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ИНОСТРАННЫЙ ЯЗЫК КАК ИНСТРУМЕНТ КОГНИТИВНОГО РАЗВИТИЯ СТУДЕНТОВ ИНЖЕНЕРНЫХ СПЕЦИАЛЬНОСТЕЙ

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Аннотация. Деятельность инженера во все времена была достаточно сложной, однако в последнее время уровень сложности увеличивается быстрыми темпами вследствие множественности вариантов выбора операций, большого объема обрабатываемых данных и многочисленных связей между техносферой и обществом. Поэтому для инженеров крайне важно приобретать навыки рефлексивно-регулятивной практики. По мнению автора, процесс приобретения современными студентами необходимых навыков и качеств затруднен четырьмя основными проблемами, характерными для системы образования. К ним относятся информационная перегрузка; применение образовательных стратегий, основанных на принципе «делай, как я», шаблонных и стереотипных учебных действиях; низкое качество профессиональной письменной и устной коммуникации студентов; недостаточно развитые эмоциональный интеллект и волевые качества личности студентов инженерных специальностей. При этом иностранный язык как учебный предмет в техническом университете редко рассматривается как способ преодоления этих трудностей. Преподаватели иностранного языка делают акцент на обучении общению в рамках основных типов и регистров иноязычной речи, но, как правило, уделяют мало внимания «инженерному регистру» или содержанию речи. С другой стороны, студенты инженерных специальностей часто рассматривают изучение иностранного языка как бессмысленную трату времени, потому что, во-первых, они не видят личностной пользы и, во-вторых, не верят, что смогут хорошо овладеть языком. Эти причины неуспеха взаимосвязаны, поскольку низкая мотивация является сильнейшим препятствием для освоения языка. Авторская позиция состоит в том, что вследствие тесной связи мышления и речи, коммуникативных и познавательных процессов, изучение иностранного языка имеет огромный потенциал для когнитивного развития личности. В статье предложен взгляд на элементы методики, которые могут способствовать когнитивному развитию студентов инженерных специальностей на занятиях по иностранному языку.

Ключевые слова: СТУДЕНТЫ ИНЖЕНЕРНЫХ СПЕЦИАЛЬНОСТЕЙ, КОГНИТИВНОЕ РАЗВИТИЕ, РЕФЛЕКСИЯ, ИНОСТРАННЫЙ ЯЗЫК, ПРОБЛЕМАТИЗАЦИЯ, ЭМОЦИОНАЛЬНЫЙ ИНТЕЛЛЕКТ, АКТИВНОЕ ОБУЧЕНИЕ

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FOREIGN LANGUAGE AS A TOOL FOR ENGINEERING STUDENTS' COGNITIVE DEVELOPMENT

Abstract: Engineering has always been challenging, but because of numerous operational options, big amount of data processed, and the numerous links between the technology and society, it is getting even more complex today. Thus, it's crucial for engineers to acquire aspects of reflective practice. The author believes that the following four major issues prevent today's engineering students from obtaining necessary skills and attributes. These include information overload; «do as I do»-based teaching strategies, pattern-based and stereotypical learning activities; low levels of professional writing and oral communication among students; and low emotional intelligence and volitional personality traits among engineering students. A foreign language, as a discipline at technical university, is rarely seen as a way to overcome these difficulties. Foreign language teachers emphasize teaching communication within the basic types and registers of language, but they often give little attention to the «engineering register» of language, or the content of speech. On the other hand, engineering students often view learning a foreign language as a pointless waste of time because, firstly, they don't see any personal advantage and, secondly, they don't believe they can become good at languages. As a result of poor motivation, the second reason comes after the first. But given the strong relationships and inseparability of thought and speech, communication and cognitive processes, the author believes that learning a foreign language has enormous potential for personal development. This article suggests certain elements of pedagogy, which can promote engineering students' cognitive development in foreign language classes.
Keywords: ENGINEERING STUDENTS, COGNITIVE DEVELOPMENT, REFLECTION, FOREIGN LANGUAGE, PROBLEMATIZATION, EMOTIONAL INTELLIGENCE, ACTIVE LEARNING

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Introduction. Classical engineering education has been well established throughout the world and shown strong conservatism. This was true prior to significant shifts in the ways that globalization, information, and communication influenced performing job tasks. The engineering profession has experienced substantial transformation in the 21st century, which has led to the creation of new challenges for the engineering education system. The above processes as well as growing social responsibilities of engineering should be considered when developing vocational education programs.

