CONTENT AND LANGUAGE INTERGATED LEARNING IN FOREIGN LANGUAGE COURSES FOR ENGINEERING STUDENTS

**N. A. Gunina, E. Yu. Voyakina,
L. Yu. Koroleva, T. V. Mordovina**

Tambov State Technical University, Tambov, Russia

Reviewed by Doctor of Philology, Professor M. N. Makeyeva

Keywords: CLIL; English for professional communication; communicative competence; university courses.

Abstract: In modern foreign language teaching, a variety of approaches is used to meet the learners' needs in acquiring language skills for professional communication. One of them is Content and Language Integrated Learning (CLIL), an innovative language teaching method that combines learning a foreign language and profession-related content. In this paper, we describe the experience of designing a course in English for students of Biomedical Engineering with elements of the CLIL approach. A theoretical foundation for implementing CLIL within the competency-based approach is provided. The core principles of CLIL are discussed. The paper focuses on the course design and its structure as well the main requirements to selecting the learning materials. The examples of sample tasks and activities for the course are presented.

Introduction

Over the past two decades, Russian universities have been adjusting their study programs to the changing requirements introduced by the Ministry of Higher Education and Science. These ongoing changes and the need to adapt to them in order to survive and remain competitive have had a two-fold effect on educational institutions and their stakeholders. On the one hand, new requirements are encouraging universities to adopt new models of teaching and

Гунина Наталия Александровна – кандидат филологических наук, доцент, заведующий кафедрой «Иностранные языки и профессиональная коммуникация», e-mail: intecomstsu@mail.ru; Воякина Елена Юрьевна – кандидат филологических наук, доцент кафедры «Иностранные языки и профессиональная коммуникация»; Королева Людмила Юрьевна – кандидат филологических наук, доцент кафедры «Иностранные языки и профессиональная коммуникация»; Мордовина Татьяна Валерьевна – кандидат педагогических наук, доцент кафедры «Иностранные языки и профессиональная коммуникация», ТамбГТУ, г. Тамбов, Россия.

ways of organizing the educational process, thus making them more attractive to students. On the other hand, introduction of new rules and approaches puts higher demands on the administrative staff and the faculty who have to upgrade their skills quickly and regularly in order to produce and select learning materials that are relevant and up-to-date. Quite often this is complicated by insufficient funds and resources, as well as lack of skills of university teachers whose teaching load prevents them from continuous professional development.

Teaching foreign languages at non-linguistic universities is also exacerbated by a number of “local” problems, such as the underestimated role of studying foreign languages due to the dominant role of special disciplines and the limited possibilities of educational institutions [1], lack of motivation for learning a foreign language by engineering students [2], insufficient amount of instructional time and its inefficient use in the classroom, mixed-ability groups, outdated teaching materials, etc. The thing that makes teaching foreign languages even more challenging is lack of professional experience of most undergraduate students, resulting in loss of interest in learning a foreign language.

One of the ways of solving the above mentioned problems is application of teaching methods with a focus on developing skills that learners can make use of in their career. Recently, CLIL (Content and Language Integrated Learning) has been gaining in popularity as an educational innovative method addressing the needs of students in the 21st century. This approach deals with teaching content and developing language skills that are in demand for future professionals. Coming in two different types – hard CLIL and soft CLIL – it offers a wide range of opportunities for teachers in terms of course design and delivery. While hard CLIL is much closer in meaning to using a foreign language as a medium of instruction, soft CLIL is concerned with teaching some of the topics through the language course. In this paper, we will focus on some strategies in designing a “soft-CLIL” course that combines the language learning with the career-related topics for Biomedical Engineering students at Tambov State Technical University (Tambov, Russia).

Framework of foreign language instruction in higher education in Russia

In Russia, teaching a foreign language at a tertiary level to non-linguistic students is organized within a framework of a competency-based approach and is aimed at developing certain competencies. This means that learners master not only the language, but also acquire skills that they need to perform certain tasks. In this case language is used as tool to attain specific goals rather than the goal of learning the language itself.

