

<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0317378>

9. Sun W., Lei L., Zhang N., Luo B. Avtomatik nutqni tanib olish texnologiyasining EFL o‘rganuvchilarining ikkinchi til talaffuzi va og‘zaki nutq ko‘nikmalariga ta’siri: aralash metodlar asosidagi tadqiqot // *Frontiers in Psychology*. – 2023. – 14-jild. – 1210187-maqola. – Mayjud: <https://www.frontiersin.org/articles/10.3389/fpsyg.2023.1210187/full>

10. Zou B., Huang L., Xie H. EFL o‘rganuvchilarining sun’iy intellekt asosidagi nutqni baholash tizimidan foydalanish bo‘yicha qarashlari: imkoniyatlar va cheklovlar // *System*. – 2024. – 122-jild. – 103256-maqola. – Mayjud: <https://www.sciencedirect.com/science/article/abs/pii/S0346251X24002793>

THEORETICAL FOUNDATIONS OF DEVELOPING LISTENING COMPREHENSION SKILLS THROUGH ARTIFICIAL INTELLIGENCE TOOLS: EDUCATIONAL, TECHNOLOGICAL, AND COGNITIVE PERSPECTIVE

Fayziyeva Ra’no Raximovna

Namangan davlat pedagogika instituti tayanch doktoranti

E-mail: rano_fayziyeva@yahoo.com

Abstract: The integration of artificial intelligence (AI) into education has created new opportunities for improving language learning processes. Among the four primary language skills, listening comprehension remains one of the most challenging for learners because it requires rapid processing of auditory input, vocabulary recognition, syntactic analysis, and contextual interpretation. This article explores the theoretical foundations of developing listening comprehension skills through artificial intelligence tools from educational, technological, and cognitive perspectives. The study examines modern pedagogical approaches that support AI-assisted learning environments and discusses how technologies such as speech recognition systems, intelligent tutoring systems, natural language processing, and adaptive learning platforms can enhance listening instruction. In addition, the paper analyzes the cognitive mechanisms involved in listening comprehension, including perception, attention, working memory, and meaning construction.

Keywords: artificial intelligence, listening comprehension, language education, cognitive processes, educational technology, adaptive learning, AI in education.

Аннотация: Интеграция искусственного интеллекта (ИИ) в образовательную сферу открыла новые возможности для хороших процессов изучения языков. Среди четырех основных языковых навыков аудирование остается наиболее сложным для обучающихся, поскольку требует быстрого восприятия и обработки звуковой информации, определения лексических единиц, синтаксического анализа. В данной статье теоретические основы развития навыков аудирования с использованием инструментов искусственного интеллекта с педагогической, технологической и когнитивной точек зрения. В ходе анализа разрабатываются современные педагогические подходы, поддерживающие образовательную среду, основанные на использовании искусственного интеллекта, а также обсуждается, каким образом такие технологии, как системы мышления, интеллектуальные обучающие системы, технологии обработки естественного языка и адаптивные образовательные платформы, могут способствовать повышению эффективности обучения и обучения. Кроме того, в статье анализируются когнитивные механизмы, включенные в процесс понимания речи на слух, включая восприятие, внимание, рабочую память.

Ключевые слова: искусственный интеллект, понимание на слух, языковое образование, когнитивные процессы, образовательные технологии, адаптивное обучение, ИИ в образовании

Annotatsiya: Sun'iy intellekt (SI) texnologiyalarining ta'lim tizimiga joriy etilishi til o'rganish jarayonlarini takomillashtirish uchun yangi imkoniyatlar yaratmoqda. Til o'rganishning to'rtta asosiy ko'nikmasi orasida tinglab tushunish ko'nikmasi eng murakkab jarayonlardan biri hisoblanadi, chunki u eshitilayotgan nutqni tezkor qayta ishlash, lug'aviy birliklarni tanib olish, sintaktik tahlil qilish hamda kontekstual ma'noni anglashni talab etadi. Ushbu maqolada sun'iy intellekt vositalari orqali tinglab tushunish ko'nikmasini rivojlantirishning nazariy asoslari ta'limiy, texnologik hamda kognitiv nuqtai nazardan tahlil qilinadi. Tadqiqotda SI yordamida tashkil etilgan o'quv muhitini qo'llab-quvvatlovchi zamonaviy pedagogik yondashuvlar ko'rib chiqiladi hamda nutqni avtomatik tanish tizimlari, intellektual o'qituvchi tizimlar, tabiiy tilni qayta ishlash texnologiyalari va moslashuvchan o'qitish platformalari kabi texnologiyalar tinglab tushunishni o'qitish jarayonini qanday takomillashtirishi mumkinligi yoritiladi. Shuningdek, maqolada tinglab tushunish jarayonida ishtirok etuvchi kognitiv mexanizmlar, jumladan idrok, diqqat, ishchi xotira hamda ma'no hosil qilish jarayonlari ham tahlil qilinadi.