The educational system gains a new focus as critical thinking, creativity, reflective thinking, and general cognitive abilities become just as important as hard skills. According to A. Rugarsia et al., engineering curricula are unable to keep up with the rapid increase in the volume of information that engineers are expected to know [1].The suggested remedy is for engineering education to place more emphasis on knowledge integration and the development of critical skills necessary to apply it appropriately, rather than on the straightforward presentation of information. As learners' active roles become more important, cognitive engagement is cited as a crucial component of an educational experience [2]. To increase cognitive curiosity, engagement, and awareness students need to switch from formal data collecting to the meaningful cognitive processing. K. Rao et al. note that the expectations of industry, academic and faculty are shared by students themselves: «current expectations of engineering students are not only that they have the ability to learn, to achieve and to create but also to have the ability to be self-starters, critical and creative thinkers» [3].

Creative and critical thinking are in dialectical interactions in the engineering practice: the need and possibility of creating something new - and exploring the existing; going beyond the established limits - and applying existing approved rules; expanding the range of phenomena - and focusing on something specific. Our position is that personal reflection, as the fundamental mechanism of self-organization of an individual activity, can facilitate critical and creative thinking of university students. Critical thinking can be considered as a reflection of a personal reasoning process [3; 4; 5; 6]. Noting the growing role and importance of reflective technologies in the higher sector, A. Sharov treats the ontological definition of a reflection in the context of the effective self-regulation of the student activities aimed at acquiring professional experience [6].

The trends noted above begin to influence the content, forms and methods of engineering pedagogy at technical universities. A new holistic paradigm of vocational education, as well as the concept of the convergence of hard skills and soft skills, profession and humanity, provide reasons to wonder whether foreign language learning can play a role in enhancing students' cognitive development and creative thinking.

Of course, the primary goal of foreign language learning is to master communication. But, aside from that, can learning a foreign language have a noticeable positive impact on all components of the cognitive apparatus? What are the underlying causes of this in today's educational environment, and how should the educational process be structured? In the sections that follow, we will attempt to answer these questions, at least partially.

Method. Traditionally, a foreign language course at a Russian technical university (usually English) is divided into General English and so-called Business English. General English follows the school course of a foreign language; thematically, educational discourse is usually located within the cultural, sociological and sometimes psychological aspects of speech. The shift to a Business English matches an evolution in students' motivations, from educational to professional. According to our observations, this transformation begins to take place most actively near the end of the first year of study. A foreign language now has the opportunity to be used as a tool for gaining professional knowledge and developing skills relevant to performing job duties, which include different types and modes of communication.

Figure 1 shows how high the expectations are for learning a foreign language in terms of professional and personal growth. Second-year students at Izhevsk State Technical University were asked which goals of studying a foreign language at university are most important to them [7].

Thus, the industry's urgent need for personal cognitive development, in which educators are also interested [2; 3; 4; 5], correlates with student expectations.

Engineering and language programs at a technical university serve a single mission – to provide students with a means of understanding the nature and world of technology, including objects, laws and processes. Thoughts and words are closely linked. The result of a person's mental activity, which reflects the world, is imprinted and realized in a linguistic sign, allowing language to express thoughts that reflect reality.