Originally the competency-based approach was developed in the United States to facilitate integration of immigrants with the society and help them to acquire not only the necessary language skills, but also some life-coping and vocational skills. The first competency-based programs were designed for teachers back in the 1960s [3] and a decade later similar approach was implemented in some vocational programs [4]. Later on colleges and universities continued to develop competency-based programs, mainly targeting adult learners. Today, the competency-based approach is integrated with hybrid learning models or online education.

The main features of the competency-based approach can be reduced to the following: (1) learners are expected to develop a broad set of competencies or skills; (2) each study program has specific learning objectives; (3) learners receive instructional support; (4) the learning process is organized through mastery of competencies; (5) each competency is measured against the effective assessments.

In Russia, the introduction of the competency-based approach was necessitated by joining the Bologna process in 2003. This step led to a number of serious changes in the system of higher education – from transition to a three-cycle education to new principles of course design and assessment criteria. Interestingly, in the Russian system of education the competency-based approach is being implemented at all levels, including secondary schools, technical colleges and vocational schools. This is slightly different from the US practice, where such an approach is limited to the system of higher education.

Since the main focus of our research is teaching English to Biomedical Engineering students, we resort to the Federal Standard of Higher Education (*Standard hereinafter*) for the program “Biotechnical Systems and Technologies” (Biomedical Engineering is part of this broader direction of study). According to the Standard, one of the competencies that university graduates in Biomedical Engineering are expected to acquire is “the ability to communicate in oral and written forms both in Russian and foreign languages in order to solve interpersonal and cross-cultural problems” (*translated by us*) [5]. As can be inferred from the wording of the Standard, neither the proficiency in a foreign language is specified, nor the importance of using a foreign language for professional purposes is stated. This resulted in a situation of insufficient attention to foreign language instruction in many Russian universities.

Despite the fact that foreign language instruction is depreciated, the majority of universities offer courses not only in English, which, of course, is the most popular foreign language, but also in other European languages, such as German, French, Spanish or Italian. At Tambov State Technical University, all students have a choice of three languages – English, German, and French. As can be seen from Fig. 1, the distribution of the students by languages shows that English remains the most popular language (87%), followed by German (9 %) and French (4 %), respectively (Fig. 1).

Although a foreign language is included in the list of core disciplines of any undergraduate program, the role of this course and the attention given to it leaves much to be desired. At Tambov State Technical University, a foreign language is taught for two years, and accounts for 108 classroom hours. Classes are delivered once a week in the first year, and every other week in the second year. The topics cover different aspects of communication in business and professional context.

The learning objectives and the expected learning outcomes of the program are presented in Table 1.

Fig. 1. Distribution of students by language:
1 – English; 2 – French; 3 – German

Table 1

Learning objectives vs. learning outcomes

Learning objectives	Learning outcomes
Know the norms of written and oral business communication in the state language of the Russian Federation and a foreign language (s)	<ul style="list-style-type: none"> – can understand and use words and phrases related to everyday topics, as well as professional settings; – can understand and use specialized vocabulary and terminology
Know how to use various forms and types of oral and written communication in interpersonal and intercultural interaction	<ul style="list-style-type: none"> – can work with technical literature (using a dictionary) on job-specific topics; – can understand oral (monologue and dialogical) speech on special topics; – can participate in discussions on professional topics
Know the standardized, communicative and ethical aspects of oral and written communication in relation to the following areas: science, business, social-political sphere, human relations	<ul style="list-style-type: none"> – can speak on topics related to professional area; – can use grammar and basic grammatical constructions in professional speech; – can deliver oral presentations (give messages, reports with preliminary preparation); – can make use of basic writing skills for document management and correspondence

As can be seen from Table 1, although learners are expected to study a foreign language for professional purposes, the language proficiency requirements are not strictly specified and have no correlation with CEFR, i.e. it is not expressed clearly what level of language proficiency graduates have to achieve.

Integrating CLIL with competency-based instruction

CLIL as a teaching pedagogy is a relatively new concept; it was first used in 1994 at the University of Jyväskylä in Finland by David Marsh [6]. However, it dates back to the tradition of bilingual education, which started much earlier than that in countries with more than one official language. The idea to teach some subjects in more than one language was aimed at enhancing immersion of students into the target language. First it was implemented at schools in Canada, the USA and then in Europe where it fitted well with the ideal of multiculturalism [7].

