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OPTIMIZING COGNITIVE PROCESSES IN LANGUAGE LEARNING THROUGH AI: INSIGHTS FROM FRENCH ACADEMIC CONTEXTS

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Annotation. *Artificial intelligence (AI) in higher education foreign language teaching can enhance attention, memory, critical thinking, and metacognition. This study examines AI applications that support second language learning and professional skills, highlighting benefits such as adaptive feedback, authentic simulations, and reduced cognitive load. Evidence shows improvements in reasoning, retention, and task performance. Challenges include digital literacy, ethics, and cross-cultural applicability. Recommendations stress combining AI with instructor guidance and embedding tasks in real-world contexts. Further research is needed to optimize AI-supported pedagogy and validate cognitive gains.*

Keywords: *artificial intelligence, cognitive processes, foreign language learning, higher education.*

Анотація. *Штучний інтелект (ШІ) у викладанні іноземних мов у вищій освіті здатний посилювати увагу, пам'ять, критичне мислення та метакогніцію. Дослідження розглядає застосування ШІ для підтримки навчання другої мови та професійних навичок, демонструючи переваги: адаптивний зворотний зв'язок, автентичні симуляції та зниження когнітивного навантаження. Дані свідчать про покращення мислення, збереження знань та результатів завдань. Основні виклики – цифрова грамотність, етичні аспекти та міжкультурна застосовність. Рекомендовано поєднувати ШІ з педагогічним супроводом і інтегрувати завдання у реальні контексти.*

Ключові слова: *штучний інтелект, когнітивні процеси, навчання іноземних мов, вища освіта.*

The digital transformation of higher education has created new opportunities for innovation in foreign language teaching. Artificial intelligence (AI), particularly generative models, has proven capable of supporting cognitively intensive, authentic, and interactive tasks that foster linguistic competence, sustain motivation, encourage autonomy, and strengthen transferable skills. At the same time, the integration of AI raises theoretical and practical questions, particularly regarding its impact on key cognitive mechanisms such as memory, attention, and thinking.

This study aims to examine how artificial intelligence technologies implemented in European universities, particularly in France, contribute to the development of cognitive skills necessary for learning a second language. The relevance of this study is highlighted by the growing demand for higher education institutions that combine technological innovation with pedagogical rigour. By incorporating artificial intelligence into tasks that stimulate memory, attention, problem solving, and critical thinking, universities are changing the way students acquire, process and retain language knowledge.

In contemporary contexts, universities are required to combine technological innovation with pedagogical rigor to ensure effective foreign language learning. Despite numerous efforts, questions remain unresolved: how does AI integration affect cognitive processes in second language acquisition, and how can these changes be measured and optimized for professional learning tasks [1].

Research shows that technology-mediated environments can enhance attention, noticing, and memory consolidation [1]. Sociocognitive approaches emphasize the role of context and interaction, justifying the use of AI-supported simulations [2]. Studies in computer-assisted language learning (CALL) highlight that adaptive feedback facilitates more effective error correction and deeper processing [3]. Reports also underline the importance of digital literacy for critically evaluating AI-generated outputs. According to a survey conducted by the International Federation of French Teachers (FIPF), students who used AI-integrated platforms showed 15% better results compared to traditional teaching methods [3]. In addition, students reported that they were more motivated to learn the language, especially because they could learn at their own pace and receive immediate feedback. According to the FIPF survey, 78% of respondents said that interactive tasks created with AI helped them better understand complex grammatical structures. 65% said that their listening skills improved as a result of interacting with AI. The survey also showed that teachers who use AI as a support tool were able to reduce the time they spent preparing for classes by 30% [5]. However, gaps remain in terms of longitudinal research, cross-cultural comparisons, and unified methodologies.

The purpose of this article is to examine how AI technologies implemented in French universities affect the development of cognitive skills essential for second language acquisition. The objectives include: analyzing theoretical foundations (memory, attention, reasoning) within CALL; collecting empirical data from French institutions; interpreting results through the lens of cognitive theory; and formulating practical recommendations and directions for future research.

The study is based on a combined approach: systematic review of relevant literature and content analysis of reports from Paris-Sorbonne, Université Lyon 2, Université de Bordeaux, and Université de Nice Sophia Antipolis. Both quantitative indicators (performance indexes, percentage improvements) and qualitative data (project descriptions, methodological principles, feedback) were analyzed. The synthesis of findings relied on thematic and comparative analysis.

The findings emphasize that:

- AI-supported environments strengthen attention and noticing by providing adaptive tasks and immediate feedback, which aid retention [1; 3];
- sociocognitive mechanisms are activated in interactive simulations that reproduce professional communication contexts, combining individual processing with social engagement [3];
- reduction of extraneous cognitive load through automation of mechanical operations (formatting, editing) frees cognitive resources for higher-order processing such as argumentation and analysis [2].

Empirical evidence from French universities illustrates how these cognitive insights are realized in practice.