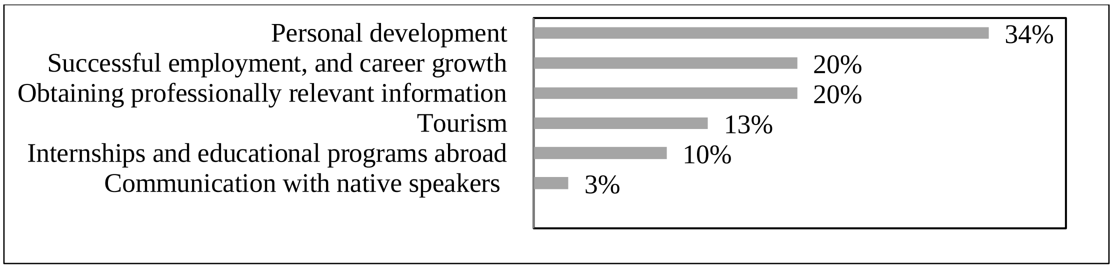

Fig. 1. What is the main goal for you to learn a foreign language at a university?
Рис. 1. В чем для Вас состоит главная цель изучения иностранного языка в университете?

The role of foreign language teaching as a cognitive development tool for engineering students will be understood if the most important problems of contemporary engineering education are revealed. The **problems** standing in the way of developing required engineering student abilities and qualities are: *the information overload problem; the educational strategies based on pattern-based and stereotypical learning actions resulting from the teachers' principle «do as I show you, do as I tell you»; inadequate proficiency of students' oral and written professional communication even in their native language; low emotional intelligence and volitional qualities of personality.* These issues are discussed further below.

Information Overload Problem (redundancy of information fields of academic disciplines). A. Olayinka and A. Chivirter claim that information overload among university and high school students is a serious problem in the 21st century, affecting cognitive development, academic performance, social behavior and health issues [8].

Students today have to acquire material (often with little personal significance) from a variety of sources that are not necessarily related to one another. The situation is aggravated as many students suffer from a short attention span; they have poorly formed processes for step-by-step work; information is presented in texts of various types and genres, as well as underdeveloped learning strategies and metacognition. The result of this is academic overload, demotivation to study, loss of educational priorities, goals, and targets.

Because a large amount of data can devalue it and produce low-quality information, the problem of information overload and redundancy is far more serious than it appears at first glance. L. Orman calls this an information paradox – drowning in information, starving for knowledge [9]. As a result, there is an increasing need for learning techniques and critical thinking techniques that can help students to digest information rationally and critically [10; 11].

Passive, pattern-based and stereotypical learning activities. The challenge of expanding the information fields of disciplines, combined with the trend of reducing contact classroom hours, can be fundamentally solved in two ways: the transition to modular problem-based learning or a very brief summary of only the basics of academic subjects. It has been proven that project learning and problem-based learning (PBL) help students acquire higher order learning skills [12; 13; 14; 15; 16]. Since PBL was originally utilized in medical education in the late 1960s, it has grown in popularity in K-12 and higher education settings worldwide [17]. An explanation may be that a central activity of engineering work is solving problems. S. Sheppard et al. claim that a distinguishing feature of the knowledge on which engineering work is based is that it is dynamic [18]. That is why an engineer's ability to comprehend, critique, synthesize and adjust to this new knowledge is essential to successful engineering.

However, in the 21st century, PBL has not significantly increased in popularity in engineering curricula because of the lengthy time required to solve complicated engineering issues and the challenges involved in evaluating effects on pupils [19]. Even the advantages of this method's broad use have received some criticism. According to J. Perrenet et al., PBL has drawbacks that render it less acceptable as a general technique for engineering education [17]. Additionally, considered methodological approaches, consistency in the didactic structure of study courses, appropriate study group occupancy, flexibility in curriculum, classroom equipment, and readiness and aptitude of instructors and students are required.

As a result, in practice students are frequently given a quick retelling of the textbook throughout the course of classroom studies, and the *«do as I do»* method is used. The names of homework assignments, such as *«a model calculation of…»* sometimes reflect how unoriginal they are. This type of educational exercise does not encourage independent thinking or inspire thought. Demotivation and stereotypical attitudes and behaviors follow as a result.

