Materiallar to'plami · Conference Proceedings
"ZAMONAVIY TADQIQOTLAR VA BARQAROR RIVOJLANISH" respublika ilmiy-amaliy konferensiyasi
04 August 2026
UDK 378
PEDAGOGIKA

Developing Critical Thinking Skills among University EFL Students through AI-Assisted Language Learning: A Conceptual Review

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ABSTRACT

Artificial intelligence (AI) has emerged as one of the most influential technologies transforming contemporary higher education. In particular, generative AI tools have created new opportunities for English as a Foreign Language (EFL) instruction by offering personalized feedback, adaptive learning experiences, and interactive language practice. According to UNESCO (2023), educational institutions should integrate generative AI in ways that enhance learning while maintaining ethical standards and human agency. Similarly, Holmes et al. (2019) argue that AI should complement teaching rather than replace educators or students' intellectual engagement. The growing use of AI in language education has also generated concerns regarding students' overreliance on AI-generated content, academic integrity, and the possible decline of independent thinking. Kasneci et al. (2023) suggest that although generative AI can support learning, inappropriate use may negatively affect learners' analytical and evaluative abilities. Therefore, language teachers need to adopt instructional strategies that encourage students to critically examine AI-generated responses instead of accepting them without reflection. This conceptual review explores how AI-assisted language learning can contribute to the development of critical thinking among university EFL students. Facione (2015) defines critical thinking as purposeful and self-regulated judgment that involves interpretation, analysis, evaluation, inference, explanation, and reflection. Building on this perspective, the present paper discusses how AI-supported learning activities can promote analytical reasoning, information evaluation, learner autonomy, and digital literacy. The discussion also considers pedagogical strategies that help students use AI responsibly in academic settings. Overall, this paper argues that AI should function as a cognitive support tool rather than a substitute for human intelligence. When implemented through carefully designed learner-centered activities, AI has the potential to strengthen critical thinking, encourage reflective learning, and improve students' ability to make evidence-based decisions in academic and professional contexts (Lo, 2023; Holmes et al., 2019).

Keywords

Artificial Intelligence, Generative AI, Critical Thinking, EFL, Higher Education, Learner Autonomy, Digital Literacy.

DOI: 10.5281/zenodo.21743299

INTRODUCTION

Artificial intelligence (AI) has rapidly transformed educational practices across the world, creating new opportunities for teaching, learning, and academic research. The emergence of generative AI technologies, particularly large language models (LLMs), has significantly influenced higher education by enabling students to access information, receive immediate feedback, and engage in personalized learning experiences. According to UNESCO (2023), generative AI has the potential to improve educational quality when implemented responsibly and supported by appropriate pedagogical practices. As a result, many universities have begun exploring ways to integrate AI into teaching while maintaining academic integrity and meaningful learning.

Within English as a Foreign Language (EFL) education, AI-assisted learning has become increasingly popular because it offers learners flexible opportunities to improve language proficiency beyond the traditional classroom. Students can use AI-powered tools to generate ideas, revise written assignments, practice conversations, and receive instant explanations of grammatical structures or vocabulary. Holmes et al. (2019) argue that AI can support learner-centered education by adapting learning experiences to students' individual needs and

learning pace. These opportunities allow learners to become more independent while encouraging continuous engagement with the target language.

Despite these advantages, the rapid adoption of generative AI has also raised important educational concerns. Many educators question whether students may become overly dependent on AI-generated responses instead of developing their own reasoning and problem-solving abilities. Kasneci et al. (2023) suggest that excessive reliance on AI may reduce learners' cognitive engagement if technology is used merely to generate answers rather than support the learning process. Similarly, concerns related to misinformation, algorithmic bias, academic dishonesty, and ethical use of AI have become increasingly prominent in discussions about higher education (UNESCO, 2023).

These concerns have reinforced the importance of developing critical thinking, which is widely regarded as one of the most essential competencies required in twenty-first-century education. Facione (2015) explains that critical thinking involves purposeful judgment through interpretation, analysis, evaluation, inference, explanation, and self-regulation. Likewise, Paul and Elder (2019) emphasize that effective thinkers evaluate evidence objectively, question assumptions, and justify conclusions using logical reasoning. Such competencies are particularly important for university students, who are expected to interpret academic texts, evaluate information sources, construct arguments, and communicate ideas effectively.

