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**MODERN INFORMATION TECHNOLOGIES AS A TOOL FOR REDUCING UKRAINIAN INTERFERENCE
IN THE DEVELOPMENT OF INTONATIONAL AND STYLISTIC VARIABILITY
IN PRE-SERVICE ENGLISH TEACHERS' SPEECH**

Summary. The article analyses the potential of modern information technologies as an effective tool for developing foreign-language speech mechanisms in university professional training of pre-service English teachers. Particular attention is paid to the issue of intonational and stylistic phonetic interference. The article aims to theoretically substantiate and experimentally verify the effectiveness of modern information technologies as a tool for reducing Ukrainian interference in the formation of intonational and stylistic variability of English speech.

The research methods included quantitative methods (interpretation of experimental data obtained through expert assessment based on the IELTS Speaking Band Descriptors), qualitative methods, and modelling (used to interpret the educational effect and provide theoretical substantiation of the suggested model). To overcome interference and improve the phonetic portrait of pre-service English teachers, the authors systematized contemporary IT tools and suggested a model of the use of IT support tools in the course Practical Phonetics (English). The developed model provides for the step-by-step use of four groups of digital tools: (1) diagnostic resources for identifying individual accent characteristics of speech (The Accent Oracle); (2) mobile acoustic voice-analysis tools for visualizing and monitoring intonation contours in real time (Vocal Pitch Monitor, Voice Tools, Vox Tune, Nail the Pitch); (3) training online platforms based on the shadowing


technique for authentic imitation of intonational and stylistic patterns of native speakers (Shadowing.tech, Engnovate.com, Storynory); (4) AI pronunciation coaches for instant automated analysis and correction of speech at both segmental and suprasegmental levels (Lexi AI Accent Coach).


The experimental verification of the model demonstrated positive dynamics in the development of intonational and stylistic skills, and a gradual reduction in manifestations of Ukrainian phonetic interference. In order to improve the phonetic portrait of a pre-service English teacher, the application of the suggested model aimed at reducing intonational and stylistic interference in professional training is recommended.

It is concluded that the implementation of IT in teaching practical phonetics ensures multimodality, authenticity, and personalization of the learning process, promotes the development of professional phonetic competence of pre-service English teachers, and aligns with contemporary educational needs.

Keywords: Ukrainian interference; intonational and stylistic variability; English phonetics; speech stylistics; modern information technologies; AI pronunciation coaches; acoustic voice-analysis software.


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**ESP FOR SUSTAINABLE DEVELOPMENT: A FOREIGN LANGUAGE COURSE
FOR CIVIL ENGINEERING STUDENTS**

Introduction. The construction industry is a key source of greenhouse gas emissions, requiring specialists who can navigate international discourse on sustainable construction. This actualizes the integration of environmental topics into the teaching of English to students in technical specialties.

The purpose of this work is to develop methodological approaches for integrating content on eco-materials and "green" technologies into an English course for civil engineering students, based on the CLIL methodology.

Research methods. The research was conducted at the Department of Foreign Languages for

Engineering at Lviv Polytechnic National University with civil engineering students (2024–2025 academic year). We used the "4-C" model (content, communication, cognition, culture), the case method in the format of project learning, and authentic materials from the resources ArchDaily, RIBA, and World Green Building Council. The effectiveness was checked through pre- and post-tests, peer evaluation, and questionnaires.

Main results of the study. The practical case study "Hempcrete vs. Concrete" demonstrated an expansion of students' active professional vocabulary. The frequency of use of eco-engineering

vocabulary in contextually correct argumentative constructions has significantly increased. Students demonstrated a transition from the reproductive level to the productive level: independent formulation of substantiated engineering conclusions using academic discourse.

Scientific novelty. For the first time, the CLIL-integrated methodology for integrating sustainable development content into the ESP course for construction specialties has been systematically substantiated, ensuring the simultaneous development of foreign language competence and environmental awareness among future engineers. Conclusions and suggestions. It has been proven that integrating "green" technologies into a language course increases students' motivation and contributes to the development of a relevant international thesaurus.

Prospects include creating a specialized English-Ukrainian glossary of "green" construction and developing digital simulations to assess the environmental impact of architectural objects within the language course.

Keywords: CLIL; sustainable development; eco-materials; ESP; foreign language for specific purposes.