CLIL as learning and teaching methodology rests on 4 Cs: content, communication, cognition and cultures. These principles were introduced and clarified in [6]. According to Oliver Meyer, they underpin the theoretical and practical foundation of a CLIL lesson and help teachers to achieve the main goal – “teach with a multiple focus” [8]. In CLIL, content is understood as knowledge and skills that learners acquire through the learning process and the

same time create their own knowledge. Cognition is essential for correct understanding and interpretation of knowledge. Communication is fundamental to learning as it is necessary for reconstruction of the knowledge and its acquisition. Language is a part of culture, which is at the core of CLIL [ibid. p. 295-296]. Understanding of these principles is crucial for successful implementation of the approach.

The underpinning principles of CLIL methodology seem to be in line with a competency-based approach, as both have similar features.

Content: Content matter is not only about acquiring knowledge and skills, it is about the learners creating their own knowledge and understanding and developing skills (personalized learning) [8].

Cognition: Content is related to learning and thinking (cognition). To enable the learners to create their own interpretation of content, it must be analysed for its linguistic demands; thinking processes (cognition) need to be analysed in terms of their linguistic demands.

Communication: Language needs to be learned which is related to the learning context, learning through that language, reconstructing the content and its related cognitive processes. This language needs to be transparent and accessible; interaction in the learning context is fundamental to learning. This has implications when the learning context operates through the medium of a foreign language.

Culture: The relationship between cultures and languages is complex. Intercultural awareness is fundamental to CLIL. Its rightful place is at the core of CLIL [6].

As can be seen from Table 2, the CLIL methodology can be successfully integrated with the competency-based approach as they have similar characteristics. Both are content-driven and orientated towards the acquisition and learning of a foreign language. The unique feature of the CLIL approach and the competency-based instruction is that language is used as a tool to learn the content and at the same time it is the goal of learning. This is what multi-focus learning and teaching is about. Language is also a tool to enhance the cognitive processes and help learners to develop the basic competencies specified in the curriculum.

Table 2

Comparison of competency-based instruction and CLIL methodology

Features	Competency-based instruction	CLIL methodology
Objective	building competencies	acquiring and creating knowledge and skills
Attitude to content	a basis for developing competencies	a basis for developing structured knowledge
The role of language	a tool for acquiring competencies	a conceptualization and communication tool
The role of a teacher	facilitators and supporters	facilitators and supporters
Type of instruction	individualized	individualized
Type of learning	self-directed	self-directed

Designing a “soft-CLIL” course for Biomedical Engineering

When designing a course in compliance with the Standard requirements, it is necessary to take into account that mastering a foreign language at university is part of the educational program. In compliance with lifelong learning principles, teaching and learning of a foreign language is more efficient if it is done on the interdisciplinary basis. If the content students are exposed to is irrelevant and not subject-related, they are less likely to achieve the desirable level of proficiency. Teaching a foreign language is multi-focused as it aims to develop a wide range of competencies: communicative, cognitive, informational, socio-cultural, professional, etc. Besides, it might be beneficial to design a multi-level course it will meet the needs of mixed-ability and mixed-level groups.

Although CLIL methodology involves teaching both language and content, their ratio depends on what type you are implementing – content-driven (hard CLIL) or language-driven (soft CLIL). With soft CLIL, the educational process is focused on learning a foreign language, through which meaningful content is presented.

A “soft CLIL” course aims to:

- introduce learners to new concepts through studying in a foreign language;
- improve learners’ productive skills in a foreign language – both oral and written;
- build up learners’ specialized knowledge of the subject area;
- increase learners’ confidence in a foreign language;
- and provide meaningful and systematic practice in order to achieve effortless use of knowledge in a foreign language.

With all this in mind, a course developer should proceed from the learning objectives and learners’ needs.

Language requirements to the course content

One of the most crucial issues for developing a CLIL course is the selection of appropriate language materials. Peeter Mehisto suggests the following ten criteria:

- 1) making the learning intentions (language, content, learning skills) and process visible to students;
- 2) systematically fostering academic language proficiency;
- 3) fostering learning skills development and learner autonomy;
- 4) including self, peer and other types of formative assessment;
- 5) helping create a safe learning environment;
- 6) fostering cooperative learning;
- 7) seeking ways of incorporating authentic language and authentic language use;
- 8) fostering critical thinking;
- 9) fostering cognitive fluency through scaffolding of a) content, b) language, c) learning skills development helping students to reach well beyond what they could do on their own;
- 10) helping to make learning meaningful [9].

