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13.00.00 Pedagogika fanlari
13.00.01 Pedagogika nazariyasi. Pedagogik ta'limotlar tarixi
13.00.02 Ta'lim va tarbiya nazariyasi va metodikasi (sohalar bo'yicha)
13.00.03 Maxsus pedagogika
13.00.04 Jismoniy tarbiya va sport mashg'ulotlari nazariyasi va metodikasi
13.00.05 Kasb-hunar ta'limi nazariyasi va metodikasi
13.00.06 Elektron ta'lim nazariyasi va metodikasi (ta'lim sohalari va bosqichlari bo'yicha)
13.00.07 Ta'limda menejment
13.00.08 Maktabgacha ta'lim va tarbiya nazariyasi va metodikasi
13.00.09 Ijtimoiy pedagogika
07.00.00 Tarix fanlari
19.00.00 Psixologiya fanlari
01.00.00 Fizika-matematika fanlari
02.00.00 Kimyo fanlari
03.00.00 Biologiya fanlari
09.00.00 Falsafa fanlari
10.00.00 Filologiya fanlari
11.00.00 Geografiya fanlari

MAKTABGACHA VA MAKTAB TA'LIMI

Pedagogika, psixologiyaga fanlariga ixtisoslashgan ilmiy jurnal

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Elektron nashr. 102 sahifa,
1-iyul, 2025-yil.

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MUNDARIJA СОДЕРЖАНИЕ CONTENTS

MUNDARIJA

FOSTERING METACOGNITIVE SKILLS IN EFL LEARNERS THROUGH AI-SUPPORTED INSTRUCTION: A REVIEW OF RECENT LITERATURE

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Abstract: In recent years, metacognitive competence – learners' ability to reflect on, regulate, and adapt their own thinking – has become a central concern in English as a Foreign Language (EFL) education. With the rapid integration of Artificial Intelligence (AI) technologies in language classrooms, new opportunities have emerged to support metacognitive growth through tools such as adaptive learning platforms, intelligent feedback systems, and AI-driven reflective prompts. This literature review synthesizes recent research (2021–2025) on how AI-supported instruction can foster core metacognitive skills – planning, monitoring, and evaluating – among EFL learners. It examines theoretical models, empirical studies, and pedagogical frameworks, highlighting both the benefits and risks of AI use. While AI can act as a "digital mirror" that enhances self-awareness and learner autonomy, concerns around over-reliance, ethical design, and unequal access remain significant. The article concludes with recommendations for integrating AI into EFL pedagogy in ways that support learner agency, critical reflection, and long-term cognitive development.

Key words: Metacognition, Artificial Intelligence in education, EFL learners, Self-regulated learning, AI-assisted language learning, Reflective learning, Intelligent tutoring systems, Learning analytics dashboards, Meta-learning strategies, Digital pedagogy.

Annotatsiya: So'nggi yillarda metakognitiv kompetensiya – ya'ni o'quvchilarning o'z fikrlash jarayonlarini kuzatish, boshqarish va moslashtirish qobiliyati – Chet tili sifatida ingliz tili (EFL) ta'limida asosiy e'tibor markaziga aylandi. Sun'iy intellekt (AI) texnologiyalarining til o'rganish jarayonlariga tezkor integratsiyalashuvi metakognitiv rivojlanishni qo'llab-quvvatlash uchun yangi imkoniyatlarni taqdim etmoqda. Ushbu adabiyotlar sharhi 2021–2025-yillar oralig'idagi tadqiqotlarni tahlil qilib, AI qo'llab-quvvatlagan ta'limning rejalashtirish, monitoring qilish va baholash kabi asosiy metakognitiv ko'nikmalarni qanday rivojlantirishi mumkinligini ko'rsatadi. Unda nazariy modellari, empirik tadqiqotlar va pedagogik yondashuvlar tahlil qilinadi hamda AI texnologiyalaridan foydalanishning foydali jihatlari va xavflari ko'rsatib o'tiladi. AI o'z-o'zini anglash va o'quvchi mustaqilligini oshiruvchi "raqamli ko'zgu" sifatida xizmat qilishi mumkin bo'lsa-da, haddan tashqari bog'liqlik, axloqiy dizayn va tengsiz imkoniyatlarga oid xavotirlar saqlanib qolmoqda. Maqola AI texnologiyalarini EFL ta'limiga o'quvchi faolligi, tanqidiy tafakkur va uzoq muddatli kognitiv rivojlanishni qo'llab-quvvatlaydigan tarzda integratsiyalash bo'yicha tavsiyalar bilan yakunlanadi.