Kalit so'zlar: sun'iy intellekt, tinglab tushunish, til ta'limi, kognitiv jarayonlar, ta'lim texnologiyalari, moslashuvchan o'qitish, ta'limda sun'iy intellekt.

Introduction. The rapid development of digital technologies has significantly transformed modern education. One of the most influential technological innovations of the twenty-first century is artificial intelligence (AI). AI technologies are increasingly being integrated into educational systems to improve teaching efficiency, personalize learning experiences, and support students in developing essential academic skills. In the field of foreign language education, AI has opened new possibilities for enhancing the development of listening comprehension skills.

Listening comprehension is widely recognized as one of the most complex aspects of language learning. Unlike reading, where learners can control the pace of processing information, listening requires immediate interpretation of spoken language. Learners must simultaneously recognize sounds, interpret vocabulary, process grammatical structures, and understand meaning within a specific context. These processes occur in real time, which often creates difficulties for language learners. Traditional approaches to teaching listening comprehension often rely on audio recordings, classroom exercises, and teacher explanations. While these methods remain valuable, they may not always provide sufficient opportunities for individualized practice and feedback. Students frequently have different listening abilities, learning speeds, and cognitive strategies. As a result, a uniform teaching approach may not effectively address the diverse needs of learners. Artificial intelligence provides new opportunities to overcome these challenges. AI-based educational tools can analyze learner performance, identify learning difficulties, and adapt instructional materials to individual needs. In addition, AI technologies can simulate authentic communication environments and provide immediate feedback. These features create a dynamic and interactive learning environment that supports the development of listening comprehension skills.

The purpose of this article is to explore the theoretical foundations of developing listening comprehension skills through artificial intelligence tools. The study focuses on three major dimensions: educational perspectives, technological innovations, and cognitive processes involved in listening comprehension.

Literature Review. Listening comprehension has long been studied within the field of second language acquisition. Researchers emphasize that listening is not a passive activity but an active cognitive process that requires the integration of linguistic knowledge, contextual understanding, and background knowledge.

Early studies in language education identified two main types of listening processes: bottom-up and top-down processing. Bottom-up

processing involves decoding sounds, words, and grammatical structures in order to construct meaning. Top-down processing, on the other hand, involves using prior knowledge, context, and expectations to interpret spoken language. Successful listening comprehension depends on the interaction of these two processes. Educational researchers have also emphasized the importance of learner-centered approaches in listening instruction. Constructivist learning theory suggests that learners actively construct knowledge through interaction with their environment. Therefore, effective listening instruction should include authentic materials, meaningful tasks, and opportunities for learners to apply listening strategies in real-life contexts. Technological advancements have significantly influenced language learning environments. Multimedia resources, online learning platforms, and mobile applications have expanded access to listening materials and interactive exercises. These tools allow learners to practice listening skills independently and at their own pace.

In recent years, artificial intelligence has emerged as a powerful tool in educational technology. AI systems are capable of analyzing large datasets, recognizing patterns in learner behavior, and delivering personalized learning experiences. Research indicates that AI-powered language learning platforms can increase learner motivation, provide adaptive learning paths, and improve overall language proficiency.

Educational Foundations of AI-Assisted Listening Development. From an educational perspective, artificial intelligence offers several advantages for the development of listening comprehension skills. One of the most significant benefits is personalization. AI systems can analyze learner performance and adapt instructional materials according to the learner's level of proficiency, learning pace, and specific difficulties. Personalized learning is particularly important in listening instruction because students often demonstrate different listening abilities. Some learners may struggle with pronunciation and sound recognition, while others may have difficulties with vocabulary or interpreting meaning in context. AI-based platforms can identify these challenges and provide targeted exercises that address individual needs. Another important educational advantage of AI is continuous feedback. In traditional classroom settings, teachers may not always have sufficient time to provide detailed feedback to every student. AI-powered systems can automatically evaluate learner responses and provide immediate feedback, allowing students to identify their mistakes and improve their listening strategies.

AI technologies also support autonomous learning. Students can access AI-based platforms at any time and practice listening skills

independently. This flexibility allows learners to repeat listening tasks, review difficult materials, and progress at their own pace.

Furthermore, AI can create immersive and interactive learning environments. Intelligent tutoring systems and virtual assistants can simulate real-life conversations and provide contextual listening tasks that enhance learners' communication skills.

Technological Foundations of Artificial Intelligence in Listening Instruction. The successful implementation of AI in language learning is supported by several technological innovations. Speech recognition technology is one of the most important tools in AI-assisted listening instruction. This technology allows computer systems to recognize and analyze spoken language, enabling learners to interact with digital platforms through speech.

Natural language processing (NLP) is another key technology used in AI-based language learning systems. NLP enables computers to understand and interpret human language. In listening applications, NLP can analyze learner responses, detect comprehension errors, and generate appropriate feedback. Machine learning algorithms also play a critical role in AI-driven educational systems. These algorithms allow systems to learn from data and continuously improve their performance. In language learning platforms, machine learning can analyze large amounts of learner data to identify common difficulties and optimize instructional materials.

