Mental Mechanisms of Foreign Vocabulary Acquisition Within Innovative Educational Approaches — A Systematic Review

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ABSTRACT

BACKGROUND

The integration of cognitive approaches into traditional foreign language learning strategies is gaining importance in contemporary education. Considering cognitive aspects—such as memory, attention, and thinking—plays a critical role in shaping educational competencies and enhancing language acquisition. These elements are especially relevant in the context of increasing digitalization, globalization, and multiculturalism.

MATERIALS AND METHODS

This study presents a theoretical and analytical review of current research on cognitive aspects in foreign language learning. It focuses on identifying key cognitive processes involved in language acquisition and explores how modern educational technologies can support the development of related competencies. The analysis is grounded in cognitive psychology, pedagogical theory, and practical innovations in digital learning environments.

RESULTS

The findings demonstrate that incorporating cognitive strategies significantly enhances students' motivation, engagement, and acquisition of foreign language skills. Cognitive processes such as perception, information processing, and knowledge transformation are central to effective language learning. Modern educational tools and technologies facilitate the development of individual cognitive traits, including memory, attention, and motivation. These tools contribute to the modeling of learner-centered educational activities and the development of universal competencies. It is also shown that aligning learning strategies with students' cognitive profiles leads to better academic outcomes and more personalized learning experiences.

CONCLUSION

The study underscores the importance of integrating cognitive approaches into foreign language education to improve learning outcomes. Emphasizing cognitive traits and processes supports a more individualized, effective, and engaging learning experience. Educational technologies serve as key enablers in this process, offering tools to enhance memory, attention, and motivation. Future educational strategies should continue to prioritize cognitive dimensions in curriculum design and teaching practices to meet the demands of modern, globally connected learners.

Keywords: Cognitive linguistics-based language instruction, Adaptive digital learning platforms, Mnemonic vocabulary techniques, Gamified foreign language pedagogy, Personalized learner profiling

Highlights

- Cognitive approaches enhance foreign language learning by improving memory, attention, motivation, and engagement.
- Digital tools like adaptive platforms and mobile apps personalize learning and support individual cognitive styles.
- A positive learning environment with strong teacher support boosts educational effectiveness.
- Key challenges include limited institutional support, low teacher motivation, and a lack of resources.
- The study advocates for integrated, cognitively oriented strategies to build personalized learning trajectories and improve outcomes.

Introduction

Today, professional competence implies the learning of foreign languages, communication skills, and cross-cultural interaction. The strategy of foreign language learning should take into account individual cognitive characteristics, which can be a determining factor in the quality of the educational process. Traditional approaches to teaching a foreign language do not take these aspects into account, which creates prerequisites for updating established concepts.

Recent discoveries in the field of cognitive linguistics open up a number of promising solutions for the integration of innovative educational tools, including elements of adaptive learning platforms. The phenomenon of cognition, which forms the basis of a modern foreign language teaching strategy, includes the processes of perception and comprehension of information, and its use in personal and professional spheres. If effectively applied, cognitive capabilities can optimize the process of learning foreign languages, improving productivity, including through the integration of the necessary unique methodology.

At the same time, there is the problem of developing the most effective methods and tools that take into account the cognitive characteristics of foreign language learners. A separate issue is the possibility of combining traditional pedagogical approaches with innovative technologies, which makes it possible to increase the involvement and motivation of students. The main research question of this article is to study in detail the cognitive aspects of foreign language acquisition using modern technologies, which will create conditions for the development of intercultural communication.

Literature Review

Publications of modern authors convincingly show that the issues of interaction between the cognitive

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Iryna Bezugla – Formal analysis, Validation, Visualization.
Olesia Stoika – Resources, Supervision, Writing – review & editing.
Kateryna Mulyk – Software, Investigation, Writing – review & editing. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work

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sphere and the quality of the educational process form a relevant scientific discourse.[1] The theoretical basis of the cognitive basis of foreign language education is formed by the scientific developments of Al-Otaibi,[2] Wei et al.,[3] and Wang,[4] who study motivational and value strategies in foreign language learning.