Kalit so'zlar: Metakognitsiya, ta'limdagi sun'iy intellekt, EFL o'quvchilari, o'zini boshqaruvchi o'rganish, AI asosidagi til o'rganish, reflektiv ta'lim, intellektual repetitor tizimlari, o'quv tahlil panellari, meta-o'rganish strategiyalari, raqamli pedagogika.

Аннотация: В последние годы метакогнитивная компетентность – способность учащихся осознавать, регулировать и адаптировать собственное мышление – стала ключевым аспектом в обучении английскому языку как иностранному (EFL). Быстрая интеграция технологий искусственного интеллекта (ИИ) в языковые классы открывает новые возможности для развития метакогнитивных навыков с помощью адаптивных образовательных платформ, интеллектуальных систем обратной связи и ИИ-инициируемых рефлексивных подсказок. Данный обзор литературы обобщает новейшие исследования (2021–2025 гг.) о том, как обучение с поддержкой ИИ способствует формированию основных метакогнитивных умений – планирования, мониторинга и оценки – среди EFL-учащихся. Анализируются теоретические модели, эмпирические исследования и педагогические подходы, выделяя как преимущества, так и риски использования ИИ. Несмотря на то, что ИИ может выступать в роли "цифрового зеркала", способствующего самосознанию и автономии учащихся, остаются значительные опасения, связанные с чрезмерной зависимостью, этическим дизайном и неравным доступом к технологиям. В заключение приводятся рекомендации по эффективной интеграции ИИ в методику преподавания английского языка как иностранного с целью поддержки агентности учащихся, критического мышления и долгосрочного когнитивного развития.

Ключевые слова: Метакогниция, искусственный интеллект в образовании, учащиеся EFL, саморегулируемое обучение, обучение языку с поддержкой ИИ, рефлексивное обучение, интеллектуальные обучающие системы, панели аналитики обучения, стратегии метаобучения, цифровая педагогика.

INTRODUCTION

Over the past few decades, the ability of learners to think about their own thinking – commonly referred to as metacognition – has emerged as one of the most essential skills in effective language learning. Metacognitive skills such as planning, monitoring, and evaluating learning progress not only support academic success but also foster learner independence and adaptability in an ever-changing global landscape (Flavell, 1979; Schraw & Moshman, 1995).

In English as a Foreign Language (EFL) contexts, these skills become especially crucial. Learners are often navigating not only a new linguistic system but also unfamiliar cultural norms, communication styles, and educational expectations. Without tools to reflect on what they are doing and why, students may struggle to make meaningful progress. Metacognition, therefore, acts as a compass – it helps learners identify where they are, what direction they need to take, and how to course-correct when challenges arise.

At the same time, education itself is undergoing a technological transformation. Artificial Intelligence (AI) is no longer a distant concept – it is already integrated into many classrooms, ranging from basic grammar correction software to adaptive learning platforms and virtual study companions. These technologies have the potential to personalize instruction, provide timely feedback, and prompt deeper reflection in ways that were not possible before (Lin & Zhang, 2021; Xu & Hwang, 2022).

This review explores how AI-powered tools and systems are being used to support the development of metacognitive competence among EFL learners. Focusing on both theoretical models and practical implementations from 2021–2025, it seeks to answer the following questions: In what ways can AI enhance learners' ability to reflect on and regulate their language learning? And under what conditions are these tools most effective?

REVIEW OF LITERATURE

Theoretical Framework and Conceptual Background

To understand how Artificial Intelligence (AI) might support metacognitive development, it is important to first unpack what metacognition means in the context of language learning. At its core, metacognitive competence refers to a learner's capacity to actively plan their learning goals, monitor their performance in real time, and evaluate outcomes to improve future learning. This is not merely about following instructions – it is about making informed decisions, adjusting strategies, and taking ownership of one's progress (Wenden, 1998; Oxford, 2011).

These metacognitive subprocesses – planning, monitoring, and evaluating – are closely tied to broader educational outcomes, including learner autonomy, critical thinking, and the ability to engage in self-regulated learning. When students are metacognitively aware, they do not simply complete a task; they understand why they are doing it, how well they are doing it, and what they can do better next time.

