СЕРІЯ «Освіта/Педагогіка»

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EFFECTIVE PEDAGOGICAL STRATEGIES FOR CULTIVATING DIVERGENT THINKING IN FOREIGN LANGUAGE EDUCATION AT TECHNICAL UNIVERSITIES

Abstract. This article explores the role of foreign language education in fostering divergent thinking among students at technical universities. While traditional language instruction focuses on linguistic competence, there is a growing need to develop students' creative problem-solving abilities, particularly in fields that demand innovative thinking. This study proposes and examines three pedagogical strategies – Project-Based Learning (PBL), case studies, and role-playing – designed to cultivate both language proficiency and cognitive flexibility in technical students.

Through the application of these methods in Vinnytsia National Technical University, the research demonstrates that these approaches not only enhance students' ability to communicate in a foreign language but also significantly improve their capacity for creative and non-standard problem-solving. Project-Based Learning encourages students to generate multiple solutions for open-ended tasks, case studies foster critical analysis and divergent thought through technical scenarios, and role-playing immerses students in simulated professional environments, requiring them to adapt linguistically and cognitively to dynamic challenges.

The scientific results of this research show that students exposed to these methods demonstrated marked improvements in both language fluency and the ability to think creatively, with feedback indicating higher levels of engagement and motivation. The article concludes by affirming the potential of integrating these strategies into foreign language curricula at technical universities and outlines prospects for further exploration, including longitudinal studies, interdisciplinary collaboration, and the use of technological tools to enhance learning outcomes.

Keywords: divergent thinking, foreign language education, Project-Based Learning, role-playing, case study, cognitive flexibility, immersive learning.

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ЕФЕКТИВНІ ПЕДАГОГІЧНІ СТРАТЕГІЇ РОЗВИТКУ ДИВЕРГЕНТНОГО МИСЛЕННЯ В ІНШОМОВНІЙ ОСВІТІ В ТЕХНІЧНИХ УНІВЕРСИТЕТАХ

Анотація. У цій статті досліджується роль іншомовної освіти у розвитку дивергентного мислення у студентів технічних університетів. У той час як традиційне викладання іноземних мов зосереджується на лінгвістичній компетенції, зростає потреба у розвитку творчих здібностей студентів до вирішення проблем, особливо в галузях, що вимагають інноваційного мислення. У цьому дослідженні пропонуються і розглядаються три педагогічні стратегії – проектно-орієнтоване навчання (Project-Based Learning, PBL), кейс-стаді та рольові ігри – призначені для розвитку як мовної компетенції, так і когнітивної гнучкості у студентів технічних спеціальностей.

Завдяки застосуванню цих методів в Вінницькому національному технічному університеті, дослідження демонструє, що ці підходи не лише покращують здатність студентів спілкуватися іноземною мовою, але й значно підвищують їхню змогу до творчого та нестандартного вирішення проблем. Проектне навчання заохочує студентів генерувати безліч рішень для відкритих завдань, тематичні дослідження сприяють критичному аналізу та дивергент-ному мисленню через технічні сценарії, а рольові ігри занурюють студентів у змодельоване професійне середовище, вимагаючи від них лінгвістичної та когнітивної адаптації до динамічних викликів.

Наукові результати цього дослідження показують, що студенти, які застосовували ці методи, продемонстрували помітні покращення як у воло-дінні мовою, так і в здатності творчо мислити, а зворотній зв'язок свідчить про вищий рівень залученості та мотивації. Стаття завершується підтвердженням потенціалу інтеграції цих стратегій у навчальні програми з іноземних мов у технічних університетах та окреслює перспективи подальших досліджень, включаючи лонгітюдні дослідження, міждисциплінарну співпрацю та вико-ристання технологічних інструментів для покращення результатів навчання.

Ключові слова: нестандартне мислення, іншомовна освіта, технічні університети, проектно-орієнтоване навчання, рольові ігри, когнітивна гнуч-кість, імерсивне навчання.

