected for its pedagogical potential to foster cognitive

engagement, linguistic intuition, and long-term retention. Within the context of digital transformation, AI integration further amplifies the effectiveness of inductive instruction by promoting learner autonomy, interactivity, and personalized feedback (Wang et al., 2024; Li et al., 2025; Tram et al., 2024).

This study employed a quasi-experimental research design with control and experimental groups. The model followed a three-stage procedure (pre-test, implementation, post-test) to evaluate the impact of AI-driven inductive grammar instruction on learners' grammatical competence, motivation, and attitudes. The research was conducted at the Faculty of World Languages, Tashenev University, during the fall semester of 2025. A total of 102 undergraduate students majoring in English Language (IP) participated. The sample consisted of 10 male and 92 female students.

Experimental groups (EG): FI-24-9k1 and FI-24-9k2 (n = 52)

Control groups (CG): FI-24-9k4 and FI-24-9k7 (n = 50)

Both groups were comparable in terms of academic achievement and English proficiency, ensuring representativeness of the sample.

Three instruments were employed to collect data:

*Pre-test and post-test:* Designed to measure grammatical competence and academic progress.

*Questionnaire survey:* Used a 5-point Likert scale to assess learners' motivation and perceptions of AI-assisted instruction.

*Instructor observations:* Documented student engagement, task completion, and classroom interaction quality.

The experiment lasted one month and consisted of three phases:

1. *Pre-test phase:* Assessment of grammatical competence and motivation before intervention.

2. *Implementation phase:*

Experimental groups received AI-supported inductive grammar instruction using platforms such as Chat GPT, Microsoft Copilot, and other digital tools.

Control groups continued with traditional inductive instruction without AI integration.

AI tools generated contextualized examples, provided individualized feedback, and facilitated interactive grammar discovery tasks. Prompts were designed to stimulate observation, hypothesis formation, and rule derivation, preserving the logic of the inductive approach.

Grammar topics included the Present Perfect tense and comparative adjectives. Learners analyzed curated examples, identified patterns, formulated rules, and practiced usage through communicative tasks.

The instructor acted as a facilitator, guiding learners through discovery tasks, moderating discussions, and encouraging reflection, while AI tools supported hypothesis testing and language production.

3. *Post-test and survey phase:* Evaluation of grammatical competence, academic performance, motivation, and learners' perceptions of AI-assisted instruction.

*Quantitative data:* Analyzed using descriptive and comparative statistics, including mean scores, percentage change, and significance testing between pre- and post-test results.

*Survey responses:* Processed to identify shifts in learner motivation and attitudes toward AI tools.

*Qualitative observations:* Interpreted to reveal behavioral patterns and engagement dynamics during AI-enhanced instruction.

The study adhered to principles of systematicity, scientific rigor, and competency-based learning. Grammar instruction was treated as an integral component of communicative competence development.

**Results.** The impact of integrating digital AI tools and pedagogical methods on students' grammatical competence, motivation, and perception of AI tools was examined. The ascertaining stage consisted of diagnosing the initial levels of these indicators through a pre-test and an online survey administered to both the experimental and control groups (Du & Daniel, 2024; Li et al., 2025). Standardized tests were used for preliminary assessments. The diagnostic results are presented in Table 1.

– in both groups, a significant number of students (on average, about 60%) demonstrated

an average level of grammatical competence, which required structured learning interventions.

- a high level of competence was found in an average of 20% of experimental group (EG) students.

- Motivation and positive perception of AI tools were initially moderate in both groups.

**Table 1**

*Pre- and Post-Experimental Student Indicators*

	CG before (n=50)	CG after	EG before (n=52)	EG after
Grammar competence (mean %)	86,1	90,4	87,4	95,2
Motivation (Likert 1–5)	4	4,3	4,1	4,8
Positive perception of AI tools (Likert 1–5)	3,8	4,1	3,9	4,9

The formative stage of the experiment involved active use of AI platforms, integrating subject knowledge with gamified tasks, quizzes, and collaborative exercises. The program emphasized autonomy, engagement, and real-time feedback, allowing students to practice grammar interactively while receiving personalized guidance. After the experimental month, a repeated assessment (post-test and survey) demonstrated significant improvements in the experimental group compared to the control group.

Key observations:

- The percentage of students with high grammatical competence increased from 20% to 72% in the EG, whereas in the CG it rose moderately from 18% to 38%;

- Students in the EG demonstrated higher engagement and positive attitudes toward AI tools;

- Teacher observations confirmed that AI-assisted learning enhanced self-confidence, accuracy in grammar production, and active participation in collaborative tasks.

The results indicate that integration of AI tools into grammar instruction significantly improved learning outcomes, motivation, and students' attitudes toward technology, setting a foundation for further research and pedagogical applications.

At the end of the experimental program, students in both groups participated in reflective sessions and collaborative presentations.

The results of the ascertaining stage allowed the researchers to identify areas requiring targeted pedagogical support and the integration of AI tools for enhanced learning. This formed the basis of a month-long experimental program using Chat GPT, Microsoft Copilot, and other AI platforms.