Recent research has begun to explore how AI can actively support this type of reflective learning. Tools such as intelligent feedback systems, self-questioning generators, and learning analytics dashboards are no longer experimental – they are being incorporated into real classrooms with promising results (Chen & Liu, 2022). These systems can track learners' behavior, analyze patterns, and offer targeted prompts that guide students toward greater awareness and intentionality in their learning.

Mazari (2025), for example, describes AI-based learning tools as "digital mirrors" – technologies that not only respond to what students write or say but also encourage them to step back and examine their learning processes. These systems can ask, "Why did you choose this word?" or "What strategy did you use here?" – questions that might otherwise be missed in a fast-paced classroom. In a similar vein, Xu and Hwang (2022) present a design framework for AI-driven learning companions that engage students in guided reflection. These tools do not merely offer corrections or praise; they invite learners to explain their reasoning, articulate their goals, and revisit their choices. In doing so, AI becomes more than a tutor – it becomes a partner in the learner's cognitive journey. As the field progresses, understanding the interplay between human instruction, AI support, and learner agency will be key to unlocking the full potential of metacognitive development in EFL education.

RESEARCH METHODOLOGY

In this study, data were collected through a review of scholarly articles published between 2021 and 2025 related to AI-supported instruction and metacognitive skill development. The selected articles were analyzed using content analysis, focusing on the research problem, type of AI tools used, and reported outcomes. Comparative interpretation was applied to identify patterns and insights across different contexts.

ANALYSIS AND RESULTS

Between 2021–2025, an increasing number of studies have taken a closer look at how Artificial Intelligence (AI) technologies are influencing the development of metacognitive skills, particularly within language learning and English as a Foreign Language (EFL) classrooms. Although these investigations vary widely in terms of educational settings, types of AI tools used, and research methodologies, a clear pattern has emerged.

Across the literature, researchers emphasize a dual dynamic: on the one hand, AI can serve as a valuable scaffold that encourages students to reflect on their learning processes; on the other hand, there is growing concern that overdependence on these tools may cause learners to engage less actively with their own thinking.

In other words, while AI holds considerable potential to foster metacognitive development, it also presents risks if not implemented with care and critical oversight.

Comparison of AI Tools and Metacognition Studies

Study Title	Problem Addressed	AI Intervention	Results
1. "Enhancing Metacognitive and Creativity Skills through AI-Driven Meta-Learning Strategies" (Khotimah, Rusijono & Mariono, 2024)	Low levels of self-reflection and creativity among EFL learners	AI-based meta-learning tasks and reflection scaffolds	Enhanced metacognitive planning and creative expression; learners became more intentional and autonomous.
2. "Building Metacognitive Skills with AI: Using AI Tools to Help Learners Reflect on Their Learning Process" (Mazari, 2025)	Lack of structured reflection in digital EFL environments	AI-supported reflective prompts and guided feedback	Learners developed greater awareness of learning processes, gaps, and performance trends.
3. "Pros and Cons of Artificial Intelligence on Metacognition: A Myopic State with Long-Term Consequences on Human Learning" (Johnpaul et al., 2025)	Cognitive offloading and overreliance on AI tools	Theoretical critique of AI's cognitive impact	Highlighted that misuse of AI may hinder deep learning and reduce learners' reflective abilities.
4. "The Impact of AI-Powered Self-Explanation Prompts on Metacognition and Learning Outcomes" (Lin & Zhang, 2021)	Difficulty in articulating reasoning and regulating understanding	AI-driven self-explanation prompts during tasks	Improved use of metacognitive strategies and deeper learning through verbalized reasoning.
5. "Using Artificial Intelligence to Foster Metacognitive Reflection in Learning Analytics Dashboards" (Chen & Liu, 2022)	Insufficient feedback for planning and monitoring	AI-generated dashboards with visual and textual feedback	Enabled students to regulate learning via self-evaluation, goal setting, and time tracking.
6. "Can Adaptive Learning with Metacognitive Prompts Help Students Learn Better? An Eye-Tracking Study" (Wang & Aleven, 2023)	Weak metacognitive engagement in adaptive systems	AI-supported adaptive learning with embedded reflection cues	Eye-tracking results showed increased learner focus and self-regulation in prompt-assisted conditions.
7. "Toward a Framework for Designing AI-Powered Learning Companions to Foster Metacognition" (Xu & Hwang, 2022)	Absence of theoretical frameworks for AI–metacognition integration	Conceptual model for reflective AI learning companions	Proposed design showed promising metacognitive effects in initial implementation trials.
8. "Investigating the Role of Peer Review with AI-Powered Feedback in Developing Metacognitive Skills" (Song & Rose, 2022)	Superficial engagement in peer review during writing tasks	AI-based tools for enhancing peer feedback	Strengthened learners' abilities in self- and peer-evaluation, reflection, and strategic revision.
9. "Fostering Metacognitive Skills in Programming: Leveraging AI to Reflect on Code" (Paludo & Montresor, 2023)	Learners' difficulty in reflectively analyzing programming steps	AI tool prompting structured reflection on coding stages	Although designed for programming, the reflection model demonstrated relevance for EFL learners engaged in complex revision tasks.