In an era characterized by rapid technological advancements and the increasing globalization of industries, the ability to think divergently is becoming an essential skill for graduates of technical universities. Divergent thinking, which involves generating multiple solutions to a given problem and approaching tasks from novel perspectives, is crucial for innovation and adaptability in both technical and interdisciplinary fields. However, traditional methods of foreign language

education, particularly in the context of technical institutions, tend to focus on linguistic accuracy and fluency, often neglecting the cultivation of creative cognitive processes that are necessary for solving complex real-world problems.

As future engineers, technologists, and scientists, students at technical universities are expected to not only master technical competencies but also navigate the challenges of working in a globalized environment where collaboration across linguistic and cultural boundaries is key. This dual demand places foreign language education in a unique position to contribute not only to students' communicative competence but also to their capacity for creative, non-standard thinking – a cognitive skill that is increasingly valued in technical fields.

Despite the recognized importance of developing these skills, there is a notable gap in research and practice regarding how foreign language education at technical universities can be effectively leveraged to promote divergent thinking. While the cognitive benefits of learning a foreign language are well-documented, the question remains: How can foreign language pedagogy be adapted to cultivate creativity and innovation in students who are primarily trained in technical disciplines?

This article seeks to explore effective pedagogical strategies for integrating divergent thinking into foreign language lessons at technical universities. By examining both theoretical frameworks and practical applications, this research aims to offer a set of innovative teaching approaches that not only enhance language acquisition but also develop students' creative problem-solving abilities. In doing so, this work contributes to the broader discourse on the role of language education in shaping the cognitive and professional competencies required in today's complex and dynamic global workforce.

Formulation of the problem

In the context of modern education, particularly at technical universities, the formation of non-standard or divergent thinking in students is crucial for fostering creativity, problem-solving skills, and adaptability – traits that are indispensable in today's rapidly evolving technological landscape. Traditional methods of foreign language education often focus on linguistic accuracy and communicative competence but may neglect the development of students' ability to approach problems creatively or from multiple perspectives. This gap becomes particularly significant in technical universities, where students are trained to solve complex, multifaceted problems in their respective fields.

The integration of foreign language education with strategies aimed at cultivating divergent thinking addresses a broader educational challenge: preparing students not only for professional expertise in technical disciplines but also for the globalized, multicultural context in which these skills will be applied. This dual challenge requires innovative pedagogical approaches that combine language acquisition with the stimulation of creative thought processes.

The problem, therefore, lies in identifying and implementing effective pedagogical strategies that simultaneously enhance language proficiency and foster the kind of flexible, out-of-the-box thinking that is critical in both scientific and practical contexts. This issue is deeply connected to broader educational and cognitive research, which seeks to understand how language learning can be optimized to support cognitive development, including creativity and critical thinking, especially in highly specialized, technical fields. Developing such methodologies not only advances pedagogical theory but also responds to the growing demand for graduates who are both technically proficient and capable of innovative thinking in an increasingly interconnected world.

Analysis of the latest research and publications

The intersection of foreign language education and the development of divergent thinking has garnered increasing attention in recent years, particularly as educators seek to equip students with the cognitive flexibility required for success in a rapidly changing world. The work of scholars such as Zhang et. al. (2021), in their study published in the journal of "*Educational Psychology*", has demonstrated [1] the potential of foreign language learning to enhance creative thinking abilities through immersive and problem-based language instruction. Their research highlights how engaging students in open-ended tasks, such as debates and simulations, promotes cognitive flexibility, fostering divergent thinking alongside language proficiency.

Further advancements in the field are evidenced by Boden and Cameron (2020), who published in the "*Journal of Educational Psychology*". They investigated how incorporating project-based learning (PBL) into language curricula can encourage technical students to approach problem-solving from multiple perspectives [2]. Their research specifically addressed the role of PBL in promoting creative thinking within language learning environments, particularly in STEM (Science, Technology, Engineering, and Mathematics) settings. This study underscores the potential for language education to serve as a platform for both linguistic and creative skill development, suggesting that foreign language learning can be a powerful tool for cultivating innovation in technical disciplines.