The first criterion necessitates the identification of short and long-term planned outcomes which are integrated into learning materials and clear to students as they must understand what they are expected to learn at the moment and in the long run. Therefore, a CLIL course must underline expected outcomes in general and the ones that students should achieve at the end of every unit and lesson in particular. According to Wood et al. students can reach learning goals if they understand and know these goals [10]. The following examples illustrate the possible formulation of the objectives:

At the end of the lesson you will be able to name new medical technologies and explain how they work (language and content); or

You will be able to summarise other students' ideas about new medical technologies (learning skills).

The second criterion focuses on scientific language which students must pay attention to identifying it within the materials, giving its characteristics (style, factual information etc.), connectors used to compare and contrast phenomena, specific vocabulary related to the curricular subject, terminology, phrases etc. [9]. Thus, CLIL materials must contain such tasks that will encourage learners to improve their level of academic language which is essential for students' professional growth. The examples of such assignments are as follows:

– Scan the text and find the words in the text that refer to biomedical engineering achievements:

No matter what the date, biomedical engineering has provided advances in medical technology to improve human health. Biomedical engineering achievements range from early devices, such as crutches, platform shoes, wooden teeth, and the ever-changing cache of instruments in a doctor's black bag, to more modern marvels, including pacemakers, the heart-lung machine, dialysis machines, diagnostic equipment, imaging technologies of every kind, and artificial organs, implants and advanced prosthetics. The National Academy of Engineering estimates that there are currently about 32.000 bioengineers working in various areas of health technology;

or

– Match the words with their definitions (Table 3).

Table 3

**Matching words and definitions as an assignment
to introduce scientific language**

Word	Definition
1) prosthesis	a) an object that doctors put into someone's body
2) device	b) a machine or piece of equipment that does a particular thing
3) science	c) an artificial body part
4) implant	d) the study and knowledge of the physical world and its behaviour that is based on experiments and proven facts and is organized into a system

According to the third criterion a CLIL course developer includes such a learning material that will make students brainstorm some ideas or do small research in order to comprehend some challenging text that follows these exercises. There can be pre-reading assignments that ask learners to skim or scan the text for unknown words and to guess their meaning before reading it or there can be an exercise that asks students to match subheadings to passages of the text. If the text contains diagrams, learners can be asked questions about them and speculate on the information given there. Materials may also provide students with learning skills tips on the successful completion of an assignment [9]. At the same time it is implied that the more autonomy learners have doing the exercises that foster their thinking skills in particular the more engaged they are in the process of learning a language [11].

The fourth criterion stipulates the use of materials in a CLIL course that will encourage learners to assess such aspects as:

- achievement of content and language goals (planned outcomes);
- achievement of learning skills goals;
- language use (different purposes are taken into account);
- ability to work with authentic materials as well as to communicate with native and non-native speakers;
- readiness to experiment with language and content;
- progress in language [9].

Thus, a course may contain assignments that ask students to develop their own criteria for assessing some work, e.g. a report, a project, an essay etc. Learners can also prefer self, peer or teacher assessment or the combination of different types. It is possible to use tables, charts, diagrams to illustrate one's progress taking into account some specific periods of time or the whole length of the course and compare it with others. Developers of a CLIL course must also pay attention to the necessity to give the feedback as it is useful for understanding what weak points a student has and what must be improved or vice versa what strong points a learner has and what progress he/she has made.

An elementary assessment chart can be included into every lesson of a CLIL course (Fig. 2).

Fig. 2. Elementary assessment chart

According to the fifth criterion materials should not be cognitively overloaded. If the information in texts contains challenging concepts, it is appropriate to introduce such exercises that will allow students to concentrate on the interpretation of the concepts firstly. Therefore, such assignments can be divided into smaller groups and the explanation of terms may be given in L1. Besides, learners can express their opinions about the level of difficulty regarding various exercises and developers of a CLIL course should think over strategies to cope with the difficulties [9].