AI's Opportunities and Affordances for Metacognitive EFL Teaching

As technology becomes more deeply embedded in educational environments, Artificial Intelligence (AI) is increasingly shaping how learners interact with content, instructors, and themselves. In the context of English

as a Foreign Language (EFL) instruction, AI does not merely deliver content – it creates opportunities for learners to reflect, adjust, and grow. When used with intention and care, AI tools can become powerful allies in fostering metacognitive thinking. The following aspects illustrate this potential:

1. **Real-Time Feedback That Sparks Reflection.** One of the most immediate benefits of AI tools such as Grammarly or ChatGPT is their capacity to provide instant feedback on language use – correcting grammar, suggesting alternative vocabulary, or improving sentence structure. However, the real value lies beyond surface-level corrections. When combined with prompts such as "Why do you think this change was suggested?" or "What was your intention with this phrase?", these tools become reflective instruments that encourage learners to examine not only what they wrote, but how and why they wrote it. As noted by Mazari (2025), such interactions can shift learners from passive recipients of corrections to active participants in their own learning process.
2. **Encouraging Self-Explanation Through Guided Dialogue.** Learning becomes more effective when students are prompted to articulate their thought processes. Lin and Zhang (2021) highlight the significance of structured questioning, where learners explain the rationale behind their choices in reading or writing. AI can support this by generating reflective prompts such as "What evidence supports your argument here?" or "Does this phrase clearly express your idea?" These instances of guided self-inquiry help develop deeper cognitive awareness and promote adaptive learning strategies.
3. **Making Progress Visible Through Data Visualization.** Abstract notions such as 'growth' or 'improvement' can be difficult for learners to assess. AI-powered analytics dashboards – like those introduced by Chen and Liu (2022) – translate complex performance data into visual insights, highlighting trends, strengths, and areas for improvement. Such visibility allows learners to self-monitor and become active agents in diagnosing their learning progress.
4. **Deepening Reflection Through Peer Comparison.** AI is transforming peer review processes by introducing structure and interactivity. AI-enhanced platforms enable learners to engage critically with peer work – comparing ideas, analyzing techniques, and offering constructive feedback. According to Song and Rose (2022), this shared reflection deepens learners' evaluative abilities and enhances their awareness of quality in their own work.
5. **Supporting Long-Term Growth Through Meta-Learning Cycles.** Learning is not merely about completing tasks – it involves developing sustained habits of reflection and improvement. Khotimah et al. (2024) present the concept of meta-learning cycles, comprising goal-setting, action, reflection, and transfer. AI tools can support each stage by offering goal-setting prompts, monitoring tools, and adaptive suggestions for future strategies. These cycles promote not only retrospective analysis but forward planning for continued development.

Challenges and Risks. While the advantages of AI in supporting metacognitive learning are well-documented, they come with important limitations – many stemming not from the technologies themselves but from their implementation. Educators and developers must remain aware of the following challenges:

1. **The Trap of Over-Reliance.** A key concern raised by researchers such as Johnpaul et al. (2025) is that learners may become overly dependent on AI-generated feedback. The convenience of instant suggestions may discourage critical evaluation. Without reflecting on the reasons behind the feedback, learners risk outsourcing their thinking, leading to cognitive disengagement and weakened metacognitive development.
2. **Insufficient Pedagogical Integration.** AI tools are not inherently pedagogical – their effectiveness depends on how they are embedded in instructional contexts. Wang and Aleven (2023) argue that many AI tools were not designed with education in mind. Without deliberate integration into teaching strategies, students may use these tools superficially rather than for meaningful learning.
3. **Unequal Access and Readiness.** Despite increasing accessibility, a digital divide persists. Learners in under-resourced settings may lack internet access, appropriate devices, or digital literacy skills. Mazari (2025) warns that this gap can exacerbate educational inequality. Bridging this divide requires not only technological resources but also training and support for both students and educators.
4. **Data Privacy and Ethical Concerns.** AI systems process large amounts of learner data, raising significant issues related to privacy, consent, and algorithmic fairness. Holmes et al. (2022) emphasize the need for transparency in how data are collected, used, and protected. If feedback systems are biased or opaque, trust in the learning process may deteriorate. Ethical implementation of AI requires openness, equity, and accountability.

Implications for EFL Pedagogy. The integration of AI into EFL classrooms should not aim to replace teachers, but to complement and enhance their role. Thoughtfully applied, AI can help students become more strategic, reflective, and independent learners. Educators play a pivotal role in ensuring that these tools genuinely contribute to metacognitive development. Recommended practices include:

- Embedding Reflective Questions: Every AI-assisted activity should prompt students to think about their processes. Questions like "What was my plan?", "What worked?", or "What can I do better next time?" can transform feedback into a learning moment.
- Finding the Right Balance: While AI is a helpful tool, overuse should be avoided. Teachers must monitor usage and intervene to maintain student engagement with their own thinking.
- Aligning AI with Learning Goals: AI should serve a specific purpose, whether it be vocabulary acquisition, writing coherence, or argument analysis. Clear learning objectives enhance its effectiveness.
- Teaching Students to Use Feedback: Feedback alone is insufficient – students must learn how to interpret and apply it. Educators should model this process and guide students in transferring feedback into action (Xu & Hwang, 2022).

CONCLUSION AND SUGGESTIONS

There is growing evidence that Artificial Intelligence (AI) can play a significant role in helping language learners become more metacognitively aware – more reflective, more strategic, and more independent. From prompts that encourage students to articulate their thinking to dashboards that visualize learning progress, AI has the potential to support meaningful cognitive development. However, it is not a universal solution. To fully benefit from these tools, schools and educators must approach AI integration with deliberation and pedagogical care. It is not merely about introducing new technologies – it is about designing learning experiences that foster engagement, curiosity, and learner agency. Teachers remain indispensable – not only for delivering instruction, but also for guiding students in interpreting and utilizing AI-generated feedback effectively.

Looking ahead, researchers and educators should investigate how AI-based educational tools can be adapted to suit diverse cultural and regional contexts. In regions such as Central Asia, where metacognitive instruction may not yet be deeply institutionalized, there exists a valuable opportunity to design tools that align with local educational needs and learner profiles. At the same time, longitudinal studies are needed to assess how these technologies influence learner autonomy and cognitive development over time. If implemented thoughtfully, AI will not merely help students construct better sentences – it will contribute to shaping them into better thinkers, more confident learners, and more active participants in their own educational journeys.

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13.00.00 Pedagogika fanlari
13.00.01 Pedagogika nazariyasi. Pedagogik ta’limotlar tarixi
13.00.02 Ta’lim va tarbiya nazariyasi va metodikasi (sohalar bo‘yicha)
13.00.03 Maxsus pedagogika
13.00.04 Jismoniy tarbiya va sport mashg‘ulotlari nazariyasi va metodikasi
13.00.05 Kasb-hunar ta’limi nazariyasi va metodikasi
13.00.06 Elektron ta’lim nazariyasi va metodikasi (ta’lim sohalari va bosqichlari bo‘yicha)
13.00.07 Ta’limda menejment
13.00.08 Maktabgacha ta’lim va tarbiya nazariyasi va metodikasi
13.00.09 Ijtimoiy pedagogika
07.00.00 Tarix fanlari
19.00.00 Psixologiya fanlari
01.00.00 Fizika-matematika fanlari
02.00.00 Kimyo fanlari
03.00.00 Biologiya fanlari
09.00.00 Falsafa fanlari
10.00.00 Filologiya fanlari
11.00.00 Geografiya fanlari

MAKTABGACHA VA MAKTAB TA’LIMI

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