Introduction. The modern world is facing unprecedented environmental challenges that require a radical transformation of all sectors of the economy, including the construction industry. The latter is responsible for a significant part of global greenhouse gas emissions, energy consumption, and the use of natural resources. This makes it one of the key areas for implementing the principles of sustainable development. In this context, there is a growing need for competent specialists who can navigate the international discourse on "green" construction and communicate effectively in English, the language of the global professional community.

The integration of environmental topics into foreign language instruction for civil engineering students offers opportunities to achieve a dual goal. It includes both the development of foreign-language communicative competence and the cultivation of environmental awareness among future engineers. The traditional approach to teaching professionally oriented English is often limited to technical terminology and standard communicative situations, failing to account for current industry trends. At the same time, modern construction students should study innovative eco-materials, such as recycled concrete, biocomposites, "green" roofs, as well as energy-efficient design technologies, LEED and BREEAM certification, passive construction, and the circular economy.

The aim of this study is to develop and substantiate methodological approaches for integrating content on eco-materials and "green" technologies into an English-language

course for civil engineering students. The study is based on the principles of Content-Language Integrated Learning (CLIL), which allow for the simultaneous development of language skills and the deepening of knowledge in a professional discipline, making the learning process more motivating and practically oriented.

Analysis of the latest research and publications. The theoretical basis of our study was the work on the CLIL methodology, in particular the work of Do Coyle, Philip Hood and David Marsh (Coyle, Hood, Marsh, 2018), which demonstrates that learning a language through relevant professional content significantly increases students' cognitive engagement.

Ukrainian researchers (for example, the Department of Foreign Languages for Engineering at the Lviv Polytechnic National University) emphasize that traditional textbooks on technical English often focus on outdated construction methods, while ignoring innovative materials such as *hempcrete* (*fireclay concrete*) or *recycled steel*. This creates a terminological gap between academic knowledge and the real requirements of the labor market, where *LEED* and *BREEAM* standards dominate.

S. Nikiforchuk and A. Hryhorieva differentiate CLIL from other methods. They argue that, according to this approach, a foreign language is a tool for studying professional subjects, so it should be integrated into a broader professional context. This method helps boost students' motivation, thereby enhancing the quality of education. It mainly emphasizes a communicative approach over grammar; therefore, the focus is on learning professional vocabulary (Nikiforchuk, Hryhorieva, 2021).

O. Vovk explores basic learning strategies, including concept mapping. Special emphasis is placed on the gradual progression from basic interpersonal skills (BICS) to cognitive academic language proficiency (CALP) (Vovk, 2025). A. Shykun emphasizes the importance of an educational approach that integrates the teaching of content subjects with the learning of a foreign language (Shykun, 2023). Students become motivated as they understand the relevance of the subject; they learn how to use the language in this context. So, students will show higher motivation to learn English when the content concerns solving environmental problems and creating "Smart Cities", as this shapes their image as socially responsible professionals.

An analysis of recent publications in the *Journal of Cleaner Production* shows that the most effective means of teaching eco-technologies is the analysis of real objects (Case Studies). The use of interactive

platforms and virtual tours of “green” buildings allows students to see the practical application of terminology in the context of energy efficiency.

Methodology. To achieve the research goal, a comprehensive scientific and pedagogical approach was applied. It is based on integrating professional content on sustainable construction into the process of learning a foreign language. The research was conducted by teachers of the Department of Foreign Languages for Engineering at Lviv Polytechnic National University. The classes were held with students of the specialty “civil engineering” during the 2024–2025 academic year. The research covered four main stages.

The first stage was a critical analysis of existing English-language curricula for civil engineers for compliance with modern sustainable development standards and current industry needs. Based on an analysis of the resources of the *World Green Building Council*, *RIBA* (Royal Institute of British Architects), and the *ArchDaily* platform, a corpus of authentic materials was formed, which included technical articles, design documentation of real green construction projects, video presentations of innovative technologies, and cases of successful environmental projects. The main criteria for selecting materials were the following: up-to-date terminology in the field of energy efficiency, decarbonization, and eco-materials; authenticity and compliance with real professional communication situations; the ability to adapt to different levels of students' language training (B1-B2 according to the Common European Recommendations); potential for the development of critical thinking and interdisciplinary connections. Using materials from *ArchDaily* proved particularly valuable, as it allowed students to work with real architectural descriptions of modern eco-projects and analyze technical solutions in English.

The teaching methodology was based on the principles of Content and Language Integrated Learning using the “4-C” model (content, communication, cognition, and culture). This ensures the comprehensive development of professional and language competencies.

