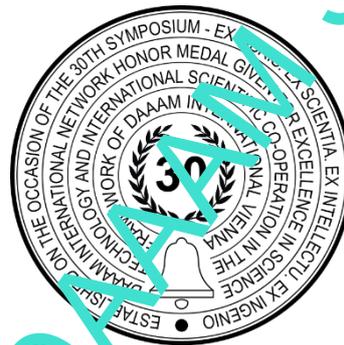


NEW TEACHING APPROACHES IN CONDITIONS OF GLOBALISATION IN DIGITIZED HIGHER ENGINEERING EDUCATION

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Abstract

The study was intended to explore the potential of new teaching approaches in digitized higher engineering education for conducting professional communications as it serves a significant competitive advantage for many specialties, and in a number of companies it is a mandatory item of the professionogram in the conditions of globalisation. This research aims to fill this void in its exploration of the effects of training engineering specialists in learning foreign languages in order to make them possess the knowledge, skills and abilities to successfully participate in foreign language professional communication. They also should be able to present the results of their professional and scientific activities in digital context, as well as possess the skills of academic writing. The conducted research shows that the main principles of teaching second foreign language for engineering specialties in the digitized context are consciousness and the principle of taking into account interference and transference. The frequency of occurrence of interference and transference phenomena depends on three factors, which are investigated in the research. The article serves the interest for those who research digital trends in education as well as those who are interested in introducing new teaching approaches into the educational process of engineers.

Keywords: Digitized contents; Multilingualism; Didactic triglossia; Engineering; Foreign language.

1. Introduction

Modern higher professional education, like science in general, cannot develop effectively without international relations in the field of research and practical testing and application of the results of scientific and educational activities. In the context of the global world and the digitalization of education, students get wide access to information resources, have the opportunity to listen to lectures, participate in webinars and scientific and educational events of various educational institutions, including foreign ones, thus setting their own individual learning path. At the same time, knowledge of a

foreign language is certainly an important and necessary factor for conducting oral and written communication and for understanding and processing large volumes of textual material on professional topics [1], [2], [3]. The digitalization of modern higher professional education makes it possible to integrate digital technologies and innovative tools into the educational process, which increase the involvement and interest of students [4], [5]. Many educational institutions have tested and implemented the Learning Management Systems, LMS, which facilitates access to educational materials and makes the learning process more flexible and accessible for any learning format (blended, distance, traditional) [6].

Peter the Great Saint Petersburg Polytechnic University (SPbPU) has long-standing partnerships with technical universities in Germany. Among them are such Technical Universities as Munich, Leibniz University Hannover, Wildau University, Ulm University, etc. Within the framework of partnership relations, SPbPU students are given the opportunity to participate in joint research projects, semester study programs, defense of master's and PhD theses. In addition, modern digital technologies, the possibility of online education allow a large number of students to participate in short-term, modular programs of partner universities, which makes education attractive, modern, and international [7].

The language of professional and scientific communication is most often English, but in order to work at an enterprise and participate in international joint project work, engineering specialists need knowledge of terminology and professional vocabulary in the language of the country (in our case, in German). Taking into account the fact that many students have been purposefully preparing to study or practice at partner universities since the first years of study at the university, it should be noted that many of the undergraduates already have sufficient knowledge of English [8], [9]. However, students have no or insignificant experience of professional communication in a foreign language and, as a result, students do not have professional vocabulary and terminological system. When teaching a foreign language at a university, the most important, in our opinion, is the development of foreign language professionally oriented communicative competence [10], [11]. The use of modern digital technologies in teaching a professionally oriented foreign language makes it possible to make classroom work more diverse and individualized, and independent work more meaningful and effective.

The main educational and methodological support in teaching a foreign language in professional activities is a professionally oriented or special text, which is not only of great informational value, but also equipped with terms and special vocabulary. The digital educational environment allows the use of various forms of work with POT (professionally oriented text) at various stages (search for equivalents, semantization, interpretation of professional vocabulary and terms, production phenomena) [12], [13]. When selecting them, it is necessary to take into account the direction of training of students, the availability of up-to-date information on the specialty, the presence of professional vocabulary and terms. Students are most interested in POTs from the original websites of equipment manufacturers, for example (<https://www.vw.com/en.html>, <https://www.ford.com/>, <https://info.daimler.com/en/>, https://www.youtube.com/channel/UCxN-Csvy_9sveq15Hj_iDj4), etc. Modern technologies make it easy to integrate text, audio and visual material of original sites into the educational process [14], [15].