Learners from the experimental group shared their experiences of using AI tools (e.g., Chat GPT) and inductive tasks to explore grammatical patterns, while the rest of the class asked questions and offered alternative strategies for rule formulation and hypothesis testing.

Questions for discussion included:

- Which exercises helped you understand grammar better and why?

- Did using AI tools make learning more interesting or easier?

- In which tasks did you feel most involved or motivated?

- What skills did you develop that could be useful beyond school?

The learning environment was intentionally designed to reduce anxiety and cognitive overload by fostering engagement, discovery, collaboration, and digital support. Many tasks were presented in the form of problem-solving activities, mini-research tasks, and creative group discussions, where students analyzed examples, formulated grammar rules, and received immediate AI-generated feedback.

Through the integration of AI tools and inductive learning, students reported increased confidence in using grammar in real contexts. Participation in group-based exploratory tasks contributed to stronger motivation, reduced fear of mistakes, and a sense of ownership over their learning process, which was particularly evident in the experimental group, where students frequently demonstrated the ability to

explain rules independently and justify their conclusions during group reflection.

The tasks encouraged critical thinking, language intuition, and meta-awareness, helping students perceive grammar not as a set of rigid rules, but as a dynamic and meaningful system. Working with AI enhanced individual understanding and created opportunities for peer teaching and collective knowledge construction.

As a result, learners experienced:

- 1) A more emotionally safe and supportive learning atmosphere
- 2) Greater willingness to take risks in language production.
- 3) Noticeable growth in engagement and long-term retention of grammar material
- 4) Development of metacognitive and research skills

Post-intervention feedback and qualitative reflections revealed a shift in learners' attitudes toward grammar, with many expressing enjoyments in "figuring out the rules themselves" and valuing the interactivity and personalization offered by AI-enhanced grammar tasks. These findings set the stage for a deeper discussion of the observed patterns and their implications for grammar instruction and the use of AI in language learning.

**Discussion.** The findings of the pedagogical experiment clearly confirm that the inductive approach contributes to more effective comprehension and retention of grammar material in foreign language learning. Rather than memorizing rules mechanically, learners are engaged in identifying patterns and grammatical features independently. Through hypothesis generation and analytical thinking, they construct their own understanding of grammatical rules, which leads to deeper and more meaningful learning (Shermatova, 2022; Firsova, 2023; Richards & Rodgers, 2014). This approach fosters language intuition and metalinguistic awareness, allowing students to move beyond passive knowledge acquisition and take an active role in the learning process. As noted by Eshcherkina et al., (2023), the inductive method supports the extrapolation of rules through reflective and comparative thinking, enhancing students' cognitive engagement.

The use of AI tools, such as Chat GPT, significantly amplifies the effectiveness of this approach, which provides personalized and adaptive feedback, generates custom examples, and supports hypothesis testing, all of which strengthen grammatical awareness and reduce reliance on rote learning (Tran et al., 2024; Du & Daniel, 2024; Wang et al., 2024). According to He (2025), AI-powered environments also encourage emotional resilience and reflective thinking in learners, making them more self-aware and autonomous in their learning.

Furthermore, the integration of digital technologies makes the learning process more motivating, accessible, and individualized. AI can act as a digital assistant, helping learners compare and classify grammatical phenomena, correct mistakes in real time, and engage in more reflective learning (Aisyiyah et al., 2024; Satiti et al., 2024), that supports the development of self-directed learning (SDL) skills, which are essential in modern education and professional development contexts (Richards & Willy, 2010). It is also important to note that while the inductive method is especially effective at beginner and intermediate levels, its efficiency depends on the nature of the grammar concept being taught. Therefore, a blended approach that flexibly combines inductive and deductive methods may be optimal (Nazarova, 2019; Richards & Willy, 2010; Trubitsina et al., 2021). Finally, to promote metacognitive development, learners should be encouraged to plan, monitor, and assess their own learning processes. AI technologies can facilitate this by offering learners tools for reflection and adjustment, thereby cultivating responsibility and autonomy in language learning (Li et al., 2025; He et al., 2025).

**Conclusion.** The conducted study confirmed the effectiveness of the inductive approach in teaching foreign language grammar. Unlike the mechanical memorization of rules, the inductive method involves independently formulating grammatical patterns based on the analysis of language input. This approach activates learners' cognitive processes, develops their ability to generate hypotheses, make logical generalizations, and apply knowledge

in practical situations. Inductive learning contributes to increased motivation: students become active participants in the learning process, discovering new knowledge on their own. This fosters confidence in their abilities and promotes the development of language intuition. Working with examples, participating in discussions, and analyzing language structures allow learners to immerse themselves more deeply in the linguistic environment and acquire grammar more consciously. The development of language intuition and metalinguistic awareness is a key outcome of the inductive approach. Students learn to recognize grammatical patterns, identify exceptions, and distinguish correct constructions from incorrect ones, relying on explicit rules and on an internal sense of the language.