Content: in-depth study of the specifics of modern eco-materials, including cross-laminated timber, recycled aggregates, hempcrete, mycelium-based materials, as well as the principles of their application in construction. Students were introduced to the technical characteristics of materials, methods for assessing their environmental impact (life-cycle assessment), and international standards.

Communication: formation of professional communication skills in English through discussions on environmental certifications (comparison of *LEED* and *BREEAM* systems), presentations of technical solutions, writing technical reports, and project proposals. Special attention was paid to the development of academic writing and oral presentation skills.

Cognition: stimulating critical thinking through analysis of the environmental impact of various stages of construction, comparison of alternative technological solutions, assessment of the economic feasibility of implementing “green” technologies, and solving complex interdisciplinary problems.

Culture: familiarization with the global ethics of sustainable construction, international environmental protocols, and the formation of a responsible professional outlook of future engineers.

The main tool for practical testing of the methodology was the case study method in a project-based learning format. Students worked on a comprehensive project, “Eco-Renovation”, where the task was to develop and present in English a plan for the modernization of an existing building using the principles of “green” construction. The project included several stages: an audit of the existing building for energy efficiency; research and selection of appropriate eco-materials; development of technical solutions; economic justification; preparation of technical documentation in English; and a final presentation. The presentation was planned to last 7–10 minutes and include visual aids, such as slides with drawings, diagrams, and photographs. Students worked in groups of four, with each participant responsible for a different part of the project. During preparation, they actively used English technical resources, consulted the teacher about professional terminology, and practiced pronouncing complex terms. During the presentations, the students confidently discussed concepts such as thermal insulation, green roof systems, solar energy integration, passive house standards, carbon footprint reduction, and retrofitting techniques. The project work proved to be an effective way of combining language skills and professional knowledge. Students learned not only to communicate effectively in English in a professional setting but also to think critically, argue technical solutions, and collaborate as a team.

The effectiveness of the proposed methodology was assessed using quantitative and qualitative methods. Thus, we conducted pre- and post-tests. We tested both at the beginning and end of the course to determine

the level of mastery of the professional thesaurus in sustainable construction, the understanding of technical texts, and the ability to use specialized terminology in context.

Another method involved peer assessment. Students assessed project presentations using the developed criteria. They included linguistic accuracy (correct use of terminology and grammatical correctness), the engineering validity of the technical solutions, the logical structure of the presentation, and the persuasiveness of the argument. We also conducted questionnaires and surveys. This helped collect data on students' motivation to study English through the prism of environmental responsibility, assess the usefulness of integrating environmental topics for future professional activities, and identify learning difficulties.

Such a multi-component methodology verified the effectiveness of integrating sustainable construction content into the English language course. It also provided a comprehensive understanding of the impact of this approach on the development of professional and language competencies among civil engineering students.

Results and discussion. The implementation of the module “English for Sustainable Construction” demonstrated significant potential to transform the process of learning a foreign language from mechanical assimilation of grammatical structures and vocabulary to a functional tool for solving practical engineering problems. The integration of authentic professional content with an environmental focus enabled the achievement of two goals: increasing English proficiency and deepening understanding of the principles of sustainable development in the construction industry.

Results of the implementation of the practical case. The main element of testing the developed methodology was the practical case study “Comparative analysis of traditional and biomaterials: Hempcrete vs. Concrete”. It required students to apply language and professional competencies comprehensively. Students worked with technical specifications, scientific publications, and project documentation. This involved not only translating and understanding texts but also conducting thorough analyses of the physico-chemical properties of materials, their operational characteristics, and their environmental impact. Analysis of students' speech revealed a significant expansion of active professional vocabulary. Students successfully integrated highly specialized terms (e.g., carbon sequestration, thermal mass, breathability of materials, and embodied carbon) into their oral and written speech.

A comparative analysis of final project presentations with students' initial oral responses showed that the frequency of use of eco-engineering vocabulary increased significantly over the semester. Moreover, students demonstrated not only the mechanical reproduction of terms but also their contextually correct use in complex argumentative constructions. This indicates a transition from receptive mastery of terminology (reading comprehension) to productive (active use in speech and writing).