The next criterion necessitates the selection of materials that will foster positive independence, face-to-face interaction, individual and group work, interpersonal skills [12].

Since pair and group work exercises are aimed at developing students' cooperation as well as critical thinking, they may be quite efficient to achieve planned outcomes. Several stages can be distinguished here:

- students are asked to suggest their own ideas to solve some problem and to do this they are given some time to think everything over and rehearse the ideas in their own minds;
- learners work in pairs and share their ideas deciding which ones are sensible and appropriate;
- students work in groups, discuss their suggestions finding the best solutions [13].

It is proved that cooperative learning is much more effective than individualistic learning and it is also beneficial for building a student's self-esteem [14].

The seventh criterion stipulates the use of authentic materials and the incorporation of language used in everyday speech in different types of discourse. These materials can allow students to have an access to various sources of language through the Internet, music or other media [9]. They may include video clips, pod-casts, web-quests, flash-cards etc. integrating motivating and illustrative materials that are considered to be rich authentic language input which is essential for mastering a foreign language [8]. These sources must be an integral part of any CLIL course as they form the basis for creating challenging assignments aimed at fostering creative thinking, differentiated learning and autonomous work. However, the main problem is to balance authentic materials and select those that will really result in achieving planned outcomes. As van Lier asserts, 'it is easy to bring genuine pieces of language into the classroom, but to create authentic opportunities of language use on their basis appears to be quite another matter' [15, p. 126].

If the materials are selected appropriately, learners will have all opportunities to participate in their own activities, using their previous knowledge and developing creativity, self-discovery and self-awareness. The following examples of assignments can cover all aspects mentioned above:

– *Watch the video about the University of Sydney (here is the link: https://www.youtube.com/watch?v=kSGX246gQfg&feature=emb_logo) and answer the questions.*

1. *What inventions were made real by biomedical engineers?*
2. *Does biomedical engineering combine a wide range of engineering disciplines with the life sciences of medicine and human biology?*
3. *Whom do biomedical engineers work with?*
4. *What program does the University of Sydney offer?*
5. *How does it differ from similar programs of other universities?*
6. *Where can biomedical engineering skills be used?*
7. *What do you think about this program?*

– *Summarise the information about the University of Sydney paying attention to its location, specializations and careers and compare it with the facts about your University.*

The next criterion implies the use of such materials that will encourage students to analyze, evaluate, and create something on the base of the information presented in the materials instead of asking them to answer questions related only to facts. This technique helps to foster learners' critical thinking and the learning process becomes more meaningful that is considered to be very important [9]. It should be noted that Bloom's taxonomy can be applied in this case (Fig. 3).

According to the ninth criterion materials should be selected on the principle of scaffolding that can help learners to achieve more goals participating in new activities and solving various problems [17]. A. Walqui proposes such scaffolding strategies as:

- modelling (giving examples for imitation);
- bridging (using previous knowledge and understanding for completing new tasks);
- contextualising (adding context to academic language);
- schema building (applying charts);
- representing a text (using a new genre for presenting the same information);
- developing meta-cognition (planning, monitoring, evaluating) [18].

Peeter Mehisto divides assignments into three categories related to language, content and learning skills. The first category may include such exercises as shortening sentences and paragraphs, giving explanation to some key vocabulary, presenting information according to different registers of language etc. The second category involves tasks which help learners access their tacit knowledge and connect the topic to their lives (using tables, charts, simple sentences, focusing on key ideas, giving sample answers etc.). The third category contains assignments which provide samples of correct answers or other students' works which were done well or poorly etc. [9].

To meet the final criterion a CLIL course developer must choose materials that explain the connection of learning to students' lives, interests and community as well as previous learning when new facts and concepts are presented. They should offer learners choice and control over the learning process [9]. If students understand the relevance of the materials they will be a success in achieving both short and long-term goals.

Thus, these ten criteria can be very useful to develop a CLIL course that will meet modern requirements and educational standards.

Fig. 3. Bloom's taxonomy [16]

Course structure and key competencies

Realizing challenges of CLIL implementation connected with adjusting to Federal state educational standards, on the one hand, and the lack of academic hours allocated for studying foreign languages, on the other hand, we designed the English language course for biomedical engineers with elements of the CLIL approach.