Low levels of Student Professional Communication (Written & Spoken). Nowadays, no one still holds the view that engineering consists solely of human-machine interaction and producing artifacts, for which wide-ranging multimodal communication is not required. Sheppard et al note that engineering practice is a social activity in which team workers collaborate to achieve a common goal; as a result, the work should include a variety of forms of communication, ranging from written to oral and formal to informal [18]. The complexity of communications between all parties in an engineering project grows along with the number of persons or groups participating. Thus, it becomes more crucial to keep everyone informed. Many experts believe that one of the most important non-technical ability required by contemporary industry standards is the capacity for effective and impressive communication [20; 21; 22; 23].

However, many researchers point out how poorly educated graduates are in communication. T. Ilyina claims that Russian industry representatives frequently complain about how young specialists are unprepared for teamwork, are unable to present themselves and the outcomes of their work in a professional setting [24]. Graduates are unable to construct phrases and sentences logically and correctly and are unable to effectively communicate their thoughts to others [24]. According to the recent academic survey conducted by I. Kakepoto et al. undergraduate engineering students struggle with communication because of a lack of vocabulary and confidence, a language barrier, hesitation, limited knowledge, stress, anxiety, inadequate listening skills, a fear of criticism, confusion, a lack of interest in the subject matter, poor judgment, depression, technical jargon, poor perception, and an overload of information [25]. Although engineering departments have worked hard to improve student communication skills, most industry managers believe that engineering graduates have poor communication skills. J. Donnel et al. identify the underlying causes of the apparent gap between academic and industrial communication requirements. According to the review, this disparity exists primarily because:

- *communication assignments that engineering students perform in college significantly differ from the writing situations (audiences, purposes & occasions) that are encountered in industry;*
- *new engineering graduates do not typically possess the expertise to realize what communication principles from classroom assignments apply or not in different professional situations;*
- *what constitutes effective communication in professional engineering settings may differ from what is taught or expected in classrooms* [26].

Undergraduate engineering students have low emotional intelligence and volition. Many objects of engineers' work exhibit complexity, interdisciplinary nature, instability and an increasing degree of subjectivity when describing their operation. Simultaneously, the scope of technology's impact on the environment and human society is expanding. Making decisions can occasionally be challenging for professionals. Particularly in view of how much responsibility engineers bear for job outcomes. Therefore, in order to engage in conscious and responsible professional activities, future professionals must have a fully developed emotional-volitional regulation [7]. The volitional qualities (self-control, perseverance, etc.), responsibility, conscientiousness, flexibility of behavior, emotional stability, readiness for lifelong learning, leadership qualities and some others are noted by T. Kovalenok, as being among the most desired personal characteristics of engineers [27]. These are generally covered by the well-known five-factor personality model (FFM). C. Soto and J. Jackson consider FFM as a set of five broad trait dimensions or domains: extraversion, agreeableness, conscientiousness, neuroticism (sometimes named by its polar opposite, emotional stability) and openness to experience (sometimes named intellect) [28].

Two elements of emotional intelligence (EI) are crucial for undergraduate engineering students. Firstly, according to EI theories, emotion understanding is a fundamental component of EI [29]. The recognition of the specific information that emotions exhibit, assessing the value of the information, and figuring out its ties and relations, are all within the control of emotional understanding. These are significant, implicit components of a decision-making process. Secondly, EI is linked to motivation, willpower, and academic performance because it predicts students' affective and cognitive involvement [30]. Unfortunately, a significant percentage of Russian engineering students, especially those from regional universities, have low emotional intelligence and strong-willed personality traits.

The list of issues that have a negative impact on achieving the intended educational results is not limited to the ones mentioned. However, we believe that foreign language teaching/learning can help to partially address issues, or at least lessen their intensity.

A foreign language, as a subject and part of the curriculum at a technical university, is rarely seen as a way to overcome the noted difficulties and problems. The development of communication is often the exclusive focus of foreign language teachers, who are frequently not tuned to analyzing engineering content of written and spoken texts. For their part, engineering students frequently see learning a foreign language as a dreary waste of time because they do not believe in their ability to master it well. Another reason is the consequence of weak motivation. The inseparability and close interrelation between thinking and speech, communication and cognition means foreign-language learning has a great developing potential. The following section will describe a few pedagogical principles that can take advantage of opportunities provided by teaching/learning foreign languages for engineering students' cognitive growth and creative thinking stimulation.