Primary when working with POT is the understanding of information. Professionally-oriented, special texts are of great educational and developmental importance. When selecting them, it is necessary to take into account the direction of students' training, the availability of up-to-date information on the specialty, the availability of professional vocabulary and terms [16], [17].

When translating technical literature, students use background knowledge and compensatory skills, and when translating terms, they most often use methods of calculus, transcription and transliteration. To help students to memorize professional vocabulary faster and better, the teacher should build the process of semantization based on the first foreign language or native language [18], [19].

A survey of students showed that more than 80% of respondents (1st-year master students in the direction of study: Energy, Construction engineering, Mechanical Engineering, Transport and Materials studies, Computer Science and Technology) consider knowledge of one or more foreign languages to be an important component of professional success. 76% believe that it is necessary to study foreign languages in professional activities as part of master's studies, while almost 70% consider the number of classroom hours allocated by the program to be insufficient, they also believe that 4 or more hours per week are needed during the entire master's course and the organization of optional classes is preferable. Almost 100% of respondents use mobile applications and various digital technologies when studying a foreign language (FL). The survey involved 80 undergraduates of the 1st year in the areas of Energy, Construction engineering, Mechanical Engineering, Transport and Materials, Computer Science and Technology.

Knowledge of a foreign language(s) at the level that allows to establish professional contacts, negotiate, promote the product of the enterprise, present the results of collective or individual scientific research and practical activities is today one of the qualification requirements for specialists in any field of activity. This is due to integration processes, the impossibility of an isolated existence and the development of civilization. This is the reason for the increasing interest in learning a foreign language and the demand for specialists who speak a foreign language at a professional level. However, the rapid changes taking place in all areas of the economy and production dictated new requirements for foreign language proficiency. In the system of higher professional education, the discipline "foreign language" has always been mandatory and belonged to the federal component. According to Federal State Educational Standards (FSES):

- Proficiency in a foreign language is an integral part of the professional training of all specialists at the university.
- The foreign language course is multilevel and is developed in the context of continuing education.
- The study of a foreign language is based on an interdisciplinary integrative basis.

• Foreign language teaching is aimed at the comprehensive development of students' communicative, cognitive, informational, socio-cultural, professional and general cultural competencies.

At the moment, in the amended standards, much attention is paid to the formation of the language (foreign language) competence of the graduate, the practical level of proficiency should not be lower than B1+, in connection with which the discipline "Foreign language in professional communication" was introduced in many technical areas of training. Despite the fact that the objective difficulties for achieving the level stipulated by the Federal State Educational Standard are a limited number of academic hours and a break in learning a foreign language (as a rule, students study this discipline in 1-2 and in the 9th, 10th or 11th semesters), recently there has been an increase in the number of students who are aware of the role of foreign languages in their future professional career. The orientation of the Russian Federation to global development trends and the entry of our state into the world educational space have led to changes in the field of language education. Currently, language education in Russia is developing in two directions: on the one hand, an increasing number of students are choosing English as their first language, on the other hand, the desire to learn the second language is growing.

Over the past ten years, the study of several foreign languages has become a common phenomenon in modern general education schools. German, French and Spanish are most often used as the second language. In accordance with the updated Federal State Educational Standard, since September 1, 2022, in all educational organizations for students mastering the educational program of basic general education, the study of the subject "Second foreign Language" is mandatory." (Letter of the Ministry of Education of the Russian Federation dated August 31, 2021 No. 03-1420 "On the study of the academic subject "Second foreign language").

Similar changes are taking place in the educational environment of higher education. The study of a second foreign language in the system of higher professional education of the Russian Federation in technical areas is becoming more and more in demand, due to modern educational trends: training of specialists capable of presenting and defending the results of innovative engineering activities in a foreign language; increasing academic mobility; internationalization of Russian higher education in general. Extensive international partnerships of Peter the Great St.Petersburg Polytechnic University allow students to participate in exchange programs, scientific conferences, industrial practice at a foreign enterprise, defend master's theses and continue research at partner universities. All these promising opportunities are a motivating factor for studying the second in a short time. Despite the processes of globalization and the dominant role of English as the language of international communication, knowledge of the language of the country of the proposed scientific internship is necessary for direct participation in professional communication. The unconditional factor of the success of cooperation is communication (personal and professional) in the partner's language.