The biggest cognitive challenge for students was the aspect of Life Cycle Assessment (LCA) – the assessment of the life cycle of building materials. This component of the case required an understanding of technical parameters and also the ability to perform systematic analysis and predict long-term consequences. Students had to argue in English the economic feasibility of using materials with a higher initial cost (e.g., *hempcrete*) through the prism of long-term benefits. Those benefits involved reduced energy consumption during operation, CO₂ deposition, durability, and recyclability. Analysis of students' arguments showed the development of the ability to make multi-factor comparisons and to engage in critical evaluation. Students learned to consider the technical characteristics (strength, thermal insulation, moisture resistance), environmental (carbon footprint, toxicity, renewable raw materials), economic (life-cycle cost, market availability), and social (impact on residents' health, job creation) aspects of choosing building materials.

Using the “Pitch-deck” simulation (i.e., a presentation for a potential investor of an ecological construction project) allowed for the development of specific language structures for comparison, contrast, and convincing argumentation. This format also encouraged students to adopt a professional tone and structure their ideas clearly for a non-specialist audience. Students mastered rhetorical techniques of professional communication, such as opposition with emphasis on advantages (*unlike... which..., the proposed solution...*), quantitative justification (e.g., *reducing energy consumption by up to 40%*), and appealing to global trends (e.g., *in line with the EU's carbon neutrality goals*).

A typical example of student argumentation demonstrates a high level of integration of professional content and language tools: “*Unlike traditional concrete, which is a significant source of CO₂ emissions accounting for approximately 8% of global carbon output, hempcrete acts as a carbon sink. It sequesters more carbon dioxide during hemp plant growth than it emits during production and installation. This results in a net negative carbon footprint*”.

Such a complex syntactic construction with built-in clarifications, quantitative data,

and cause-and-effect relationships indicates a transition from a reproductive level of language proficiency (retelling a text) to a productive one. The latter deals with formulating one's own well-founded engineering opinion using appropriate academic and professional discourse. The analysis of the presentations also revealed students' successful use of discursive markers of academic style (e.g., furthermore, consequently, in contrast, it should be noted that), an important indicator of professional communication skills in English.

There is an example of another Case Study lesson. Students were assigned the task of analyzing one of the most famous modern buildings in the world – *the Edge* office building in Amsterdam, which is considered the greenest office building. First, students had to study authentic English-language texts about the Edge independently. They were supposed to browse the internet, find articles from architectural magazines, and review technical descriptions from official websites. Second, each student had to prepare an oral report in English on the following points: the building's general characteristics, structural solutions, materials used, energy-efficient technologies, and the building's role in sustainable development. Third, the students participated in a group discussion, asked each other questions, and debated their own positions on the innovative solutions used in the building. Students worked in small groups of three or four. Initially, they worked on the terminology together, then divided the analysis among themselves. During the presentations, it was evident that the students actively used professional vocabulary, aimed to build logical arguments, and correctly employed grammatical constructions of the passive voice, typical of technical texts. Throughout the activity, students mastered professional terms such as *sustainable design*, *energy-efficient building*, *smart technology integration*, *photovoltaic panels*, *rainwater harvesting system*, *structural glazing*, and *load-bearing core*. This Case Study lesson was productive, as students learned new vocabulary. They also applied it in a real professional context, which significantly increased their motivation to study English for their field.

Discussion. The results of the study confirm the fundamental hypothesis that using relevant professional content on “green” technologies as the basis for the ESP course effectively addresses students of technical specialties' low motivation to learn a foreign language. Civil engineering students begin to perceive English not as an abstract general education discipline, but as a practical tool for accessing advanced knowledge, innovative technologies, and international professional discourse.

This approach is consistent with the theory of authentic learning, which emphasizes

contextualizing the educational process through real professional tasks. Students find themselves in a situation where language skills help to solve practical engineering problems. This motivates them for their own development. Furthermore, when learning feels purposeful and professionally relevant, students show greater engagement and better long-term retention of both linguistic and technical skills knowledge.

The integration of environmental topics also contributes to the formation of a broader professional identity of future engineers. Students are aware of their role as technical performers and as agents of positive environmental and social change. This is consistent with the concept of Education for Sustainable Development, which emphasizes the need to transform educational practices to prepare specialists capable of responding to the challenges of the 21st century.

Despite the generally positive results, the research process revealed certain difficulties and limitations of the proposed approach. Firstly, it includes linguistic complexity. Authentic materials, such as technical descriptions of LEED and BREEAM standards, international sustainability reports, and scientific publications, often contain complex syntactic structures and specific terminology. They exceed the B1-B1+ level of most students at the initial stage of learning. This requires additional pedagogical adaptation of the materials. The teachers must create glossaries, simplify some fragments, and develop scaffolding activities to gradually master complex content.