Hung[5] and Sailer and Homner[6] highlight the potential of innovative educational tools based on a cognitive approach. House and Kádár[7] investigate the modern methodology of education in the context of digitalization of education against the background of general processes of globalization and integration of the educational environment.

Saarinen[8] and Hidayati et al.[9] explore the potential of incorporating innovative digital solutions into integrated foreign language teaching programs. The authors consider the possibilities of artificial intelligence to effectively analyze information. Kliesch et al.[10] examine digital interactive platforms and immersive technologies from the perspective of their future significance in cognitive strategies for competency-based education. Sıburıan et al.[11] analyze the phenomenon of cognitive linguistics in terms of differentiating approaches.

The main concepts of the cognitive approach to educational strategy were presented and developed in the studies of Hanif[12] and Farah,[13] who analyze the nature of speech activity. The authors focus their research efforts on the peculiarities of cognitive science, which studies the specifics of understanding key global contexts and the subsequent reflection of perception.

Cognitive linguistics, which is the subject of research by Cheng et al.,[14] explains how the structure of language can represent conceptual categories of thinking and integrate them into the language teaching process. Lorenz et al.[15] demonstrate how cognitive linguistics promotes awareness of linguistic units, while also paying attention to the impact of a positive psychological microclimate on the learning process.

Empirical studies demonstrate the effectiveness of the cognitive strategy in the context of skills development. Liu et al.[16] argue that learning new languages enhances cognitive functions in older age. At the same time, Aydın[17] emphasizes the prerequisites for the formation of language competence, which are based on cognitive processes.

Taking into account the cognitive sphere promotes deeper acquisition of language structures and opens up prospects for further upgrading the methodological support of the process of acquiring foreign language competencies.

Aims

The purpose of the article is to analyze the possibilities of involving the cognitive sphere in the process of foreign language acquisition, with the determination of practical tools in the modern educational environment.

To achieve this goal, it is advisable to formulate the main research task: to analyze the possibilities of innovative technologies in cognitive learning strategies.

Research Methods

Type of article: systematic review.

The research materials were based on primary sources of information—recent publications indexed in the leading scientific databases Web of Science and Scopus, as well as statistics from official sources. Publications from different regions of the world were analyzed, with priority given to works from the last 5 years. The keywords used for the search were foreign languages, cognitive approach, cognitive linguistics, motivation, and innovative educational solutions. The criterion for inclusion and exclusion of publications was the reliability of information.

The criteria for exclusion and inclusion of scientific works and publications were spatial and temporal indicators, and the level of reliability of information. The sources used include a selection of approximately 27 publications from industry journals over the last few years. Considering practical realities, the size of the sample of sources was considered appropriate, ensuring sufficient scientific and statistical power. To reduce internal bias in the publications used for this study, a strategy of open access and data reuse was applied. This involved providing access to the full research data, including raw data and code, allowing the results to be verified and further analysis to be conducted if necessary, thereby reducing the impact of bias.

The overall flowchart of the sampling methodology can be presented as follows in Figure 1.

The first stage of the work consisted of a theoretical analysis of the scientific literature in psychology, cognitive linguistics, information technology, and pedagogy. This helped to identify the main principles of the cognitive approach in the educational trajectory. The second stage was generalization and systematization, which allowed us to form a holistic picture of the

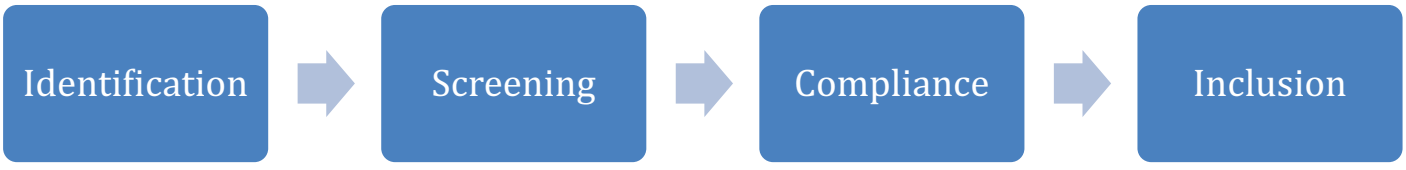

Fig 1 | The sampling methodology

impact of cognitive processes on the acquisition of universal competencies.