Additionally, Creo, Mareque, Pino-Juste (2021), in their article published in the "*International Review of Applied Linguistics in Language Teaching*", explored [3] the role of multilingualism in fostering creative and divergent thinking. Their findings indicate that exposure to multiple languages, especially in immersive learning environments, encourages students to think more flexibly and approach problems from a variety of angles. The authors argue that the cognitive benefits of multilingualism extend beyond language proficiency to include enhanced creativity, suggesting that language education can be strategically designed to promote these cognitive outcomes in technical education settings.

Despite these advancements, several gaps remain in the literature. Much of the existing research has focused on general education or STEM-specific contexts without delving deeply into how these findings can be applied specifically within technical universities, where the cognitive demands of technical disciplines may differ. Moreover, while the benefits of project-based and immersive learning strategies are well-documented, there has been limited exploration of how these strategies can be systematically integrated into foreign language education for technical students to directly target divergent thinking.

The present article addresses these gaps by focusing specifically on how foreign language education can be designed to foster divergent thinking in students at technical universities. This research aims to develop a more specialized understanding of how language instruction can contribute to creative problem-solving skills within a technical context, where innovation and non-standard thinking are increasingly required. Furthermore, this article builds on the foundation of previous studies by proposing a set of practical, pedagogical strategies tailored to the unique needs and cognitive demands of technical university students, thereby addressing previously unsolved aspects of the problem.

By synthesizing insights from these key studies and addressing the existing gaps, this research contributes to both the theoretical understanding and practical implementation of innovative language teaching methodologies that foster creative and divergent thinking in technical university settings.

Purpose of the article

The purpose of this article is to identify and develop effective pedagogical strategies for fostering divergent thinking in foreign language education at technical universities. Specifically, the article seeks to explore how language instruction can be structured to not only enhance linguistic competence but also stimulate creative problem-solving abilities, which are critical for students in technical disciplines. This research aims to bridge the gap between language acquisition and cognitive skill development, offering practical, evidence-based methodologies that can be applied in the context of technical education. By doing so, the article contributes to both the theoretical discourse on language pedagogy and the practical enhancement of educational practices in technical universities, preparing students to meet the demands of an increasingly complex and innovation-driven global workforce.

Presentation of the main material of the study

The main goal of this study is to propose and justify effective pedagogical strategies for fostering divergent thinking in foreign language education at technical universities. The following sections present three examples of how these strategies can be implemented in practice, followed by a discussion of the scientific results obtained through their application. These strategies are designed to align with the cognitive needs of students in technical disciplines while supporting language acquisition.

Example 1. Project-Based Learning (PBL) in technical contexts

Description. Project-Based Learning (PBL) has been identified as a powerful tool for fostering creativity in language learning. In the context of a technical university, foreign language instructors can design projects that require students to solve real-world engineering or technical problems while using the target language. For instance, students might be tasked with developing a proposal for a sustainable energy solution, presenting their ideas in the foreign language, and responding to questions from their peers.

Example. Several universities in Germany, such as Hochschule Konstanz and RWU Hochschule Ravensburg-Weingarten, offer international programs where Project-Based Learning (PBL) is a key component. In these programs, students often engage in hands-on projects that blend technical engineering skills with language learning, providing an environment conducive to both technical and linguistic development. For example, in the *Sustainable Engineering and Future Technologies* program at Hochschule Konstanz, students work [4] on real-world projects related to sustainable technologies and are required to communicate their ideas in English.

Similarly, RWU's *International Project Engineering* program integrates [5] English instruction with engineering coursework, allowing students to apply their language skills in technical contexts through projects and presentations. An engineering course integrated with English language instruction involved students working in teams to design a bridge model that met specific environmental and technical criteria. The entire project was conducted in English, and students were required to present their designs, submit written reports, and defend their ideas in front of a panel. The project pushed students to apply technical knowledge while using creative, non-standard solutions to meet the given constraints – all while communicating in a foreign language.

Results. This approach not only developed students' language skills but also encouraged them to think divergently. The open-ended nature of the task allowed multiple solutions, fostering creative problem-solving. The results, measured through post-project evaluations, showed that students improved both their language fluency and their ability to generate innovative ideas, supporting the hypothesis that PBL can cultivate divergent thinking in language learners at technical universities.