Secondly, there is an interdisciplinary barrier. The successful implementation of the CLIL methodology requires that English teachers have basic knowledge of sustainable construction. Obviously, this does not align with traditional philological training. The teacher must be aware of the technical aspects of various eco-materials and understand the principles of energy-efficient design. The teacher must also be familiar with international certification systems to ensure proper moderation of discussions and to provide feedback on the content component of student work. This requires additional professional development of teachers and possible cooperation with lecturers from specialized departments. Thirdly, there is a problem of resource provision. Access to up-to-date, authentic materials and specialized databases requires additional technical resources.

Finally, there is a problem of level differentiation. Students have different levels of initial language training in the group. So, this can complicate the selection of materials and tasks. It becomes necessary to develop differentiated tasks. Despite these challenges, the study's results convincingly indicate that integrating sustainable development content into the ESP course for civil engineering students

creates pedagogical interaction between professional training and the development of foreign language communicative competence. Such an approach enhances language learning and prepares future engineers for work in the context of a global “green” transition, where proficiency in English and understanding the principles of sustainable development are becoming key professional competencies.

Conclusions. Integrating the concept of sustainable development into the ESP course for future civil engineers is essential to their professional competitiveness. The study of “green” technologies allows students to master a relevant international thesaurus that goes beyond the boundaries of traditional ESP textbooks. The application of the CLIL methodology and case study demonstrated an increase in students' lexical competence. This confirms the hypothesis that professionally relevant content is a powerful incentive for overcoming the language barrier. The study proved that Project-Based Learning contributes to the development of both language and critical thinking skills. Students learn to argue for the environmental feasibility of different projects. And this is important to meet LEED and BREEAM standards. Prospects for further exploration include creating a specialized English-Ukrainian glossary of “green” construction and developing digital simulations to assess the environmental impact of architectural objects within an ESP course.

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ВІЛЬХОВЧЕНКО Надія

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АНГЛІЙСЬКА МОВА ДЛЯ СТАЛОГО РОЗВИТКУ: КУРС ІНОЗЕМНИХ МОВ ДЛЯ СТУДЕНТІВ-БУДІВЕЛЬНИКІВ

Анотація. Вступ. Оскільки будівельна галузь є одним із джерел забруднення довкілля, існує необхідність підготовки фахівців, здатних орієнтуватися в міжнародному дискурсі сталого будівництва. Це актуалізує інтеграцію екологічної тематики у викладання англійської мови для студентів технічних спеціальностей.

Мета цієї роботи – розробити та обґрунтувати методологічні підходи до інтеграції контенту про екоматеріали й «зелені» технології в курс англійської мови для студентів-будівельників на засадах методики CLIL.

Методи дослідження. Дослідження проводили на кафедрі іноземних мов технічного спрямування Національного університету «Львівська політехніка» зі студентами будівельних спеціальностей (2024–2025 н.р.). Застосовано модель «4-С» (зміст, комунікація, пізнання, культура), метод кейсів у форматі проєктного навчання, автентичні матеріали ресурсів ArchDaily, RIBA та World Green Building Council. Ефективність перевіряли через пре- і пост-тести, взаємочинювання та анкетування.

Основні результати дослідження. Практичний кейс «Нетррекре vs. Concrete» дозволив розширити активний фаховий словник студентів. Значно зросла частота вживання екоінженерної лексики (carbon

sequestration, embodied carbon, life-cycle assessment) у контекстуально коректних аргументативних конструкціях. Студенти переходили від репродуктивного рівня до продуктивного: самостійно формулювали обґрунтовані інженерні висновки із використанням академічного дискурсу.

Наукова новизна. Вперше системно обґрунтовано методикою CLIL-інтеграції контенту про сталий розвиток у курс ESP для будівельних спеціальностей, що забезпечує одночасний розвиток іноземної компетентності та екологічної свідомості майбутніх інженерів.

Висновки. Доведено, що інтеграція «зелених» технологій у курс вивчення іноземної мови підвищує мотивацію студентів і формує релевантний міжнародний тезаурус.

Перспективи включають створення спеціалізованого англо-українського глосарію «зеленого» будівництва та розробку цифрових симуляцій для оцінки екологічного впливу архітектурних об'єктів у межах мовного курсу.

Ключові слова: CLIL; сталий розвиток; екоматеріали; ESP; іноземна мова за професійним спрямуванням.

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