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**Developing Foreign-Language Terminological Competence in Technical Students:
A Methodological Approach**

DOI: 10.61718/mon202614.01

УДК 811.111'276.6:378.147

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The research substantiates and experimentally verifies a comprehensive strategic approach to optimizing the process of learning English professional terminology for higher education students in technical fields. The relevance of the study is driven by the modern technical industry's objective need for highly qualified specialists capable of seamless foreign-language communication amidst globalization and rapid technological progress. The author provides a detailed analysis of the linguodidactic potential of integrating cognitive, derivational, and digital learning strategies, which form the basis for mastering a specialized thesaurus and developing intercultural business communication skills among students at technical higher education institutions. Particular attention is paid to the practical implementation of methods for the frame modeling of domain-specific term systems and the morphemic-compositional analysis of complex technical lexical units, as well as the adoption of spaced-repetition mobile applications to enhance memorization. The study identifies and delineates the pedagogical conditions and methodological algorithms that facilitate the transformation of students' passive terminological minimum into active communicative competence during the resolution of quasi-professional tasks. A theoretical and methodological analysis of the experience of applying the proposed approaches confirmed the effectiveness of systematizing the educational process and a significant improvement in the quality of students' mastery of the professional thesaurus. The practical value of the findings lies in the possibility of directly implementing the substantiated strategies and didactic materials into the educational process of technical universities to systematically enhance the quality of ESP training. Keywords: professional terminology, technical specialties, cognitive strategies, derivational strategies, digital learning strategies, professional thesaurus, frame modeling, professional communication.

Problem statement. This study is driven by the rapid globalization of the global engineering and digital landscape and the integration of the domestic manufacturing sector into international high-tech projects, which impose fundamentally new requirements on the quality of language training for future technical specialists.

The modern labor market requires professionals capable not only of basic conversational skills but also of seamlessly navigating complex specialized terminology within a dynamic digital environment.

Despite the evident importance of ESP training, the traditional system of foreign language instruction in technical higher education institutions often focuses on passive reading and linear translation of specialized texts. Such an approach hinders the development of productive professional speaking skills and fails to prepare graduates for real-world intercultural business communication.

Furthermore, traditional methods often overlook the patterns of cognitive information processing and the derivational potential of term systems, leading to the rote memorization of vocabulary without an understanding of its structural-semantic connections.

The situation is complicated by the need to urgently adapt didactic tools to the conditions of educational digitalization, which requires the systemic integration of mobile applications and online platforms into students' independent work.

Thus, a contradiction arises between the industry's objective need for highly qualified personnel with developed terminological competence and the insufficient methodological development of comprehensive strategies for fostering it.

In this context, there is an emerging need for a scientifically grounded new methodological model that would organically integrate cognitive, derivational, and digital trajectories of professional language acquisition.

Analysis of recent research and publications. The issue of developing foreign-language professional communicative competence among future technical specialists is constantly at the center of attention for many domestic and foreign researchers.

The fundamental theoretical and methodological principles of teaching English for Specific Purposes (ESP) were established in the works of such renowned scholars as T. Hutchinson, A. Waters, O. Tarnopolsky, and S. Nikolaieva. The systemic organization of domain-specific term systems and the functional characteristics of technical discourse

have been studied in depth within the fields of cognitive linguistics and terminology studies. Modern linguists have made significant contributions to the study of the cognitive mechanisms involved in acquiring foreign-language vocabulary and derivational processes in specialized language, substantiating the importance of morphemic-structural analysis for understanding the semantics of complex nominative units. In parallel, the work of proponents of the frame-based approach has demonstrated the effectiveness of modeling knowledge as conceptual networks for structuring abstract technical concepts. At the same time, the rapid development of information technologies has spurred numerous studies focused on the digitalization of the linguodidactic process.

Research by both foreign and Ukrainian authors confirms the significant potential of using mobile applications, microlearning platforms, and spaced repetition systems to intensify students' independent study. However, despite substantial developments in each of these areas, the integration of cognitive, derivational, and digital components into a cohesive methodological system for learning technical terminology remains fragmentary.

Most existing publications focus on specific aspects of instruction without offering a comprehensive, step-by-step process for transforming students' passive terminological knowledge into active communicative competence. Thus, the lack of comprehensive methodological studies integrating the cognitive-structural analysis of terminology with modern mobile technologies in the training of technical students underscores the rationale for our research.

Research objective. The objective of the study is to provide a scientific rationale for and develop a holistic strategic approach to optimizing the process of learning English professional terminology for students of technical specialties, based on the integration of cognitive, derivational, and digital learning technologies.