The course is intended for 2-year bachelors studying Biomedical Systems and Technologies at Tambov State Technical University (TSTU). The aim of the course, which is the compulsory part of the bachelor curriculum, consists in developing a foreign language competency at the B1+ level together with professional skills. This interconnection of the language and professional competencies can be developed by reading and understanding professionally-oriented texts, communicating on specific professional topics, discussing particular professional issues, etc.

The analysis of the curriculum conducted from the CLIL point of view (involving subject university teachers) allowed us to identify a list of topics and teaching materials which should be provided to students in the framework of foreign language training. Thus, the topics of our course coincide with the curriculum of the major disciplines.

The course structure is presented by four modules each consisting of four units (Fig. 4).

Each unit in the course includes authentic and relevant texts and materials, a carefully selected active vocabulary and grammar, as well as a system of developmental assignments and exercises aimed at solving the following objectives:

Fig. 4. "English for Biomedical Engineering" course structure

- expanding the students' vocabulary on the topics studied;
- consolidating and activating grammatical material in the oral and written speech;

- developing four basic skills (listening, reading, speaking and writing);
- developing the intercultural competency;
- developing both professional and soft skills.

These objectives are sometimes hard to achieve due to poor students' professional and language competence. However, this challenge can be overcome by grading the difficulty of the assignments according to the students' level of English proficiency. While doing the course students have high level of autonomy in selecting texts for self-study tasks taking into account their preferences and language proficiency and promoting personal learning strategies.

Mastering the material presented in the course contributes to the formation and development of communicative competence in the field of professional communication, the improvement of speech skills and abilities, as well as the application of this knowledge in professional communicative situations.

In the process of developing teaching materials for the course, special attention was paid to the authenticity and content of texts, videos, grammar and vocabulary material, since all the tasks must be related by semantic content representing the interdisciplinary communication, which is one of the main requirements of the CLIL method. However, the course includes not only professionally-oriented texts rich in specific vocabulary related to biomedical engineering (the so-called content-obligatory language) but also practices general English (content-compatible language) necessary for everyday communication. Therefore, besides subject-specific vocabulary learners need general language structures of comparison and contrast, location or describing a process, collocations or prepositional phrases.

As part of the formation of four basic skills, the course meets all the necessary requirements in terms of the CLIL approach. Let us describe the course content through the development of these core skills.

Listening in a CLIL environment differs from listening in the ordinary language class where General English is taught. While doing listening tasks, it is important to introduce content-based listening strategies to students helping them to get the gist of the heard information or find out specific details. This can be done by activating students' knowledge from their professional sphere through vocabulary practice. Language scaffolding as a basic technique in CLIL lessons (including repetition, paraphrasing, working with synonyms and antonyms, eliciting ideas, brainstorming, oral feedback, etc.) seems to be effective at this stage. Visual scaffolding (pictures, schemes, tables, maps, charts) also contributes to deeper comprehension of the audio material, helps students better understand the information and pay attention to the key content.

Listening tasks (supplemented by video tasks) in the course for biomedical engineers reflect learner styles and preferences and include receptive skill activities of the "listen and do" type, e.g. listen and label a graph/map/picture, listen and complete the table with specific information, listen and put the information in the correct order, listen and identify speakers/location, listen and complete the gaps in the text, etc. The complexity of materials and tasks depends on the students' level of language proficiency.

Reading within the CLIL method also reflects the connection with a particular knowledge and is often integrated with other three basic skills. This integration of skills and professional content motivates students because all tasks are focused on the content related to students' needs and expectations.

The reading strategies (at pre, while and post stages) are focused on vocabulary related to the text in order to make the language acquisition more appropriate and meaningful. Pre-reading activities include constructing mind maps, working with vocabulary supposed to appear in the text, etc. Each unit in our course has questions for discussion before reading and various types of vocabulary exercises. At the while-reading stage students find the main idea of the text, match the heading with the paragraphs and complete the missing details in various charts and tables. In integrated tasks students find similar information in the texts they have read and listened to, rewrite the information without changing the meaning, express their ideas on the topic, or discuss the problems mentioned in the texts.