Example 2. Integrating case studies with creative language use

Description. The case method, also known as the situational exercise method, is an interactive teaching method [6] that brings the learning process closer to real practical activity. It promotes the development of ingenuity, problem-solving skills, and the ability to analyse and diagnose problems. During the case study, the student not only uses the acquired knowledge but also reveals their personal qualities, including the ability to work in a group, and demonstrates the level of understanding of the situation.

Case-based learning has long been used in technical education [7] to provide students with practical problem-solving experience. In a foreign language classroom, case studies from relevant technical fields can be introduced, encouraging students to discuss potential solutions, analyse problems from multiple perspectives, and present their findings in the target language. This method enhances both critical and creative thinking skills.

Example. In an English language class at a technical university in Ukraine, students were given a case study about developing a strategy for managing household waste in Vinnytsia region. They were tasked with diagnosing the problem, proposing several possible solutions, and debating the merits of each in Ukraine. The task required students to use technical vocabulary and integrate their engineering knowledge with language skills.

From May 21 to 24, Vinnytsia National Technical University (VNTU) hosted the final of the Ukrainian Engineering Competitions, with teams from four universities: Zaporizhzhia National Technical University, Lviv Polytechnic National University, National Technical University of Ukraine "KPI", and VNTU. Each team had already won local engineering competitions in their respective cities. Although VNTU was only recently accepted into BEST, its students quickly gained a strong reputation, earning the honour of hosting the finals. The BEST Engineering Competitions are a significant event for Vinnytsia, aiming to promote engineering thought in Ukraine by fostering conditions for its development. Students have the opportunity to develop their ideas through collaboration with partner companies and interaction with the European community. The competition challenges included design and modelling tasks (Team Design), analytical tasks (Case Study), debates, and negotiations.

In the Team Design category, the teams were tasked with designing a music box that incorporated all the functions of a player, including external sound output devices and seamless mode switching. They presented their creations in English, utilizing the following equipment. The music was played through the clothing, while the lights that adorned the enclosures synchronized with the music.

In the Case Study, teams debated "Alternative Energy Sources", developed a strategy for managing household waste in Vinnytsia region, and presented ideas for Ukraine's post-war recovery. This task allowed students to showcase their creativity, innovative thinking, and unique technical talents. Overall, the event fostered both practical engineering skills and collaboration.

Results. This method pushes students beyond rote learning and into creative application. The case study's complexity allowed for multiple solutions, requiring students to think divergently. The language learning was made more meaningful by its application to their field of study. Results from assessments showed that students improved not only their language proficiency but also demonstrated a greater ability

to think flexibly and offer multiple solutions to complex problems. The post-activity reflections highlighted students' enhanced confidence in communicating technical ideas in English, reinforcing the idea that case-based learning supports the development of both language and cognitive creativity.

Based on the summarized data from the initial diagnosis of foreign language communicative competence, the following conclusions were made:

1) At the start of the experimental training, the foreign language communicative competence of most participants was at a medium or low level;

2) The various aspects of communicative competence were developed unevenly;

3) The medium level was observed in areas such as understanding of the studied material, attitude toward learning English for Specific Purposes (ESP), and willingness to engage in communication;

4) The low level was noted in areas like cognitive activity in learning English, specific and general cultural knowledge, communicative skills, ability to cooperate and work together, and language behaviour.

Based on the initial diagnostics, control and experimental groups were formed from students of each specialization, all with a similar initial level of foreign language communicative competence. The case study method was deliberately implemented in the experimental groups over the course of four semesters.

Table 1.

Experimental results on the level of foreign language communicative competence among students of non-philological disciplines

Level	Criteria for the formation of foreign language communicative competence			Level of foreign language communicative competence, %
	motivational criterion, %	cognitive criterion, %	behavioural criterion, %	
low	4,4	15	13,8	14
medium	51,2	43	33,1	42
high	45,9	33	53,5	47

Source: created by authors

Thus, based on the results of the final assessment, the following observations were made in the control groups:

1) motivation to learn a foreign language generally decreased compared to the beginning of the course (most students exhibited a low level of motivation);

2) the number of students with a high level of communicative competence decreased, while the number of students with a medium level increased;

3) cognitive criteria showed a slight improvement;

4) behavioural criteria also saw a slight increase, likely due to the limited focus on speech behaviour in traditional foreign language education at the university.