The screening process involves double-blind peer review by two independent reviewers, whose names are not disclosed to the authors. In addition, the names of the authors of the manuscript are concealed from the reviewers. Reviewers evaluate the quality of the manuscript, the methodology of its research, the rationale and conclusions, the level of academic writing, and style. In addition, they are able to identify unethical behavior or plagiarism.

Conflict of interest in scientific research is prevented by avoiding situations where a researcher has personal, financial, or other interests that may influence their professional activities, including the conduct and results of research.

A number of methods were used in the study: pedagogical observation—to study the latest trends in the cognitive concept; analysis and synthesis—for a critical review of the industry's scientific achievements; generalization—to formulate the scientific and practical conclusions. Finally, practical recommendations for integrating cognitive-oriented approaches into the traditional educational process were developed.

Results

The cognitive approach to learning foreign languages is positioned as particularly important against the background of general social processes of globalization. The acquisition of universal competencies is accompanied by the development of certain behavioral reactions with figurative and semantic components.

The cognitive linear methodology is closely related to the theory of intercultural communication, which involves a number of aspects: cognitive material should have cultural value, should form a conscious perception of critical definitions of the cognitive sphere, and should be complementary to the cognitive characteristics of the learners.

Various innovative methods of cognitive teaching have the potential to stimulate the effect of the presentation of educational material through the audiovisual, audiolinguistic, case, and linguistic and sociocultural methodologies (allowing the formation of stable speech competencies).

Digital optimization of education creates new opportunities for engaging the potential of the cognitive aspects of learning through linguistic and cultural programs ("Expert Groups," "Interview," "Project," "Reflective Circle"). At the same time, the impact of digital educational content on cognitive development is growing significantly (Figure 2).[18]

Memory and attention are currently considered to be the main cognitive factors influencing the acquisition of grammatical and lexical foreign language structures. It is important to use methods of activating short-term and long-term memory, including associative methods, repetition, and mnemonics. Also, an important role is given to the aspects of engagement and motivation that are directly related to cognitive processes.

Among the innovative educational technologies within the cognitive approach, adaptive platforms, brainstorming methods, gamification, Babylon, World Café, etc., have proven to be the most effective. In particular, the Babylon method promotes cognitive interest and cognitive development. The World Café method, in turn, allows for the generation of intercultural interaction experiences. In particular, the World Café method is