Results. We consider student cognitive development, critical thinking, and subject and foreign language awareness to be the foundation of holistic engineering study programs [31].

Learning a foreign language contributes objectively to cognitive development in areas such as focus and attention switching, memory improvement, mental flexibility, logical reasoning, and others. This can happen, because learning a foreign language involves memorizing novel vocabulary, grammatical rules, and norms. Along with participating in dialogue and polylogue, switching between speech perception and production is a necessary aspect of learning. The responsibility of the educator is to decide which method and content best supports engineering students' cognition, under the given circumstances.

A foreign language teacher has to be creative, given the present abundance of various educational and methodological materials available. The choice of a specific pedagogy is influenced by the psychological, intellectual, and communicative typological traits of students, their motivation for learning, as well as personal preferences and teacher readiness. Furthermore, it is dependent on organizational factors, such as the duration of study, its normative outcomes, accessibility of educational resources, and others.

However, there are key methodological elements to be considered if the pedagogy is developed to meet students' cognitive development. These elements are:

- **cognition via problematization** - as this strengthens connections between the basic mental processes (reasoning, concept generation, judgment & drawing conclusions) that make up one's intellectual apparatus;
- **active communication -** since speech and mind are closely related;
- **switching between communicative goals and content, academic tasks and professional issues -** because this flipping helps to develop motivations and acts as a kind of trigger for the waking of emotional intelligence.

We discuss the essential elements and how to incorporate them in English classes below.

Cognition via problematization. The repeating of examples and solutions are the main focus of engineering classes. The theory taught seems sophisticated, scholarly and challenging to grasp, with all of its twists. As a result, students fail to recognize differences between theory and application, concepts and examples. Instead of learning basic principles, students frequently memorize ways to solve particular problems. This method of instruction is also widely used in foreign language classes. A typical introductory English university course offers a number of exercises, including examination of vocabulary and grammar, reading and hearing comprehension. A more specific «Business English» course focuses on basic workplace needs. However, the latter is frequently just a collection of introductory materials on fundamental engineering topics presented as descriptive texts that do not require any analysis. Instructions on how to read and translate engineering or scientific texts are sometimes provided, as well as advice on formal presentation issues. These descriptive, pattern-based, and learning-by-example study, whether delivered in engineering or English classes, do little to foster student cognitive growth and critical thinking. These descriptive, pattern-based, and learning-by-example studies, whether delivered in engineering or English classes, do little to foster student cognitive growth and critical thinking.

A foreign language professional vocabulary contains a significant amount of engineering terminology. In turn, terminology units are built from *concepts*, which are thought of as mental understandings derived from experience or reasoning. Hence, **concepts** are of the highest importance for the language of any profession. As a consequence, the process of forming concepts is essential for acquiring the language of any profession.

Very often students typically have a shallow and deceptive perception of the things being discussed. This may occur as a result of apathy, the wrong learning strategy, or a lack of personal involvement in the issue in question. Without solid justification and explanation, a concept is nothing more than a sign, a curtain that imitates knowledge that students do not have. Due to time constraints and an overload of academic responsibilities, students often attempt to solve problems by reducing their techniques and imitating the strategies of their teachers.

The teacher should stop and ask the class questions regarding even the most apparent ideas, concepts, and words to give them time for thinking. The process of **problematizing** the study material involves reflection, questioning, and reasoning. Students are encouraged to concentrate on refining their conceptual comprehension and data analysis skills.

In English lessons, teaching professional vocabulary is an excellent opportunity to problematize academic material. The teacher should be prepared for this, although substantial engineering knowledge is not required. A general comprehension of concepts, applied in everyday life, or in engineering and scientific practice, is often sufficient.

The teacher only needs to ask questions to get to the core of the concept and discover applications. The exercises for problematization can concern:

- objects: *what is weightless body, give examples*;
- general notions: *what is force, make definition*;
- hysical/math/others phenomena: *constant entity, time-dependent entity*, equation vs. expression;
- math operations and operands: *collecting terms, what is sine of given angle, why angles are measured both in degrees and radians*.