The increasing availability of AI-generated information makes critical thinking even more significant in language learning. Rather than accepting AI-generated responses as unquestionably accurate, learners should develop the ability to verify information, compare different perspectives, and identify unsupported claims. Previous studies have demonstrated that digital literacy and critical thinking are closely connected because both require learners to evaluate the credibility and reliability of information before making decisions (Zawacki-Richter et al., 2019; OECD, 2021). Consequently, EFL classrooms should encourage students to engage critically with AI-generated content instead of relying on it passively.

From a pedagogical perspective, AI should not be viewed as a replacement for teachers but as a tool that enhances meaningful learning. Lo (2023) reported that generative AI can improve language learning by providing immediate feedback, personalized support, and opportunities for self-directed learning. However, the author also emphasizes that educational benefits depend on appropriate instructional design and teacher guidance. Similarly, Pack and Maloney (2023) contend that learners should be encouraged to analyze, revise, and evaluate AI-generated texts rather than simply reproducing them. Such learning activities promote learner autonomy while strengthening higher-order cognitive skills.

Despite the growing body of research on artificial intelligence in education, relatively few studies have examined how AI-assisted language learning can systematically foster critical thinking among university EFL students. Existing research has primarily emphasized the technological capabilities of generative AI and its impact on language performance, while comparatively less attention has been devoted to pedagogical strategies that encourage learners to critically evaluate AI-generated content. Addressing this gap, the present conceptual review synthesizes recent evidence to examine how AI can be integrated into EFL instruction to promote critical thinking, learner autonomy, and responsible technology use.

Therefore, this paper aims to examine the role of AI-assisted language learning in developing critical thinking among university EFL students. Specifically, it reviews current literature on artificial intelligence in education, discusses both the opportunities and challenges associated with AI integration, and proposes pedagogical implications that support responsible AI use in higher education. It is expected that the findings of this review will contribute to ongoing discussions regarding the effective integration of AI into language education while emphasizing the importance of human judgment, ethical awareness, and learner autonomy.

Literature Review

2.1. Artificial Intelligence in Higher Education

Artificial intelligence has become an integral component of higher education by transforming instructional practices, assessment methods, and student learning experiences. Recent developments in generative AI have expanded the role of educational technologies beyond content delivery to include personalized tutoring,

intelligent feedback, and interactive learning environments. According to Holmes et al. (2019), AI has the potential to create more learner-centered educational experiences by adapting instruction to individual learners' needs and supporting personalized learning pathways. As higher education institutions continue to adopt digital technologies, AI is increasingly viewed as a valuable tool for improving teaching effectiveness and student engagement.

The rapid development of generative AI has further accelerated this transformation. Unlike traditional educational software, large language models can generate human-like responses, explain complex concepts, summarize academic texts, and assist learners in completing language-related tasks. Lo (2023) reported that these capabilities have encouraged many educators to integrate AI into classroom instruction because of its potential to provide immediate feedback and promote independent learning. Consequently, AI has become an important supplementary resource that supports students both inside and outside formal educational settings.

Nevertheless, educational researchers emphasize that technological innovation alone cannot improve learning outcomes. AI should be implemented within sound pedagogical frameworks that encourage active participation, reflection, and critical inquiry rather than passive consumption of information. The effectiveness of AI therefore depends largely on how teachers design learning activities and guide students' interaction with AI-generated content (Holmes et al., 2019; UNESCO, 2023).

2.2. AI-Assisted Language Learning

Artificial intelligence has significantly influenced English language teaching by providing learners with new opportunities to practice language skills through personalized and interactive environments. AI-powered tools enable students to receive immediate feedback on grammar, vocabulary, pronunciation, and writing while encouraging independent learning beyond classroom boundaries. Pack and Maloney (2023) argue that generative AI has the potential to support language education by assisting learners in idea generation, language production, and academic writing. These opportunities contribute to learner autonomy and increase students' confidence in using English for authentic communication.

In addition to providing individualized support, AI allows learners to engage in meaningful language practice through interactive dialogue and task-based activities. Students can simulate conversations, analyze authentic texts, revise essays, and explore alternative ways of expressing ideas. Such experiences create opportunities for continuous language development while reducing learners' anxiety about making mistakes. Previous studies have shown that personalized feedback can positively influence students' motivation and language performance when integrated appropriately into instruction (Lo, 2023; Mayer, 2021).

Despite these advantages, researchers also warn against the uncritical use of AI-generated content. Kasneci et al. (2023) suggest that students may become overly dependent on AI if they use it merely to complete assignments rather than to improve their understanding. Similarly, UNESCO (2023) recommends that educational institutions establish ethical guidelines for AI use to ensure that technology enhances rather than replaces meaningful learning. Therefore, language teachers should encourage learners to evaluate AI-generated responses critically, verify information using reliable academic sources, and reflect on the strengths and limitations of AI-assisted learning.