Productive skills which include *speaking* and *writing* are also subject-orientated in the course, so that both content and language are recycled. Writing and speaking tasks aim at activating students' prior knowledge, cognitive challenge and developing thinking skills.

Speaking activities introduced in the course for biomedical engineers include question loops, discussion of texts studied, information gap tasks, group surveys, trivia search of things students know and do not know, debates, interviews, case studies, role-playing, problem-solving tasks, etc. The speaking tasks can be given to students according to the level of their language proficiency: "weak" students can do storytelling, text completion, search tasks, while "strong" students complete more advanced assignments. However, while doing collaborative tasks both "weak" and "strong" students should cooperate fulfilling their own role which they are capable of.

Foreign language speaking skills are realized in dialogues, monologues, polylogues supposing purposeful communication of professional character on a specific topic (e.g. while discussing the most efficient biomedical technology students suggest their ideas proving them with advantages and drawbacks of using different technologies and in conclusion choose the most efficient option). The course also includes research speaking activities such as project work consisting in doing a research on a particular topic in groups or individually and presenting a report on the research data.

According to our experience, the learners' speaking skills in the CLIL approach are improved if students clearly understand the goal and all the steps of the task, if they can choose the level of the task complexity which correlates with their language proficiency and if the speaking activity is of interest to the learners. The last "if" condition is the most important in our opinion it realizes the principle of functional application.

Discussing *writing* skills within the CLIL instruction we should note that the CLIL approach has a positive effect on developing foreign language written competency. While testing the course with biomedical engineering students, we noticed the overall written competence, as well as complexity, accuracy and fluency in writing. The writing assignments provided in the course (including

factual writing a report according to the chart/graph/table data, writing an essay, completing various questionnaires, etc.) improved students' lexico-grammatical accuracy and discursive skills.

Besides linguistic competency and four core skills, the course for biomedical engineering students implies developing *intercultural awareness* which enables students to explore cultural complexity, enhance cultural understanding and acquire new cultural frames. Successful interaction in any field is ineffective if there is misunderstanding between the participants of the communication process. Realizing the national peculiarities in different cultures should be a part of international communication without which it is impossible to become a highly-qualified specialist.

The inseparable link between language and culture brings enormous educational opportunities [19]. The intercultural potential of CLIL activities developed in our course consists in selecting educational material. To foster learners' intercultural competency, we included authentic materials (texts, video, audio) which add to students' intercultural awareness, keep them motivated and develop cross-disciplinary relations. Thus, studying the history of biomedical engineering, considering various biomedical engineering training programmes in different countries contribute to constructing students' cultural identity.

The digital world offers ample opportunities to select authentic materials for CLIL-oriented tasks [20]. Using Internet video resources is also an integral part of our course which helps to develop learners' intercultural awareness. Watching authentic videos students discover what inventions were made by biomedical engineers, whom biomedical engineers work with, what biomedical engineering programmes are offered in different foreign universities. Further students analyze the information they have watched in the video and compare it with their previous knowledge, thus developing their professional competency and learning something new from other cultures. Through comparison of domestic and foreign biomedical technologies students reconstruct and assess a foreign culture perspective.

Simulating situations of cross-cultural environment also show its effectiveness, since modeling tasks help to imitate real-life communication. Role-playing games, talk shows, case studies create a safe environment for learners where they can develop communication skills, try different forms of behavior, react to any kind of attitude of participants and see their feedback. CLIL tasks embedded in our course increased students' motivation to study foreign cultures. Learners realized the necessity to be purposefully trained and to be able to communicate at an intercultural level as part of their professional qualification.

Thus, successful results of the pedagogical experience on the course for biomedical engineering students allow us talking about its effectiveness in terms of mastering both the foreign language communicative competence (including four basic skills, language aspects and intercultural awareness) and professional skills. As a result of mastering the course material, students can participate in the discussion of various professional problems arising in the field of biomedical technologies in English, find and use the necessary professional information from foreign sources, read professional texts, and communicate with foreign partners both orally and in writing.