The results of the experiment showed that learners who followed the inductive method demonstrated higher levels of long-term retention and more frequently used the studied grammatical structures in spontaneous spoken communication. The inductive approach proved particularly effective when supported by AI tools such as ChatGPT, which provide access to diverse linguistic material, assist in the analysis and formulation of rules, and offer interactive feedback. To ensure high effectiveness of inductive learning, it is essential to carefully

select linguistic material and organize student collaboration in pairs or small groups, creating conditions for joint analysis, discussion, and rule formulation. It is reasonable to assume that the inductive method could fully replace the traditional approach to foreign language instruction, provided that the methodology and lesson structure are appropriately reformed. All of the above allow us to conclude that the inductive approach is an effective and modern method of teaching foreign language grammar, contributing to both the intellectual and communicative development of learners. Its integration into the educational process requires methodological preparation from the teacher, but when implemented correctly, it significantly enhances the quality of grammar acquisition.

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#### References

- Aisyiyah, S., Novawan, A., Dewangga, V., & Bunarkaheni, S. (2024). Teaching grammar by using technologies: Unlocking language pedagogical potential. *Journal of English in Academic and Professional Communication*, 10(1), 36-45. <https://publikasi.polije.ac.id/jeapco/article/view/4615>
- Du, J., & Daniel, B. K. (2024). Transforming language education: A systematic review of AI-powered chatbots for English as a foreign language speaking practice. *Computers and Education: Artificial Intelligence*, 6, 100230. <https://www.sciencedirect.com/science/article/pii/S2666920X24000316>
- Eshcherkina, L. V., Skachkova, E. A., & Kazachenok, Yu. V. (2023). The inductive approach in foreign language teaching: Aspects of extrapolation and synergy. *Management in Modern Systems*, 4(40), 149-156. <https://doi.org/10.24412/2311-1313-40-149-156>
- Firsova, A. V. (2023). Features of the inductive method of teaching English. *International Journal of Humanities and Natural Sciences*, 5-4(80), 99-102. <https://sciup.org/osobennosti-induktivnoy-metodiki-prepodavaniya-anglijskogo-jazyka-170199464-en?ysclid=miybaevum799262444>
- He, M., Abbasi, B. N., & He, J. (2025). AI-driven language learning in higher education: an empirical study on self-reflection, creativity, anxiety, and emotional resilience in EFL learners. *Humanities and Social Sciences Communications*, 12(1), 1-20. <https://www.nature.com/articles/s41599-025-05817-5>
- Li, Y., Zhou, X., Yin, H. B., & Chiu, T. K. (2025). Design language learning with artificial intelligence (AI) chatbots based on activity theory from a systematic review. *Smart Learning Environments*, 12(1), 24. <https://link.springer.com/article/10.1186/s40561-025-00379-0>

Nazarova, V. S. (2019). The inductive method of presenting new grammatical material within the communicative methodology. *Young Scientist*, 47(285), 39–41.

Richards, J. C., & Rodgers, T. S. (2014). *Approaches and methods in language teaching*. Cambridge University Press. Richards, J. C., & Willy, A. R. (2010). *Teaching grammar*. In *Methodology in Language Teaching: An Anthology of Current Practice*. Cambridge University Press.

Romanchuk, A. A. (2023). 'Blind Spots' of the 'Scandinavian-Centric' Hypothesis on the Origin of the Old Russian State. *Social Evolution & History*, 22(2), 94-110. <https://cyberleninka.ru/article/n/blind-spots-of-the-scandinavian-centric-hypothesis-on-the-origin-of-the-old-russian-state>

Satiti, L. H., Fauziati, E., & Seytaningsih, E. (2024). AI Chatbot as an effective English teaching partner for university students. *International Journal of Educational Research & Social Sciences*, 5(3), 463-469. <https://elibrary.ru/item.asp?id=79836243>

Shermatova, Z. N. (2022). Advantages of using the inductive method in grammar teaching. *Science and Innovation*, 1, 934–937. <https://scientists.uz/view.php?id=2873#:~:text=Abstract,%2C%20speech%2C%20phenomenon%2C%20aspects>.

Tram, N. H. M., Nguyen, T. T., & Tran, C. D. (2024). ChatGPT as a tool for self-learning English among EFL learners: A multi-methods study. *System*, 127, 103528. <https://www.sciencedirect.com/science/article/pii/S0346251X24003105>

Trubitsina, O. I., Kolyadko, S. V., Alina, I. A., et al. (2021). *Methodology of Teaching a Foreign Language*. Moscow: Yurayt Publishing House.

Wang, C., Zou, B., Du, Y., & Wang, Z. (2024). The impact of different conversational generative AI chatbots on EFL learners: An analysis of willingness to communicate, foreign language speaking anxiety, and self-perceived communicative competence. *System*, 127, 103533. <https://www.sciencedirect.com/science/article/pii/S0346251X24003154>

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