THE EVOLUTION OF TECHNOLOGICAL SUPPORT FOR FOREIGN LANGUAGE LEARNING: FROM CALL TO AI-BASED LANGUAGE LEARNING

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The process of foreign language acquisition supported by technological means has undergone a significant phase of evolutionary transformation. The initial stage of development, defined by Computer-Assisted Language Learning (CALL), was characterized by strict adherence to algorithmic rules and the use of predetermined, limited matrices. This approach ensured automation but often led to an artificial learning environment and communication process.

The current stage of integrating AI technologies into foreign language learning is called AI-based Language Learning (AILL). The technological base that enables this transition is multi-component and includes the integrated use of advanced areas such as Natural Language Processing (NLP), Deep Learning methodologies, general principles of Machine Learning (ML), and Large Language Models (LLMs) [2; 3].

The following stages are traditionally distinguished in the periodization of AILL development:

1. Initial stage: Electronic language learning (until the 1980s). The basis is Computer-Assisted Instruction (CAI) – the use of a computer as a simulator for automating exercises, reinforcing grammatical structures, and vocabulary. The communicative aspect was minimal.
2. Classic CALL (1980s–1990s). Transition from training programs to communicative CALL. Use of multimedia, interactive dialogues, and hypertexts (Hot Potatoes, Tell Me More, Rosetta Stone).
3. Intelligent CALL (ICALL, 1990–2010). Integration of first-generation artificial intelligence elements (expert systems, NLP). Adaptive exercises, error analysis, and writing assessment systems (AutoTutor, ALEKS) appear.
4. Mobile and network learning (2010–2020). The spread of mobile applications and social networks (Duolingo, Memrise).
5. AI-based Language Learning (AILL, 2020–present). Use of generative AI (LLM, ChatGPT, Claude). Models capable of conducting dialogue, creating adaptive scenarios, and acting as cognitive partners (ChatGPT, ELSA Speak, GrammarlyGO).

AILL relies on the interaction of several high-tech components: NLP, ML, DL, and LLM. These systems allow the generation of dialogues, explanations, and tasks, and the provision of contextual feedback [4; 5]. AILL is driven by generative models, which is a fundamental difference from the previous CALL.

The integration of LLM into language learning has opened up new opportunities, namely:

1. Creation of authentic communication scenarios. The innovative potential of LLM lies in the ability to generate high-quality and authentic language content. The authenticity of the content is achieved by training LLM on billions of words collected from a wide range of text sources, including books, articles, and websites. This amount of data provides an adequate basis for simulating natural communication.

Unlike traditional CALL chatbots, which had a limited, pre-written set of dialogues, LLMs can generate context-oriented conversations. This allows LLMs to simulate spontaneity, giving students the freedom to direct the conversation. This ability critically breaks down the barrier of artificiality and brings online practice closer to real language immersion for the first time.

2. Personalized feedback, automatic task generation, and style adaptation. The integration of LLM reflects a shift from a focus on memorizing grammar rules to learning through real communication and contextual assimilation.

From a pedagogical point of view, the use of LLMs offers a lot of advantages. First, they personalize the learning process by automatically adapting tasks to the student's level and learning style. Second, LLMs provide instant feedback, which helps correct speech behavior in real time. Third, the generative nature of the models allows for the creation of a large amount of authentic learning content, which significantly expands learning resources. Interactivity and the ability to simulate communication scenarios ensure the development of all language skills – speaking, writing, listening, and reading [1].

At the same time, the use of LLM in education has certain limitations: the generation of false or incorrect information; the inability to independently assess the accuracy of one's answers; ethical issues related to bias in training data, copyright, and cultural context.

In practical application, LLMs are already integrated into various educational platforms. For example, ChatGPT is used to create dialogues, essays, and grammar exercises, and to develop writing and speaking skills. ELSA Speak is used for pronunciation correction, and GrammarlyGO is used for automatic checking of written texts. Current research shows that the effective use of LLM in teaching involves combining technological support with pedagogical guidance from the teacher and critical evaluation of the results by the student, which contributes to the formation of a competent and autonomous language user [3; 4].

Thus, the evolution from CALL to AILL demonstrates a transition from fixed algorithms to adaptive and generative systems. AILL opens the potential for personalization and the development of student autonomy, but requires pedagogically sound implementation and further research.

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SOME ASPECTS OF THE USE OF INTERACTIVE TEACHING TOOLS IN COMPUTER SCIENCE CLASSES

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In today's educational environment, computer science as a subject plays a key role in developing digital literacy, logical thinking, and information technology skills. Given the rapid development of digital tools, interactive teaching aids are becoming not only desirable but also essential components of an effective computer science lesson. Their use stimulates students' cognitive activity, helps visualize complex concepts, and creates conditions for individualizing the learning process.

Interactive teaching tools cover a wide range of instruments, from multimedia presentations and educational platforms to virtual simulations, interactive whiteboards, and cloud services [2; 3]. In computer science lessons, they perform several important functions:

– Motivational – engaging students through gamification, visual effects, and feedback.

– Cognitive – promoting a deeper understanding of algorithms, data structures, and programming principles.

– Practical – creating conditions for modeling, testing, and independent design of digital products.

The use of interactive tools in computer science classes is one of the most effective ways to improve the quality of education. Thanks to visual materials, students have the opportunity to better understand complex concepts and deepen their knowledge of the subject using interactive technologies and other visualization tools. Interactive tools not only improve perception and assimilation of material, but also develop critical thinking, creativity, analytical skills, and even technical skills [1].

Studying computer science often involves working with abstract concepts such as algorithms, data structures, and programming, which can be difficult for students, especially beginners. Visualization helps simplify these complex topics, making them easier to understand. For example, animating algorithms can clearly show how a search or sorting algorithm works and what changes occur at each stage of its execution.

The use of diagrams and charts allows you to examine the logical structures of programs, the relationships between their elements, and visually explain concepts such as loops, conditions, and functions. This allows students to better understand how different components of a program interact with each other, as well as what the execution of a program looks like step by step.

Computer science lessons that actively use visual aids allow students to master programming skills more quickly. Thanks to interactive environments such as Scratch or