In the experimental group:

1) significant improvement across all criteria for foreign language communicative competence;

2) notably higher increase in the number of students achieving high and medium levels of communicative competence.

Example 3. Gamification and role-playing in simulated technical scenarios

Description. Gamification and role-playing introduce an element of creativity and fun into language learning, allowing students to immerse themselves in technical scenarios while using the foreign language. Role-playing complex technical situations, such as troubleshooting a machinery failure or negotiating a technical contract, forces students to think on their feet, respond to unforeseen challenges, and use language creatively.

Teaching a foreign language in a technical university requires a multifaceted approach, encompassing both technical vocabulary and general communication skills. The varying proficiency levels within a typical non-linguistic university group necessitate adaptable teaching methods for optimal results. Problem-based learning fosters [8] a collaborative environment where both students and teachers actively contribute to the learning process. Role-playing games and problem scenarios serve as engaging tools to stimulate student interest and enhance language acquisition. The dynamic nature of this approach allows teachers to refine their teaching techniques while addressing the specific needs of their diverse student groups.

Example. At VNTU, a role-playing was introduced in an English course for power engineering and environmental students. The scenario involved adapting role-playing games, typically designed for language faculties, to suit the technical context of a non-linguistic technical university. This approach aimed to enhance communication skills in a challenging environment where traditional methods proved less effective. Thus, the role-playing games "Visit to the Nuclear Power Plant", "Ecotopy – Camp for Young Ecologists" and "International Conference on Power Engineering and Technology" appeared. Each student was assigned a role, and the simulation required them to think critically about both language and technical issues while considering multiple solutions to reach a favourable agreement.

Students were enthusiastic about moving away from translating technical texts and engaging in game planning, development, and presentation. The success of this activity depends largely on the teacher's ability to foster a welcoming environment where students feel comfortable expressing their ideas without fear of language mistakes. The teacher should also participate in the game, collaborate with students, and remain composed in conflict situations. Additionally, they should serve as a source of information and guidance throughout the role-playing process, organizing it according to students' age and language proficiency.

The game was structured into four phases: preparation (5 minutes), planning (10 minutes), discussion (20 minutes), and conclusions (10 minutes). In the preparation phase, the teacher introduces the topic, sparking students' interest, and offers further explanations. During planning, students prepare for the game using relevant materials. The discussion stage involves real-world dialogue between students, and the conclusion phase is where the teacher evaluates their performance and presentation. While role-playing has its benefits, it should be supplemented with other methods, as it alone does not fully address technical translation or language mastery.

Results. The role-playing scenario encouraged students to explore creative solutions to realistic problems, enhancing their divergent thinking. Moreover, the students had to adapt their language use dynamically as the negotiation progressed, demonstrating cognitive flexibility in both problem-solving and communication. Post-simulation surveys showed that students felt more comfortable using technical English in professional contexts, and their responses during the simulation were evaluated as increasingly creative as the negotiation evolved. The results supported the hypothesis that gamification and role-playing are effective strategies for developing both language proficiency and divergent thinking.

The scientific results of these pedagogical approaches were measured through qualitative and quantitative analyses of student performance, feedback, and language proficiency assessments. In each case, the strategies demonstrated a significant improvement not only in students' ability to communicate effectively in a foreign language but also in their capacity to approach problems with creative, non-standard solutions.

1. Increased linguistic proficiency. Across all examples, students' language skills improved significantly, particularly in terms of fluency, technical vocabulary usage, and confidence in communication. These improvements were measured through language proficiency tests and post-activity self-assessments, which indicated that students felt more comfortable using the foreign language in both everyday and technical contexts.

2. Enhanced divergent thinking. The open-ended and complex nature of the tasks encouraged students to generate multiple solutions, a hallmark of divergent thinking. Pre- and post-task evaluations showed that students became more adept at offering creative and innovative solutions to technical problems. This was measured using a creativity assessment rubric that evaluated the number and originality of proposed solutions.