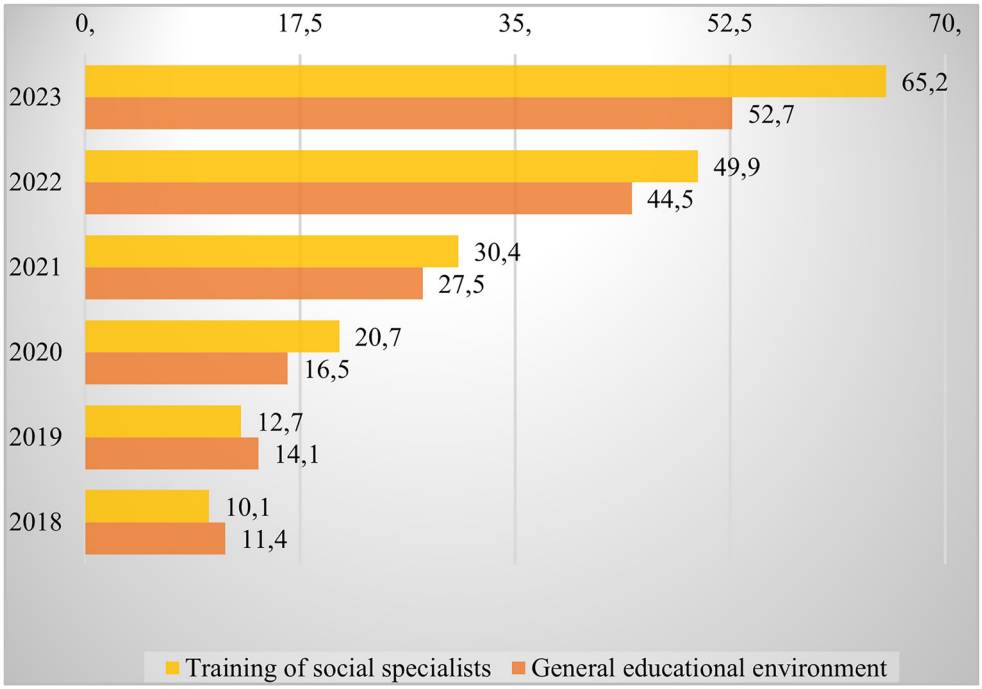

Fig 2 | The level of integration of linguistic and cultural programs in foreign language education in European countries, percentage of students involved
Source: Created by the authors

a modern and effective facilitation technique, the essence of which lies in the formation of several communication platforms that work on a specific task on a predetermined topic under the guidance of moderators. The method actively develops cognitive abilities, engagement, and motivation, which requires special attention in the future.

Mobile applications and adaptive online platforms form the basis of personalized learning, allowing students to monitor their own progress and choose the level of tasks that is complementary to their cognitive abilities. The emotional component of learning is closely linked to cognitive mechanisms, which can positively affect the effectiveness of the process. A positive microclimate of the educational environment and positive feedback contribute to better memorization of educational material.

Innovative approaches to cognitive learning form an effective learning environment for acquiring foreign language competencies, which have both advantages and disadvantages (Table 1).

It is obvious that practical recommendations for integrating the cognitive concept of learning should be focused on personalizing the learning process, adaptability of teaching materials, and the use of interactive tasks. All this is aimed at activating cognitive processes, developing attention and memory. Mnemonics, repetition, and associative learning help to optimize the process of learning vocabulary and grammar. At the same time, interactive platforms and gamification help to stimulate the engagement and motivation of students.

Creating an emotionally supportive educational environment is also important. Teachers should provide effective feedback and maintain a collaborative atmosphere that significantly stimulates the effectiveness of the learning process. An integrated approach to cognitively oriented methods of foreign language learning should aim to provide conditions for the maximum realization of the potential of students. The cognitive educational strategy is currently seen as potentially effective both within traditional educational trajectories and in the format of online learning, which positions them as a universal educational solution for modern foreign language teaching practice.

The creation of a conceptual model that generalizes the relationship between cognitive traits and digital tools will allow for the effective use of visual aids, the formation of stable language skills, and the development of communication and social skills. Among the main psychological aspects of foreign language learning, the following are considered the most important: (1) motivation and interest in learning the language; (2) active memory and thinking; (3) language learning abilities; (4) the relationship between language and speech in learning; and (5) language barrier. Cognitive processes such as memory, attention, and thinking should be actively used in language acquisition, and digital tools such as online platforms and mobile applications can serve as effective means of learning and practice.

The relationship between cognitive mechanisms and specific digital interventions and observed learning outcomes is presented in Table 2.

Table 1 | Opportunities and risks of integrating educational innovations within the cognitive approach to foreign language learning

Potential Opportunities	Related Challenges
Variability of cultural content	Reliance on online communication may reduce the quality of social and interpersonal skills
Increasing adaptability	Potential decline in academic performance and inconsistency with educational programs
Improvement of memory processes	Risks of increased competition
Increased motivation and engagement	Potential loss of teacher credibility
Development of critical thinking skills	Excessive use of digital communications
Formation of emotional intelligence	Risks of increased rivalry

Source: Developed by the authors.