It is not necessary for a foreign language instructor to be familiar with the responses to these queries. The answers to these queries ought to be known by students. However, they develop their concepts and ideas within the structure of their mother tongue. They must go beyond the stereotypes and templates and reconsider the relationship between phenomena and objects when they are compelled to solve a cognitive-communicative scenario in a foreign language. As a result, thinking is stimulated by the foreign language environment.

Active Communication. When teaching engineers a foreign language, the next opportunity for cognitive development is *verbalization*. In technical communication, when ideas are represented through numbers, equations, diagrams, graphs and drawings, verbose speaking styles are uncommon. On the other hand, students' comprehension of conventional engineering patterns improves significantly when the language is used extensively in engineering courses.

Novel concepts are presented as simply boring words and learned merely as *words* if a teaching style is imperative, «solve this...» without a room for critical thinking and debate. As a result, there is a disruption in the relationship between the concept being taught and the operations that the students are performing, leading to mindless imitation of the models.

Students will successfully learn new material if it is presented to them in contrast to what they already know and if its importance and practical application are made clear. For these reasons, mental processes of **classification, generalization, comparison** and **categorization** are frequently effective. This is crucial for forming foreign-language concepts and terminology. These are a few verbalization instances.

Exercises using reasoning are great for introducing a topic. These simple mental tasks provide substance for reflection and stimulate brain functions. As an example, *what if the difference between mechanism and machine?*

Possible reasoning: a *mechanism can be thought of as a system of movable linkages that are used to transmit, control, or limit relative motion. A machine, on the other hand, is an assembly of mechanisms that transfer force from the power source to the resistance to be overcome.*

Though all machines are mechanisms, all mechanisms are not machines.

The next difficult yet incredibly beneficial task for engineering students is **creating written formulas from verbal instructions**. For students to acquire the required skills, constant training is required.

Example: *Given that the drag force acting on a car is proportional to its speed & equal to R when brakes are applied. Derive the drag force formula in terms of factor R & initial speed* V_0*?*

Students have time for introspection and discussion.

Does the fact that two quantities are proportional imply that they are equal?

No, $F = kV$*, force is related to velocity, but is not equal to it. So, we need a factor between F and V.*

The next step: applying the idea in practice.

What is the value of the coefficient k in this problem?
We need to use initial conditions, $V = V_0$, $F = R$.
Hence, when the brakes are applied, $R = kV_0$, *and* $k = R/V_0$.
The final step: synthesis and conclusion.
$F = (R/V_0)\ V$ *Answer*

This example shows how the *proportionality* concept can be taught to students in a way that makes sense and prepares them for its application. It is important to think aloud and verbalize every action during these exercises. It is the teacher's responsibility to provoke students' thinking by providing challenging questions.

Switching between communicative goals and content, between academic tasks and professional issues. Engineering is the process of designing goods to meet societal and individual demands. Engineering students go to colleges and universities for theoretical knowledge of "*how they do it*" and related practical skills. Their main goal is to find the fastest and most cost-effective solutions to real-world problems. Motivating students to learn a foreign language is a big problem. In order to enhance their cognitive capacities, by means of a foreign language, educators must spark interest and demonstrate the practical applications of language learning for future careers. Fortunately, this is feasible since engineering and foreign languages provide distinct perspectives on reality. To characterize the many types, structures, and attributes of objects as well as how they interact with one another, one to learn specific foreign language discourse including vocabulary and grammar norms.

The filling of the reciprocal excursions between the fields of engineering and foreign languages is shown in table 1.

Table 1.

Engineering and foreign language as related fields of study

Таблица 1.