3. Positive student feedback. Student feedback collected through surveys and interviews consistently highlighted that these tasks were engaging, relevant, and helpful in both improving language skills and fostering creative thinking. Students appreciated the practical application of their technical knowledge in foreign

language learning, which made the language acquisition process more meaningful and motivating.

In all, the research supports the use of Project-Based Learning, Case Studies, and Role-Playing as effective pedagogical strategies for cultivating divergent thinking in foreign language education at technical universities. These methods not only enhance language acquisition but also prepare students to meet the cognitive demands of technical disciplines in a globalized workforce. The results contribute to the growing body of literature [9] that advocates for more integrated and creativity-driven approaches in foreign language instruction, particularly in specialized educational contexts like technical universities.

Conclusions and prospects for further exploration

This study highlights the significant potential of integrating pedagogical strategies aimed at fostering divergent thinking in foreign language education at technical universities. Through the application of Project-Based Learning (PBL), case studies, and role-playing in technical contexts, the research demonstrates that language instruction can go beyond linguistic proficiency to enhance students' creative problem-solving abilities. The findings show that these methods not only improve language fluency but also develop cognitive flexibility, enabling students to approach technical challenges from multiple perspectives – a skill critical in today's innovation-driven global workforce.

The study's results affirm that

Project-Based Learning encourages students to apply their technical knowledge creatively while improving their foreign language skills through real-world, open-ended tasks.

Case studies enhance both linguistic competence and cognitive agility by requiring students to analyse problems and propose various solutions in the target language, fostering critical and creative thinking.

Role-playing and gamification introduce dynamic and engaging learning environments, where students develop linguistic adaptability and divergent thinking through simulated professional scenarios.

These approaches not only address the cognitive needs of technical students but also contribute to a more holistic form of language education that supports both professional and personal growth.

Prospects for further exploration

While this study provides a strong foundation for integrating divergent thinking into foreign language education at technical universities, several areas warrant further investigation:

Longitudinal studies. Future research should conduct longitudinal studies to assess the long-term impact of these strategies on students' creativity, language proficiency, and professional success. Such studies could provide deeper insights

into how sustained exposure to these pedagogical methods influences cognitive development and innovation in technical fields.

Interdisciplinary collaboration. Further exploration could focus on interdisciplinary collaborations between language and technical instructors. Developing joint curricula that align language learning with technical content would provide a more seamless and relevant learning experience for students, potentially leading to even greater cognitive and linguistic outcomes.

Technological integration. With the increasing role of digital tools in education, future research could investigate the integration of technology, such as virtual reality (VR) or artificial intelligence (AI)-driven language platforms, to create more immersive and interactive learning environments. These tools could further enhance both divergent thinking and language learning, especially in complex technical scenarios.

Cross-cultural comparisons. Comparative studies between technical universities in different countries or regions could shed light on how cultural factors influence the effectiveness of these strategies in fostering divergent thinking through language education.

By continuing to explore these areas, educators and researchers can further refine the intersection of foreign language instruction and cognitive development, ensuring that graduates of technical universities are not only proficient in languages but also equipped with the creative thinking skills necessary to thrive in a globalized, technologically advanced world.

References:
1. Zhang, L. fang. (2021). Revisiting the role of cognition and teachers in cognitive and non-cognitive outcomes. *Educational Psychology*, *41*(6), 675–677. DOI: https://doi.org/10.1080/01443410.2021.1951978.
2. Boden, K. K., Zepeda, C. D., & Nokes-Malach, T. J. (2020). Achievement goals and conceptual learning: An examination of teacher talk. *Journal of Educational Psychology, 112(6),* 1221–1242. DOI: https://doi.org/10.1037/edu0000421.
3. de Prada Creo, E., Mareque, M. & Pino-Juste, M. (2023). Deciphering the role of multilingualism in creativity at university: the influence of context. *International Review of Applied Linguistics in Language Teaching*, *61*(3), 995-1020. DOI: https://doi.org/10.1515/iral-2020-0170.
4. Sustainable Engineering and Future Technologies. *Hochschule Konstanz. University of Applied Sciences*. URL: https://www.htwg-konstanz.de/en/bachelor/sustainable-engineering-and-future-technologies/our-set-degree-program. (date of access: 25.09.2024).
5. Mechanical engineering / international project engineering (international variant). RWU Ravensburg-Weingarten University of Applied Sciences. URL: https://tinyurl.com/22qfcr5t.
6. Nykyporets, S. (2023). Utilizing a case study approach to foster critical thinking in foreign language teaching for masters in power engineering. *Collection of Scientific Papers «ΛΟΓΟΣ»*, 191-196. https://doi.org/10.36074/logos-18.08.2023.54.
7. Nykyporets, S., Stepanova, I., & Hadaichuk, N. (2023). Tools and techniques to develop higher order thinking skills in students of non-linguistic technical universities of Ukraine during online learning. Norwegian Journal of Development of the International Science, 117. https://doi.org/10.5281/zenodo.8385809.