Table 2 | Relationship between cognitive mechanisms and specific digital interventions and observed learning outcomes

Digital Interventions	Learning Outcomes
Audiovisual and audiolinguistic methods	Deeper understanding, improved memory, and language skills development
Case method	Development of practical skills, analytical thinking, ability to work in a team and make informed decisions
Linguistic, sociocultural methodology (“Expert groups,” “Interviews,” “Project,” “Reflective circle”)	Better assimilation of the information received, processing of additional related material, formation of stable skills in aspects of linguistic, social, and cultural competence
Online platforms	Better assimilation of material and development of practical skills
Gamification	A positive microclimate in the learning environment and positive feedback contributing to better retention of learning material
Mobile applications	Personalized learning, allowing students to track their own progress and choose a level of challenge that complements their cognitive abilities

Source: Developed by the authors.

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Discussion

The issue of developing universal foreign language competencies in the modern educational environment is being actively studied by world scholars. In particular, Nasir et al.[19] analyze the experience of professional training through the variability of innovative technologies. House and Kádár[7] offer their own vision of the basic tools for developing foreign language communication skills within the traditional educational field.

McCaw[20] analyzes the practical aspects of the cognitive approach and summarizes the essence of innovative concepts of foreign language education. The researcher studies targeted pedagogical tools that maximize the use of the cognitive sphere for the development of sustainable foreign language skills, and also argues that integrating the cognitive educational strategy is determined by the effectiveness of its synergy with other technologies of foreign language teaching and the formation of core competencies.

Some researchers emphasize the potential challenges of the cognitive strategy for the development of foreign language education.[21,22] The process requires a shift in thinking to integrate attention, memory, and language education. Kliesch et al.[10] position the cognitive approach as a priority in the context of implementing the educational concept, as it allows developing universal models of foreign language teaching, endowing the educational process with a sociocultural context, and choosing the necessary lexical material. Novantri et al.[23] emphasize that the development of universal skills in today's students requires the involvement of cognitive and reflective skills, ethical and cultural contexts, which will contribute to the development of sustainable foreign language communication skills.

Rapanta et al.[24] see the essence of the cognitive educational strategy in the importance of noticing the diversity of ways of thinking in the context of a multilingual environment. This makes it possible to take into account the cognitive aspects of linguistic phenomena, in fact, explaining them from the point of view of their relationship with the processes of cognition of the world.

The cognitive approach is especially valuable in the possibility of describing the phenomenon of a foreign language from the point of view of national peculiarities, means, and approaches to linguistic decisions, which makes it possible to better understand the specifics of a language being learned.

According to Lorenz et al.,[15] the cognitive aspect involves recognizing patterns of acquisition. The purpose of the approach under study is to effectively build an individual educational trajectory based on a system of defined patterns. The integration of adequate strategies has an important impact on the level of learning quality, motivation, and engagement of students. It should be added that the methods implemented in the context of cognitive learning have a huge educational potential. Cognitive learning develops critical thinking and adaptability, promotes resilience and dynamism.

The current study, as well as previous scientific developments, highlights the potential of cognitively oriented educational approaches to stimulate the effectiveness of teaching. Among the main cognitive factors that determine the quality of the process of acquiring foreign language competencies are memory, attention, individual cognitive styles, motivation, and engagement. Among the main challenges of the process are low motivation of teaching staff to integrate innovations, lack of institutional support, and insufficient technical and methodological resources. This necessitates joining efforts to implement cognitive approaches to foreign language learning strategies.

It is evident that practical recommendations for integrating online resources and cognitive concepts of foreign language learning should focus on personalizing the learning process, adapting learning materials, and incorporating interactive tasks. All this is aimed at activating cognitive processes and developing attention and memory. Mnemonics, repetition, and associative learning make it possible to optimize the process of learning vocabulary and grammar. At the same time, interactive platforms and gamification stimulate the engagement and motivation of learners.