2.3. Critical Thinking in EFL Education

Critical thinking has long been recognized as one of the fundamental competencies required for academic success and lifelong learning. Facione (2015) explains that critical thinking involves interpretation, analysis, evaluation, inference, explanation, and self-regulation. These cognitive processes enable learners to assess information objectively, identify logical relationships, and make informed decisions based on evidence. Similarly, Paul and Elder (2019) emphasize that critical thinkers actively question assumptions, evaluate arguments, and consider alternative perspectives before reaching conclusions.

Within EFL education, critical thinking extends beyond language accuracy to include the ability to interpret texts, evaluate sources, construct persuasive arguments, and communicate ideas effectively. Students are increasingly expected to analyze authentic materials, synthesize information from multiple sources, and participate in evidence-based discussions. These expectations require instructional approaches that promote reasoning rather than memorization. Research has consistently demonstrated that learner-centered pedagogies

contribute to the development of higher-order thinking skills by encouraging active participation and reflective learning (Holmes et al., 2019; OECD, 2021).

The emergence of generative AI has made critical thinking even more essential. Because AI-generated responses may occasionally contain inaccuracies or unsupported claims, learners must develop the ability to evaluate the credibility of information before accepting it as reliable. This responsibility requires both critical thinking and digital literacy, making these competencies increasingly interconnected in contemporary higher education (Zawacki-Richter et al., 2019).

2.4. Artificial Intelligence and Critical Thinking: Opportunities and Challenges

The relationship between artificial intelligence and critical thinking remains a subject of ongoing debate among educational researchers. On the one hand, AI provides learners with immediate access to information, personalized explanations, and opportunities for independent learning. On the other hand, concerns have emerged regarding students' excessive dependence on AI-generated content and the possible decline of independent reasoning skills. Kasneci et al. (2023) caution that learners who rely on AI without evaluating its responses may engage less actively in analytical thinking and problem-solving.

Conversely, several scholars argue that AI can strengthen critical thinking when integrated through carefully designed pedagogical activities. For example, students may compare AI-generated responses with peer-reviewed journal articles, identify factual inaccuracies, justify revisions using academic evidence, and reflect on differences between multiple perspectives. Such activities require learners to analyze, evaluate, synthesize, and defend their ideas using logical reasoning. According to Pack and Maloney (2023), AI becomes educationally valuable when it encourages learners to think critically rather than merely generating answers.

Overall, the reviewed literature suggests that AI itself neither improves nor diminishes critical thinking automatically. Instead, learning outcomes depend on instructional design, teacher guidance, and students' willingness to engage critically with AI-generated information. Therefore, responsible AI integration should prioritize meaningful learning experiences that encourage inquiry, reflection, collaboration, and evidence-based reasoning (UNESCO, 2023; Holmes et al., 2019).

Discussion

The reviewed literature demonstrates that artificial intelligence has become more than a technological innovation; it is increasingly recognized as a pedagogical resource capable of supporting language learning and higher-order cognitive development. Nevertheless, the educational value of AI depends largely on how it is integrated into teaching practices rather than on the technology itself. Holmes et al. (2019) argue that AI should enhance learner engagement and support meaningful educational experiences instead of replacing teachers' instructional roles. This perspective suggests that the effectiveness of AI-assisted language learning is determined by pedagogical design rather than technological sophistication.

One of the most significant advantages of AI in EFL education is its ability to provide immediate and individualized feedback. Unlike traditional classrooms, where students often wait for teacher comments, AI-powered tools enable learners to receive instant suggestions related to grammar, vocabulary, coherence, and organization. Such immediate feedback encourages students to revise their work repeatedly, allowing them to become more independent learners. Lo (2023) reported that personalized AI feedback contributes to learner autonomy by encouraging students to monitor and regulate their own learning processes. However, feedback becomes educationally meaningful only when learners critically evaluate AI suggestions before incorporating them into their work.

Critical thinking plays a central role in this process. Students should not assume that AI-generated responses are always accurate or appropriate. Instead, they should compare AI outputs with peer-reviewed literature, evaluate supporting evidence, identify inconsistencies, and justify their own decisions using reliable academic sources. Facione (2015) explains that critical thinking requires learners to analyze information systematically before making judgments. Similarly, Paul and Elder (2019) emphasize that sound reasoning depends on questioning assumptions and evaluating evidence rather than accepting information at face value. Consequently, AI should stimulate inquiry and reflection rather than passive acceptance of automatically generated

content.