To achieve the stated goal, the following tasks are to be addressed: analyzing the theoretical and methodological foundations and the linguodidactic potential of integrating modern teaching strategies into the educational process of technical higher education institutions; to substantiate the essence and application algorithm of the cognitive frame modeling method for the logical structuring and categorization of English-language domain-specific term systems; to determine the didactic potential of the morphemic-compositional analysis of complex engineering lexemes as a derivational tool for the independent decoding of terminology; to outline the methodological conditions for the effective implementation of digital spaced-repetition technologies via mobile applications to ensure the reliable consolidation of professional vocabulary in long-term memory; to identify a set of pedagogical conditions and quasi-professional tasks that facilitate the successful transformation of learners' passive terminological minimum into active communicative competence.

Subject of research: a set of methodological strategies (cognitive, derivational, digital) and pedagogical conditions that optimize the process of mastering English professional terminology for students of technical specialties.

The object of the study is the process of professionally oriented foreign language training (ESP training) for higher education students in technical fields at higher education institutions.

The **research material** consists of authentic English-language technical texts, industry documentation, international engineering standards, as well as specialized scientific publications and English for Specific Purposes (ESP) teaching materials for technical disciplines.

Research methodology and methods. The methodological basis of the study comprises a systems approach to organizing the educational process in higher education, the fundamental principles of cognitive linguistics and terminology studies, the concept of contextual learning, and the linguodidactic principles of teaching foreign languages for professional purposes (ESP).

To address the set tasks and achieve the research objective, a complex of scientific methods was employed: theoretical methods – specifically comparative and systems-analysis approaches – were used to analyze psychological-pedagogical, linguistic, and methodological literature in order to determine the linguodidactic potential of modern teaching strategies; the modeling method – to construct a structural-logical scheme of the frame-based organization of domain-specific term systems; abstraction, generalization, and systematization – to provide a theoretical and methodological rationale for the pedagogical conditions fostering the activation of a professional thesaurus; linguistic methods: the cognitive-frame analysis method – to structure technical knowledge through a system of target slots and sub-slots; morphemic-compositional and derivational analysis – to investigate the internal structure of complex technical lexical units and develop algorithms for their independent decoding; empirical and applied: methods for studying and synthesizing the pedagogical experience of ESP instructors – to evaluate the effectiveness of implementing spaced repetition system (SRS) mobile applications and to analyze the impact of using quasi-professional tasks in both independent study and classroom activities for higher education students.

Presentation of the research findings. Optimizing the process of mastering English technical terminology for students in technical fields requires the use of cognitive strategies focused on the deep mental structuring of knowledge, rather than the rote memorization of linguistic units. Central to this context is the method of frame modeling, which

enables the representation of a domain-specific terminological system as a dynamic network of concepts reflecting real-world industrial or scientific situations [5]. In essence, a frame is an abstract cognitive knowledge structure composed of logical gaps or cells – slots – each of which captures a specific attribute, function, component, or operational stage of a technical object [11].

In the process of foreign language training for future technical specialists, the use of such models helps move away from the linear study of isolated words toward a systemic understanding of technical discourse. For instance, when studying a specific topic, the instructor models a basic frame in which the slots represent "components," "operating principle," "technical specifications," and "typical malfunctions" [4; 11]. Students independently fill these slots with the corresponding English terms, establishing cause-and-effect and hierarchical relationships between the concepts. This approach activates cognitive mechanisms for the classification, generalization, and semantic mapping of information, thereby significantly facilitating the conceptualization of complex abstract material [5]. Furthermore, the frame-based organization of vocabulary fosters the creation of strong associative links between new foreign-language terms and the students' existing professional knowledge in their fields of study [11].

An important didactic advantage of this method is its predictive potential, as an individual trained using this approach is capable of independently anticipating the emergence and significance of new thermoelements within a familiar cognitive scenario. Through the visualization and logical categorization of technical concepts, frame modeling eliminates the issue of knowledge fragmentation and establishes a robust cognitive foundation for the subsequent analysis of the internal structure of words.

At the same time, the frame structure serves as a linguistic scaffold: terms organized within slots are easily transformed into ready-made syntactic constructions when formulating a monologue or engaging in a technical dialogue. In this way, the passive accumulation of a core set of terms evolves into a conscious command of the tools required for professional thinking in a foreign language.

Mastering frame matrices not only enhances retention but also fosters the flexibility of analytical thinking – a skill critical for future teamwork on international projects. Thus, the integration of cognitive strategies establishes a solid conceptual foundation for the learning process, preparing students for a more in-depth linguistic analysis of the material.

Ultimately, the frame serves as the primary didactic matrix that organizes the chaotic flow of technical terms into a clear, logical system. Further optimization of this model entails a shift from the macro-structure of knowledge to the micro-analysis of individual linguistic units – a process directly implemented through derivational learning strategies.