Техника и иностранный язык как связанные учебные области

Units	**Educational content**	
	Engineering (subject issues)	**Foreign language (vocabulary and grammar norms)**
1	Components of the structure, parts; relative position of parts of the structure; direction of movement; direction of the process; instructions, protocols, and processes.	Order of words in a sentence; adverbs; verb forms; *verbs to be, to have*; imperative mood; gerund; past participles; word formation (word endings); plural of nouns; prefixes, suffixes; abbreviations (abbreviations) of terms.
2	Physical characteristics of objects: shape, color, condition; engineering materials, their properties and processing methods; types of connections of parts and units; functions of parts and units within a system; description of motion, process, state - short summaries of dozens of technical staff operations; description of probable events and necessary actions.	Making definitions; conjunctions and their uses; combining sentence fragments into a single sentence; action verbs; future tense construction; subordinate conditions; time and location.

Table 1. Continued

3	Geometric sizes and dimensions; drawings: views, scales, dimension lines, tolerances; addressing graphic information in business correspondence; settling drawing-related issues; units and conversion factors between national and international different unit systems.	Words that describe sizes, including nouns, adjectives, and verbs; lexical and grammatical descriptions of graphic data; interpreting complex numbers; reading numerals, reading formulas and mathematical expressions.
4	Motion; processes (continued); functional connections; equipment condition; damage; failures; electrical circuits; elements of mechanics, aerodynamics, hydrodynamics, thermodynamics; safety precautions: guidelines, labels, and standards.	Adjectives with comparative and superlative degrees; unions; phrasal verbs; verbs expressing movement; phrases related to movement; active and passive voice; vocabulary and grammatical material pertaining to electrical circuits, valves, controls, and descriptions of damage of various degrees; means for describing duration, indicating, informing, inspecting, and calculating.
5	Connections between structural components, mathematical and logical procedures, electrical and hydraulic circuit elements; installation and assembly.	Present and past participles; units of measurements, reading and writing fractions; ordinals; reading and writing complex mathematical expressions; 'translator's false friends' (les faux amis); vocabulary related to mechanics, electrical circuits and electronics (several dozen words and phrases).

Engineering textbooks by P. Shawcross, M. Ibbotson, E. Glendinning, and N. Glendinning provide excellent examples of how to teach English [32; 33; 34]. While it is not required of a foreign language teacher to be an expert in engineering, they should consider the demands of students, while choosing language learning material. As a result, students develop a dual focus and the practice of treating foreign-language sources equally with native-language writings.

The teaching method that has been presented thus far has shown efficacy in both engineering and English classrooms [35]. Indeed, what is studying engineering if not learning a «*special purpose language employed under particular circumstances*»? The students' intellectual sense, desire to penetrate the essence of phenomena, understand what is hidden behind words and concepts, contribute to their cognitive development.

Conclusion. Thus, learning a foreign language has significant impact on cognitive development of engineering students, in addition to the purpose of teaching a professional language. In order to make this possible, the learning process should be designed so that the student must overcome a significant, but controllable challenge, link the new material with what is already known and apply the new material to one or more learning activities. Generally, these requirements must be met in order to teach/learn any subject. Nonetheless, foreign language teaching offers distinct chances in this context.

There are many challenges at hand: Students usually find it difficult to read and comprehend technical and scientific texts; the foreign language classes does not cover the vocabulary required for even the most fundamental items and situations in engineering practice, and students' grammatical skills are insufficient to make coherent assertions.

It is possible to gently introduce students to the variety of phenomena that comprise engineering operations by teaching technical English. These phenomena include formulas, drawings, materials, and discussions of the key steps in product manufacturing. Additionally, language practice enables one to master a foreign language at the micro level, meaning that one can explain all the steps required to solve a specific problem, comprehend actions of others, and plan interactions at any level, from manager to technician.

A foreign language course can offer a deeper understanding of an object than just investigating it in a mother tongue, despite how strange this may initially sound. Sometimes, when we hear words in our own language, the inertia of perception and thought prevents us from understanding the main point of what is being said. In a well-structured foreign language classroom, the teacher and students do not proceed until they fully comprehend the subject matter being covered, the rationale behind the chosen description of the occurrence, and its unique characteristics.

With the speed at which the current post-industrial world is changing, it is becoming important to be able to assess, adapt, persevere, and navigate through a changing environment. Use of all opportunities, including those offered by the foreign language course, is therefore essential for students' cognitive development.

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