At Paris-Sorbonne University, AI-supported platforms for DELF/DALF preparation replicate exam conditions and provide automated analysis of written work, helping learners train attentional control and error detection. At Lumière University Lyon 2, the «EconCrisis AI Analysis» project generates tasks from authentic economic texts, fostering inferential reasoning and domain-specific vocabulary; 85% of students improved relevant skills. At the University of Bordeaux, negotiation simulations enhanced cognitive flexibility and terminology retention (+25%). At the University of Nice Sophia Antipolis, the «EconTech Report AI» project allowed students to focus on higher-order

analytical writing, with 80% reporting improved professional writing skills. The systematized data on the cognitive effects of AI integration in French universities are presented in Table 1.

Table 1

Cognitive Effects of AI Integration in French Universities

University	AI Project/Practice	Main Cognitive Focus	Reported Outcomes
Paris-Sorbonne University	DELF/DALF preparation platform	Attentional control, error detection	Improved exam readiness, faster error correction
Lumière University Lyon	EconCrisis AI Analysis	Inferential reasoning, professional vocabulary	85% improved domain-specific skills
University of Bordeaux	AI Business Negotiation Simulations	Cognitive flexibility, terminology retention	+25% terminology retention, higher oral confidence
University of Nice Sophia Antipolis	EconTech Report AI	Reduction of cognitive load, analytical writing	80% improved professional writing skills

These results indicate several principal findings. First, the genuineness of AI-facilitated tasks enhances the semantic depth of processing and long-term memory consolidation [2]. Second, responsive feedback bolsters metacognitive control by encouraging self-monitoring and correction [3]. Third, automation diminishes extraneous load, allowing learners to concentrate on complex reasoning and synthesis. At the same time, challenges persist: lacking critical digital literacy, learners might heed misleading AI outputs. Over-standardization of adaptive tasks risks curbing creativity and flexibility, while ethical issues like data privacy and academic honesty require careful attention.

Moreover, a cross-university comparison in France reveals that different implementations of AI highlight distinct cognitive gains: the Sorbonne's high-stakes exam simulations emphasize attentional control and error detection; Lyon 2's economic discourse analysis develops inferential and evaluative thinking; Bordeaux's negotiation scenarios stimulate cognitive flexibility and metacognitive regulation; and Nice Sophia Antipolis's report-writing project reduces extraneous cognitive load to privilege higher-order reasoning. Taken together, these practices illustrate how theoretical principles – such as the importance of working memory, depth of processing, and metacognitive awareness – are materialized in pedagogical design.

From this analysis, the following actions are proposed:

- embed AI within authentic, domain-specific tasks;
- pair adaptive feedback with instructor guidance;
- incorporate digital-literacy modules;
- devise strategies to lower extraneous cognitive load;
- continually evaluate ethical implications and data protection.

While current evidence highlights the promising cognitive outcomes of AI-supported pedagogical interventions, further inquiry is needed to deepen theoretical understanding and bolster empirical validation. Future research should thus examine the durability and transferability of cognitive gains through longitudinal cohort designs, while also employing experimental methodologies to isolate the specific influence of AI on working memory, attentional control, and semantic processing. To gain a deeper understanding of the mechanisms underlying these processes, mixed-methods approaches that integrate eye-tracking, learner surveys, and classroom observations appear particularly promising.

Additionally, cross-cultural comparative analyses are essential to determine the extent to which AI-driven pedagogical effects can be generalized across diverse educational, linguistic, and cultural settings. Finally, special attention should be devoted to teacher training, since the effectiveness of AI integration ultimately depends on educators' competencies, methodological adjustments, and attitudes toward technological innovation. Taken together, these research directions would not only refine current models of AI-enhanced learning but also inform evidence-based policies and best practices for higher education worldwide.

The analysis of existing research indicates that the integration of artificial intelligence technologies into foreign language teaching in higher education institutions offers significant potential for enhancing mental processes, including attention, memory, critical thinking, and students' metacognitive skills. The successful implementation of such innovative approaches requires the use of hybrid learning models in which AI functions as a cognitive enhancer, while instructors provide pedagogical interpretation, ensure adherence to ethical standards, and foster the development of digital literacy.

Moreover, the combination of adaptive algorithms with professional pedagogical guidance allows for the creation of individualized learning trajectories and the optimization of knowledge acquisition. Further research, conducted according to rigorous methodological standards, will be crucial for delineating the specific domains of AI application and identifying the conditions under which its implementation yields maximal cognitive and educational benefits.

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ПАРТНЕРСТВО ВЛАДИ ТА БІЗНЕСУ ЯК ІНСТРУМЕНТ ІННОВАЦІЙНОГО РОЗВИТКУ ЕКОНОМІКИ

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Анотація. *Розкрито роль державно-приватного партнерства як інструменту інноваційного розвитку економіки України. Проаналізовано міжнародний та національний досвід, виявлено бар'єри реалізації ДПП та окреслено перспективи його використання у відбудові та модернізації країни.*

Ключові слова: *державно-приватне партнерство, інноваційний розвиток, економіка, відбудова, модернізація, інфраструктура, цифровізація.*