The next strategic step in the proposed methodology is the implementation of a derivational component based on the morphemic-compositional analysis of complex technical lexical units [9]. Technical terminology is characterized by a high degree of standardization and regularity in word formation, making it an ideal subject for morphological modeling [12].

Rather than relying on the linear memorization of long, individual words, the linguodidactic potential of derivational analysis encourages higher education students to break down complex terms into their constituent parts: prefixes, roots, suffixes, and interfixes. Mastering a limited number of Latin and Greek word-formation elements (such as sub-, inter-, trans-, -ation, -itis, -ity) enables students to independently decode the meaning of thousands of new terms without recourse to translation dictionaries [9; 12]. Morphemic-compositional analysis fosters a sense of "linguistic alertness" in future engineers, enabling the word's structure to reveal its functional role within a technical text. For instance, identifying the suffix -ity clearly points to a process (derived from a verb), whereas -ability signals an object's property or capacity to withstand specific loads.

This approach is indispensable when dealing with complex multi-component noun clusters characteristic of English-language technical discourse. Understanding the hierarchy of component relationships in a phrase such as "high-voltage power supply cable design" helps prevent errors in interpreting technical documentation. Thus, the derivational strategy acts as a catalyst for linguistic thinking, transforming the mechanical accumulation of terms into the conscious construction of linguistic knowledge.

However, the successful cognitive and derivational systematization of learning material requires appropriate technological tools to reliably consolidate vocabulary in long-term memory, which highlights the importance of digital learning strategies. The modern information and educational environment offers extensive opportunities to intensify students' independent work through the integration of specialized mobile applications [2; 7]. Digital spaced repetition tools (SRS) – such as those implemented on platforms like Quizlet or Anki – demonstrate the greatest didactic effectiveness for mastering a specialized thesaurus [7]. The methodological approach to using these applications involves creating personalized and collaborative digital flashcard decks, where each item includes not only the isolated translation of a term but also its frame context, audio support, and a schematic visualization [10].

The use of SRS algorithms allows for the adaptation of vocabulary review schedules to each student's individual cognitive characteristics, maximizing retention efficiency while minimizing time investment. Digital strategies effectively address the issue of rapid foreign language skill decay during periods between study sessions by providing regular, flexible, 24/7 access to learning content.

Furthermore, gamifying the knowledge assessment process in mobile applications lowers the psychological barrier associated with foreign-language texts and boosts the intrinsic motivation of technical students, for whom digital interfaces represent a natural environment for interaction. Automated progress monitoring enables instructors to promptly adjust learning paths and timely identify gaps in the mastery of terminology.

The final and critically important stage of the proposed methodology involves identifying the pedagogical conditions that ensure the successful transformation of learners' passive terminological repertoire into active verbal communication [6; 8]. A theoretical and methodological analysis of existing practice demonstrates that mere familiarity with digital flashcards or knowledge of word-formation affixes does not guarantee fluent language use in professional discourse.

To effectively transition vocabulary into active use, learning must take place exclusively through the resolution of quasi-professional tasks that simulate future industrial or research activities [8]. The educational process should be rich in situational simulations, with a special role played by "Tech Talks"-style mini-presentations, where students defend their technical solutions, describe charts, and analyze equipment specifications in English.

An important prerequisite is the implementation of teamwork elements based on the Scrum methodology, where brief daily meetings ("Daily Standups") are conducted in a foreign language, compelling students to use professional terminology spontaneously and appropriately. Instructional materials must be based exclusively on authentic sources – such as datasheets, patents, ISO standards, and current scientific publications – thereby avoiding an artificial language environment [1; 3].

The systemic integration of cognitive structuring, derivational analysis, and digital interval-based vocabulary reinforcement within the framework of quasi-professional activity creates a synergistic effect, significantly enhancing foreign language proficiency for professional purposes. This confirms the advisability of abandoning outdated linear, reproductive methods in favor of comprehensive strategic models for foreign language training in technical higher education institutions [1; 8].

Conclusions.

The article provides a scientifically grounded, comprehensive strategic approach to optimizing the process of learning English professional terminology, based on the synergy of cognitive, derivational, and digital learning technologies. The application of the frame modeling method, combined with morphemic-compositional analysis, enables the structuring of domain-specific vocabulary and equips students with algorithms for the independent decoding of complex technical terms.

The integration of digital strategies via spaced-repetition mobile apps successfully addresses the issue of rapid knowledge decay and ensures the reliable retention of professional terminology in long-term memory. A prerequisite for the effectiveness of the developed methodology is immersing learners in quasi-professional tasks, which directly transforms passive vocabulary into active communicative competence.

Prospects for further development in this area are linked to exploring the potential of integrating artificial intelligence to create personalized learning pathways for professionally oriented foreign languages at technical universities.

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