It is worth noting a number of inconsistencies, gaps, and methodological shortcomings in the existing literature. In particular, researchers focus on the level of learning and competence development, while aspects of memory and attention are key cognitive factors that influence the level of acquisition of grammatical and lexical structures of a foreign language. Little attention is paid to methods of activating short-term and long-term memory, including associative methods, repetition, and mnemonic techniques. Aspects of engagement and motivation, which are directly related to cognitive processes, also play an important role.

A number of contemporary scholars have recently published articles addressing the issues of cognitive load, working memory training, and computer-assisted language learning (CALL). In particular, Langerock et al.[25] investigate working memory models, offering competing explanations for the cognitive load effect. At the same time, to establish the nature of these processes, more detailed research into their functioning is needed to describe them more accurately and determine the conditions under which they are effective.

Theunissen et al.[26] emphasize the potential of virtual reality in the development of cognitive functions. It is evident that immersive educational solutions have the potential to increase the engagement of learners. Furthermore, Gkintoni et al.[27] hypothesize that artificial intelligence significantly improves learning efficiency through automatic cognitive load management, personalized learning, and dynamic adaptation of learning paths based on real-time neurophysiological data. Deep learning models such as convolutional neural networks, recurrent neural networks, and support vector machine techniques improve classification accuracy, making AI-based adaptive learning systems more effective and scalable.

Finally, Jiang and Yu[28] promote the synergistic integration of student and peer help-seeking strategies into teaching methods and CALL course design, which encourages students to use help-seeking strategies,

thereby promoting a collaborative and self-regulated learning environment. It is evident that the interactive implementation of these strategies generates collaboration and self-monitoring, which is consistent with cognitive load theory, social cognitive theory, and self-regulated learning theory.

At the same time, there are certain related challenges, shortcomings, and risks of innovation in the educational process, in particular, the high cost of certified teaching tools and the complexity of access to the necessary technical equipment. Other risks include the development of excessive dependence on digital learning tools and health problems, including deterioration of vision and memory development processes.

The cognitive approach involves the use of adaptive online platforms, mobile applications, and immersive solutions that create new opportunities for personalizing learning and developing its emotional component. The positive atmosphere of the educational environment, unhindered feedback, and teacher support help to ensure the effectiveness of learning and stimulate the motivation and engagement of participants in the educational process.

Conclusion

The transformation of educational programs in foreign language learning forms a deep interest of students in learning, and promotes the development of universal skills in professional competence. The cognitive approach involves a combination of different forms of learning activities to expand vocabulary, improve grammatical and other competencies, and increase motivation, activity, and efficiency of learning material in the development of foreign language skills.

The study highlights the importance of implementing cognitively oriented methods in the process of teaching foreign languages. Cognitive linguistics forms a reliable basis for the development of individual educational trajectories, involving digital educational tools such as adaptive platforms, mobile applications, and artificial intelligence.

An integrated approach to the integration of cognitively oriented methods of foreign language learning should be aimed at providing conditions for the realization of the personal potential of students. The proposed recommendations emphasize the importance of creating an emotionally comfortable learning environment, using adaptive technologies, and taking into account individual cognitive characteristics. If used effectively, cognitive capabilities can optimize the process of learning foreign languages, stimulate educational productivity, and facilitate the integration of a unique methodology.

The main limitations of the study include the narrow time frame, small sample size, language bias, and lack of experimental verification. Obtaining these conclusions was made possible by mitigating biases in advance, which was achieved through a strategy of open access and data reuse. A promising concept is the development and integration of educational material that assimilates different types of information perception.

Further research in this area should focus on improving personalization technologies within the cognitive strategy of foreign language learning. Furthermore, future research directions should include neurocognitive measurements using special tests and techniques to identify specific cognitive brain functions such as memory, attention, thinking, speech, and others.

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