Another important issue emerging from the literature is the relationship between AI and learner autonomy. Although AI offers students greater flexibility to study independently, autonomous learning should not be confused with learning without guidance. Students require explicit instruction on how to formulate effective prompts, evaluate AI-generated information, and recognize the limitations of generative technologies. According to UNESCO (2023), responsible AI integration requires educational institutions to promote ethical awareness, transparency, and digital literacy alongside technological competence. These competencies enable students to become responsible users of AI while maintaining academic integrity.

The reviewed studies also indicate that AI can promote collaborative learning when integrated into classroom activities. Rather than completing assignments individually through AI, students may work together to compare AI-generated responses, discuss alternative viewpoints, identify factual inaccuracies, and revise generated texts using academic evidence. Such collaborative tasks encourage learners to justify their opinions, negotiate meaning, and engage in reflective discussion. Previous studies have demonstrated that collaborative learning environments strengthen both communication skills and higher-order thinking by encouraging learners to exchange perspectives and evaluate different interpretations (Holmes et al., 2019; OECD, 2021).

Despite these educational opportunities, several challenges remain. Kasneci et al. (2023) suggest that excessive dependence on AI-generated content may reduce students' motivation to engage in independent reasoning and problem-solving. Furthermore, AI systems occasionally produce inaccurate information, fabricated references, or biased responses. These limitations highlight the necessity of developing digital information literacy. Students should be encouraged to verify AI-generated information using peer-reviewed journal articles, academic books, and official institutional publications before incorporating it into their academic work (UNESCO, 2023).

Teacher competence represents another crucial factor influencing the successful implementation of AI in language education. While AI can provide valuable support during learning, it cannot replace teachers' professional judgment, classroom management, or ability to facilitate meaningful interaction. Pack and Maloney (2023) contend that teachers remain responsible for designing authentic learning tasks that encourage learners to analyze, evaluate, and reflect upon AI-generated responses. Therefore, effective AI integration requires continuous professional development that enables educators to use AI responsibly while maintaining learner-centered instructional practices.

Overall, the literature suggests that AI should be viewed as a cognitive support tool rather than a substitute for human intelligence. Its educational potential can only be realized when teachers design activities that encourage students to question information, compare multiple perspectives, evaluate evidence, and construct their own understanding. In this way, AI-assisted language learning can contribute not only to language proficiency but also to the development of critical thinking, learner autonomy, and responsible digital citizenship.

Pedagogical Implications

The findings of this review have several important implications for English language teachers, curriculum developers, and higher education institutions seeking to integrate artificial intelligence into EFL instruction. Although generative AI offers considerable educational opportunities, its effectiveness depends on pedagogical decisions that encourage learners to think critically rather than simply generate answers. Therefore, AI should be incorporated into language classrooms through activities that require analysis, evaluation, reflection, and evidence-based reasoning.

First, teachers should design learning tasks that encourage students to evaluate AI-generated responses instead of accepting them as correct. For example, learners may compare AI-generated essays with peer-reviewed journal articles, identify factual inaccuracies, revise unsupported arguments, and justify their revisions using reliable academic evidence. According to Facione (2015), such activities promote interpretation, analysis, evaluation, and self-regulation, which are fundamental components of critical thinking. Consequently, AI becomes a tool for intellectual inquiry rather than a source of ready-made answers.

Second, language instructors should emphasize prompt literacy, enabling students to formulate clear, purposeful, and contextually appropriate prompts when interacting with AI. The quality of AI-generated re-

sponses depends largely on the quality of users' prompts. Pack and Maloney (2023) argue that learners who develop effective prompting skills are more likely to engage in meaningful dialogue with AI and receive responses that stimulate reflection rather than passive learning. Teaching students how to refine prompts also strengthens problem-solving and communication skills.

Another important implication concerns assessment. Traditional assessment methods that rely primarily on take-home writing assignments may no longer accurately reflect students' independent abilities. Instead, educators should adopt authentic assessment approaches that require learners to explain their reasoning, defend their opinions, and demonstrate how they evaluated AI-generated information. Oral presentations, reflective journals, classroom debates, portfolio assessment, and project-based learning provide opportunities for assessing higher-order thinking while reducing inappropriate dependence on AI-generated texts. Previous studies have shown that authentic assessment encourages deeper learning and greater learner engagement (Holmes et al., 2019; OECD, 2021).