Since teaching a second foreign language takes place in an organized educational process, we single out its didactic component as the main characteristic of the trilingualism under consideration, designating it with the terminological phrase "didactic triglossia" (DT) [20]. By DT we mean the coexistence of three languages (native and two foreign) in the speech-thinking sphere of an individual who learns these languages consistently and (with the exception of the native) in educational conditions, uses them in different communicative situations. In the situation of DT, the nature of the mutual influence of the three languages is determined primarily by the genetic relationship of the two foreign languages, German acts as the second foreign language, the study of which begins at the stage when students already speak English at an average level. Since English and German belong to the Germanic group, the similarity between them is much stronger than between German and the Russian language (RL), i.e. when studying FL2, students will primarily rely on FL1. Thus, the possession of RL is characterized by the greatest autonomy, while FL1 and FL2 interact in the student's mind. In the conditions of DT, this means the need to take into account this mutual influence when building the educational process, i.e. it is necessary to develop and apply such approaches in teaching FL2 that would rely on students' knowledge of the system and phenomena of FL1 and their native language [21]. In order to optimize the educational process, previous linguistic experience must be taken into account when studying FL2, where one of the main educational tools is the comparison of the phenomena of the languages that make up DT.

The comparison of linguistic elements of several language systems allows students to more easily and efficiently assimilate linguistic phenomena common to the two components of DT, as well as to avoid errors of negative transference (interference). The presence of regular comparison of linguistic phenomena of co-studied languages determines the expediency of the contrastive approach. Taking into account the importance of taking into account the mutual influence of the languages forming DT in the minds of students, we come to the conclusion that the main principles of teaching FL2 are consciousness (since direct methods do not provide for the analysis and comparison of phenomena of language systems of different languages) and the principle of taking into account interference and transference. The educational process should be structured in such a way that the reliance on the language and the FL1 is carried out – then the prerequisites are created for the positive transfer of the use of phenomena of one language to similar phenomena of another by analogy. The frequency of occurrence of interference and transference phenomena depends on three factors:

- 1) the level of speech development in the native language and conscious proficiency in it;
- 2) the level of proficiency in FL1: the better the learner speaks FL1, the fewer interference phenomena he has and the more opportunities there are for positive transference. But it also means that a low level of proficiency in FL1 can have a retarding effect on the mastery of FL2;

3) the length of time that separates the study of FL2 from IY1: the smaller the interval, the greater the impact of FL1 on the mastery of IY2. Interference is usually based on differences in terms of expression, when the meanings present in both languages are transmitted by different linguistic means. However, the semantics of language units and their functioning even more provoke violations of the norms of FL (word order, tense coordination, specific meanings of verb forms, etc.). The work on the prevention of interference is based on the principles of consciousness and activity, the speech orientation of learning, taking into account the meaning of RL and FL1, i.e. FL2 training is based on analytical information that reveals the features of the functioning of the phenomenon under study in comparative terms. At the same time, the constant availability of oral practice is ensured to activate knowledge and skills in order to solve communicative tasks [22]. Summarizing the above, we can conclude that when teaching IY2, one of the main tasks of the teacher and the compilers of educational and methodological complexes (EMC) is to consistently rely on the knowledge, skills and abilities already formed in students, similar in FL1 and FL2, and to prevent errors in the study of these phenomena where the possibility of such an analogy is only apparent.

So, undergraduates of the SPbPU Institutes of Energy, Construction engineering, Mechanical Engineering, Transport and Materials, Institute of Computer Science and Technology after a 2-3-year break, begin studying the discipline "Foreign language in professional communication". The study of this discipline takes 3-38 hours. In this situation, a contradiction arises: on the one hand, the desire and motivation of undergraduates to study the second language for use in professional activities (many undergraduates have sufficient knowledge of English), on the other – a limited number of study hours. In this regard, it is natural to teach the second language, in particular, to teach translation taking into account the principles of DT, i.e. conscious reliance on the native language and the first foreign language. For effective work, it is necessary to use the possibilities of optimal organization of classroom releases and independent work of students to prepare for professional communication, scientific discourse and academic writing. To achieve this goal, it is necessary to teach how to work with a professionally oriented text, a scientific text in the specialty, which includes the study of the basic terms of a certain term system in a foreign language, with the help of which they will be able to further understand special literature and, if possible, participate in foreign-language professional communication [23].