Adaptive learning systems combine these technologies to create personalized learning environments. These platforms monitor learner progress, adjust task difficulty, and provide customized recommendations. As a result, students receive a learning experience that is tailored to their individual needs.

Cognitive Processes in Listening Comprehension. Listening comprehension involves several complex cognitive processes. The first stage of listening is auditory perception, during which learners recognize and distinguish sounds within the target language. Differences in pronunciation, stress patterns, and intonation often create challenges for learners at this stage. Attention is another important cognitive factor in listening comprehension. Learners must focus on relevant information while filtering out background noise and distractions. Effective listening requires the ability to maintain concentration and identify key elements of the spoken message. Working memory also plays a crucial role in listening comprehension. Learners must temporarily store information while processing new input. When cognitive load becomes too high, comprehension may be disrupted. Therefore, listening tasks should be designed in ways that reduce cognitive overload.

Artificial intelligence tools can support these cognitive processes by providing structured listening exercises, adjustable playback speed, and repeated exposure to difficult materials. These features help learners process auditory information more efficiently and gradually develop stronger listening abilities.

AI-Based Tools for Listening Skill Development. Various AI-based tools are currently used to support listening development in language learning. Intelligent tutoring systems provide interactive lessons that adapt to the learner’s progress and performance. These systems guide students through listening exercises and provide explanations when difficulties occur.

Speech recognition applications allow learners to practice listening and speaking simultaneously. By analyzing learner speech, these tools can provide feedback on pronunciation and comprehension. AI-powered chatbots and virtual assistants also create opportunities for simulated conversations. These systems allow learners to interact with digital agents in realistic communication scenarios, which helps them develop practical listening and communication skills. Another important category of AI tools includes adaptive learning platforms. These platforms analyze learner data and automatically adjust learning materials based on performance. As a result, students receive personalized listening exercises that match their proficiency level.

Discussion. The integration of artificial intelligence into language education represents a significant shift in the way listening skills are taught and learned. AI technologies provide opportunities for more personalized, interactive, and data-driven learning experiences. However, the successful implementation of AI in education requires careful consideration of pedagogical principles. Technology should not replace teachers but rather support them in creating effective learning environments. Teachers remain essential in guiding learners, designing meaningful tasks, and fostering critical thinking.

Furthermore, ethical considerations related to data privacy, accessibility, and technological inequality must also be addressed. Educational institutions should ensure that AI technologies are used responsibly and that all students have equal access to digital learning resources.

Conclusion. The development of listening comprehension skills remains one of the major challenges in foreign language education. Artificial intelligence technologies provide innovative solutions that can significantly enhance listening instruction.

This article has explored the theoretical foundations of AI-assisted listening development from educational, technological, and cognitive perspectives. The analysis demonstrates that AI tools can improve

listening comprehension by providing authentic audio materials, adaptive learning experiences, and immediate feedback.

Future research should focus on empirical studies that examine the effectiveness of AI-based listening instruction in different educational contexts. Such research will contribute to a deeper understanding of how artificial intelligence can be integrated into language education to improve student outcomes.

References

1. Chapelle, C. A. (2001). Computer Applications in Second Language Acquisition. Cambridge University Press.
2. Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial Intelligence in Education. Center for Curriculum Redesign.
3. Zafar, D., & Sardor, O. (2022). DIFFICULTIES OF NON-PHILOLOGICAL STUDENTS IN LEARNING VOCABULARY AND USING RELEVANT TEXTS IN TEACHING ENGLISH. INTERNATIONAL JOURNAL OF SOCIAL SCIENCE & INTERDISCIPLINARY RESEARCH ISSN: 2277-3630 Impact factor: 8.036, 11(02), 163-165.
4. Richards, J. C. (2008). Teaching Listening and Speaking. Cambridge University Press.
5. Vandergrift, L., & Goh, C. (2012). Teaching and Learning Second Language Listening. Routledge.
6. Godwin-Jones, R. (2019). Emerging technologies for language learning. Language Learning & Technology.
7. Li, Z. (2020). Artificial intelligence in language education. Educational Technology Research.
8. Farmonov, A., Dadabaev, Z., Qosimova, G., Juramurodov, D., Nishonova, D., Boboyev, S., & Tursunov, Q. (2026). Genome-Wide Insights into The Role of Genetic Variability in Linguistic and Cognitive Functions. Genetics and Molecular Research, 25(1).

THE EFFECTIVENESS OF INNOVATIVE METHODS AND MODERN TECHNOLOGIES IN TEACHING FOREIGN LANGUAGES

Ziyamitdinova Ra'noxon Orifjon qizi

Namangan State Pedagogical Institute

Email: ziyamitdinovarano41@gmail.com

A second-year student of Foreign Languages Department

Abstract: This article analyzes the effectiveness of innovative methods and modern pedagogical technologies in teaching foreign languages. The importance of using interactive methods, information and