Furthermore, digital literacy should become an integral component of EFL instruction. Students need explicit guidance on evaluating the credibility of online information, recognizing AI limitations, protecting personal data, and using AI ethically in academic contexts. UNESCO (2023) recommends that educational institutions establish clear policies promoting responsible AI use while ensuring that students understand issues related to transparency, privacy, accountability, and academic integrity. These competencies prepare learners to participate responsibly in increasingly technology-driven educational and professional environments.

Teacher professional development also deserves particular attention. Although AI technologies continue to evolve rapidly, many educators have limited experience integrating them into classroom instruction. Continuous professional training can help teachers understand the capabilities and limitations of generative AI, design appropriate learning activities, and develop assessment methods that encourage independent thinking. Holmes et al. (2019) emphasize that successful AI integration depends not only on technological infrastructure but also on teachers' pedagogical competence and willingness to adopt innovative instructional approaches.

Finally, higher education institutions should develop comprehensive institutional policies regarding AI use in teaching, learning, and assessment. Such policies should clearly distinguish between acceptable educational support and academic misconduct while encouraging responsible innovation. Kasneci et al. (2023) suggest that universities should promote AI literacy alongside ethical awareness to ensure that technological advancement strengthens rather than undermines educational quality. Establishing transparent institutional guidelines will help create learning environments where AI supports academic excellence while preserving students' independent intellectual development.

Overall, the reviewed literature indicates that effective AI integration requires a balanced approach that combines technological innovation with sound pedagogical principles. When supported by thoughtful instructional design, ethical guidance, and learner-centered teaching, AI can become a valuable educational resource that promotes critical thinking, learner autonomy, digital literacy, and lifelong learning.

CONCLUSION

Artificial intelligence has become an increasingly influential component of higher education, creating new possibilities for enhancing English as a Foreign Language (EFL) instruction and promoting learner-centered education. As discussed throughout this review, AI-assisted language learning provides students with opportunities to receive personalized feedback, engage in authentic language practice, and develop greater autonomy in their learning. However, the educational value of AI depends not on the technology itself but on how it is implemented within pedagogically meaningful learning environments. According to Holmes et al. (2019), technology should support educational objectives rather than determine them.

The findings of this conceptual review indicate that AI can contribute to the development of critical thinking when learners are encouraged to analyze, evaluate, compare, and reflect on AI-generated information instead of accepting it uncritically. These learning processes enable students to strengthen higher-order cognitive skills while improving their digital literacy and academic decision-making. Facione (2015) explains that critical thinking requires purposeful analysis and evaluation, competencies that become increasingly important

as students interact with AI-generated content in academic contexts.

The review also demonstrates that responsible AI integration requires the active involvement of teachers and educational institutions. Effective instructional design, authentic assessment, ethical guidance, and explicit instruction in digital literacy remain essential for ensuring that AI supports meaningful learning. UNESCO (2023) emphasizes that educational systems should adopt human-centered approaches to AI implementation that preserve learners' agency, academic integrity, and ethical responsibility. Likewise, Kasneci et al. (2023) suggest that generative AI should be viewed as a tool for supporting learning rather than replacing independent reasoning and intellectual effort.

Another important finding is that AI should be integrated into language classrooms through activities that require evidence-based reasoning, collaborative learning, and reflective practice. Students should be encouraged to verify AI-generated information using reliable academic sources, compare alternative perspectives, and justify their conclusions through logical argumentation. Such instructional practices enable AI to function as a cognitive support tool that strengthens both language proficiency and critical thinking rather than simply increasing learning efficiency (Lo, 2023; Pack & Maloney, 2023).

Although this paper provides a comprehensive conceptual review of AI-assisted language learning and critical thinking, it is limited by its reliance on existing literature rather than empirical data. Future research should examine how different AI-assisted instructional strategies influence critical thinking, learner autonomy, and language proficiency across diverse educational contexts. Longitudinal and mixed-methods studies may provide deeper insights into the long-term educational impact of generative AI on university EFL learners.

In conclusion, artificial intelligence should not be regarded as a replacement for teachers or human intelligence. Instead, it should be used as an educational resource that complements effective pedagogy and encourages learners to become analytical, reflective, and responsible users of technology. When integrated thoughtfully into language education, AI has the potential to promote critical thinking, strengthen digital competence, and prepare university students for lifelong learning in an increasingly technology-driven world.

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