Russian	English	German
Авиационный двигатель	Aero-engine	Flugzeugtriebwerk, n.
Высшая математика	Higher mathematics	die höhere Mathematik
Гидроаэродинамика	Hydroaerodynamics	Hydroaerodynamik, f.
Гидротехника	Hydroengineering	Hydrotechnik, f. / Wassertechnik, f
Информационные технологии	Information technology (IT)	Informationstechnologien,
Квантовая электроника	Quantum electronics	Quantenelektronik, f.
Котельная установка	Boiler plant	Dampfkesselanlage, f.
Лазерные технологии	Laser technologies	Lasertechnologien, f. pl
Литейное производство	Casting production	Gießbetrieb, m.
Машиностроение	Engineering	Maschinenbau, m.
Парогенератор	Steam generator	Dampferzeuger, m.
Полупроводник	Semiconductor	Halbleiter, m
Прикладная механика	Applied mechanics	Angewandte Mechanik
Проводник	Conductor	Leiter, m.
Радиотехника	Radio engineering	Radiotechnik, f
Сопротивление материалов	Resistance of materials	Festigkeitslehre, f
Станкостроение	Machine-tool construction	Werkzeugmaschinenbau, m.
Теоретическая физика	Theoretical physics	Theoretische Physik
Физика плазмы	Plasma physics	Plasmaphysik, f
Холодильная техника	Refrigeration engineering	Kühltechnik, f.
Экспериментальная физика	Experimental physics	Experimentalphysik
Электрическая станция	Power plant	Elektrizitätswerk, n
Ядерная энергетика	Nuclear power	Kernenergetik

Table 1. Examples of using the calculus technique

The algorithm of work on a professionally-oriented text assumes reliance on the knowledge of the 1st century, i.e. when translating terms and professional vocabulary, first of all, the search for internationalisms and Anglicisms is conducted. Students cope with this type of work quite easily, because when translating professional vocabulary, the

calculus technique is used more often than others. Calculus should be understood as one of the methods of translation, which consists in the fact that words and expressions of one language are translated into another language by means of exact reproduction by means of their morphemic or verbal structure (examples of using the calculus technique are presented in Table 1). Due to the fact that students of technical specialties did not study theoretical linguistic disciplines, the task of the teacher is to explain word formation in German by the example of simple phrases and compound words (for example: Theoretische Physik, Angewandte Mechanik, die Kernenergetik, die Kühltechnik usw.)

The next technique used in the translation of professional vocabulary is transliteration, i.e. the technique of translating the lexical unit of the original by recreating its graphic form using the letters of the target language (see Table 2). When using techniques such as transcription and borrowing, it is necessary to pay students' attention to the phonological side of words and phrases (for example: design – in English, дизайн – in Russian and das Design – in German; менеджер, der Manager, manager; die Telekommunikation in German, which was gradually borrowed into English and Russian, i.e. "telecommunication" and "telecommunications" respectively). The primary data of the analysis of the use of methods of translation of professional vocabulary are presented in Table 1 and Figure 1.

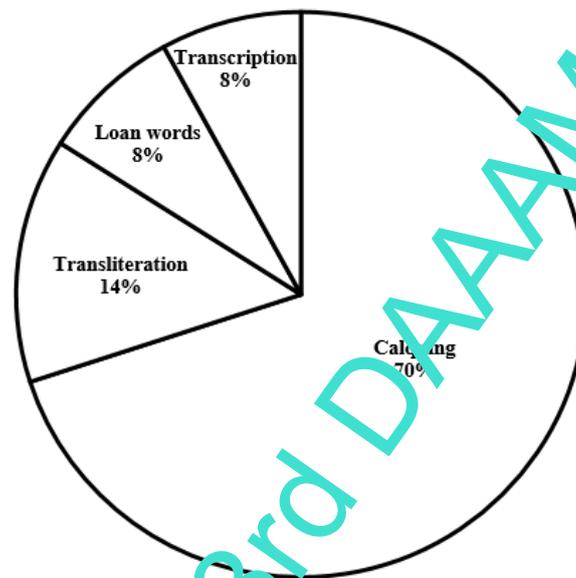


Fig. 1. The analysis of the results of the use of professional vocabulary translation techniques

2. Conclusion

As can be seen in the figure, the calculus technique was used more often than others (70%), i.e. it can be assumed that students use their linguistic experience when translating, but in order to achieve more effective results, given the limited time allotted by the program to study the discipline, the teacher should build classes using the full potential of the DT system.

In conclusion, it should be noted that the conducted research may be of interest to those who are engaged in the study of new trends in education. Thus, the modern educational environment is associated with the use of digital technologies, which provides the educational process with relevant information material and significantly optimizes teaching methods and obtaining the final result. When teaching students of technical areas of training, the resources of the original sites are used, as well as various forms of education (traditional, mixed and online). With the use of digital technologies, classroom and independent work can be more effective. In general, the problem investigated in the work presents great prospects for further research. Prospects for further research are seen in the need to continue working on further finding models for better improvement of the students' language skills in the foreign language learning process. If taken into account multilingualism can help to reduce individual and social risks of it and stimulate its positive impact on the individual and society there is the necessity of interdisciplinary interaction in research of multilingualism on various individual and social processes.

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