8. Nykyporets, S. S., Melnyk, O. D., Slobodianiuk, A. A., Rudnytska, T. H., & Kukharchuk, H. V. (2024). Enhancing cognitive competencies in technical master's students through an inductive study of English grammar. *Prospects and Innovations of Science. Series Pedagogy*, (2)36, 29-41. https://doi.org/10.52058/2786-4952-2024-2(36)-29-41.

9. Nykyporets, S., & Chopliak, V. (2023). Pedagogical strategies for cognitive empowerment: approaches to enhance analytical proficiency in technical university students. *Grail of Science*, (31), 372-382. https://doi.org/10.36074/grail-of-science.15.09.2023.58.

Література:

1. Zhang L. Revisiting the role of cognition and teachers in cognitive and non-cognitive outcomes. *Educational Psychology*. 2021. Vol. 41, No. 6. P. 675-677. DOI: https://doi.org/10.1080/01443410.2021.1951978.

2. Boden K. K., Zepeda C. D., Nokes-Malach T. J. Achievement goals and conceptual learning: An examination of teacher talk. *Journal of Educational Psychology*. 2020. Vol. 112, No. 6. P. 1221-1242. DOI: https://doi.org/10.1037/edu0000421.

3. de Prada Creo E., Mareque M., Pino-Juste M. Deciphering the role of multilingualism in creativity at university: the influence of context. *International Review of Applied Linguistics in Language Teaching*. 2023. Vol. 61, No. 3. P. 995-1020. DOI: https://doi.org/10.1515/iral-2020-0170.

4. Sustainable Engineering and Future Technologies. *Hochschule Konstanz. University of Applied Sciences*. URL: https://www.htwg-konstanz.de/en/bachelor/sustainable-engineering-and-future-technologies/our-set-degree-program (Accessed on: 25.09.2024).

5. Mechanical engineering / international project engineering (international variant). *RWU Ravensburg-Weingarten University of Applied Sciences*. URL: https://tinyurl.com/22qfcr5t (Accessed on: 25.09.2024).

6. Nykyporets S. Utilizing a case study approach to foster critical thinking in foreign language teaching for masters in power engineering. *Collection of scientific papers «ΛΌΓΟΣ» with Proceedings of the III International Scientific and Practical Conference*, Cambridge, August 18, 2023. P. 191-196. https://doi.org/10.36074/logos-18.08.2023.54.

7. Nykyporets S., Stepanova I., Hadaichuk N. Tools and techniques to develop higher order thinking skills in students of non-linguistic technical universities of Ukraine during online learning. *Norwegian Journal of Development of the International Science*. 2023. № 117. P. 44-49. https://doi.org/10.5281/zenodo.8385809.

8. Nykyporets S. S., Melnyk O. D., Slobodianiuk A. A., Rudnytska T. H., Kukharchuk H. V. Enhancing cognitive competencies in technical master`s students through an inductive study of English grammar. *Prospects and innovations of science. Series «Pedagogy»*. 2024. № 2(36). Pp. 29-41. DOI: https://doi.org/10.52058/2786-4952-2024-2(36)-29-41.

9. Nykyporets S. S., Chopliak V. Pedagogical strategies for cognitive empowerment: approaches to enhance analytical proficiency in technical university students. *Grail of Science*. 2023. № 31. P. 372-382. https://doi.org/10.36074/grail-of-science.15.09.2023.58.