A CLIL lesson for Biomedical Engineering

In order to consider the features of the process of implementing teaching English to students of Biomedical Engineering with elements of the CLIL approach on specific subject content, it is necessary to clarify the stages and elements of a CLIL lesson.

As mentioned above any CLIL lesson should be built in compliance with the principles of 4C: content, cognition, communication and culture [6]. We propose to follow a four-stage algorithm.

The first stage involves some sort of warming-up aimed at activating the existing background knowledge and at involving students in the process of mastering information in a foreign language; collective goal-setting – discussion of goals and expected learning outcomes with students (preparatory work with content).

The second stage implies fully-fledged work with the text and the simultaneous development of thinking skills, thus encompassing two principles at once – content and cognition. Speaking about cognitive skills, it is necessary to mention the hierarchical system of B. S. Bloom, which includes six mental functions, divided into two groups:

- low order thinking skills (LOTS) – knowledge, understanding, use;
- high order thinking skills (HOTS) – analysis, synthesis, evaluation [16].

In accordance with this theory, work with a text must be built starting with low-order thinking skills (giving such tasks as: to make a list, to highlight and identify signs, to apply, to illustrate) and then moving on to tasks that form high-order thinking skills (to analyze, to compare, to identify differences, to come up with, to develop a plan, to prove, to predict, etc.). As specific techniques, various means of visual organization of the text can be used: mental and concept maps, diagrams, flowcharts, etc.

The third stage focuses on communication and language as means of communication. It is necessary to draw students' attention to the linguistic component of CLIL here. At this stage they study lexical and grammatical features of the text material, as well as practice the target language and structures in situations of real communication in a foreign language.

The fourth stage is oriented at raising students' cultural awareness and developing intercultural skills. Culture influences the perception of the world around us, considering language as a means of expressing this vision. Acceptance of the differences between one's own and another culture makes students think about the uniqueness of the information obtained from the text, and consider it from different points of view, thereby building their own understanding of a phenomenon or situation. The ability to identify the linguocultural features of the text material, the skills to switch between their own and foreign cultural traditions quickly are the foundation of successful integrated learning. In a practical sense, these can be tasks of determining the differences in the vocabulary of certain variations of a foreign language.

Thus, the main elements of a CLIL lesson can be:

- warming-up;
- discussing learning objectives and expected learning outcomes with students;

- identifying already existing knowledge of students on the topic of the lesson;
- reading a text/or watching a video and searching for specific information;
- working in pairs or groups to compare the results of the completed assignments/to process the information received and its presentation;
- discussing issues by the whole group in order to develop students' critical thinking skills;
- summarizing the results of the group discussion;
- making sure the goals and objectives set at the beginning of the lesson are achieved [21].

The above CLIL principles and the main elements of the CLIL lesson formed the basis of our course of English for students of Biomedical Engineering.

Below are examples of some of assignments and activities for a CLIL lesson on the topic “The endoscope” (Module 2 “Bioinstrumentation”) that are designed to meet the learning objectives that can be divided into three categories.

General objectives are:

- to understand and produce contextualized oral and written messages in English;
- to acquire basic linguistic structures to allow proper communication;
- to transmit ideas to different people in English;
- to read and understand as a tool for expressing ideas, feelings or needs;
- to use a foreign language as a tool for learning non-linguistic contents;
- and to encourage students to improve their identification and problem-solving skills, as well as their ability to reflect on any kind of process.

Content objectives are:

- to introduce the working principle of endoscopes;
- to study the endoscope application procedure.

Language objectives are:

- to apply the past simple tense to tell about the history of the endoscope invention;
- to familiarize students with the semantic field of “endoscope”;
- to read and understand a text dealing with endoscope device.

Assignments and activities for a CLIL lesson

For the first stage we propose to organize a discussion in order to identify the background knowledge of the subject and define the goals and objective for the lesson with the students. As can be seen from Fig. 5 students are supposed to answer the question. This can be done in small groups with further exchange of ideas or as a class activity, which is appropriate in small groups.

The second stage aims at introducing the subject content and developing thinking skills of low and high order. For example, students read a report on the diagnostic endoscopy and deal with both content and language. Although the primary goal is to teach students about the medical procedure and tools used, it is important to make sure that learners are familiar with the words and terminology. The sample task is shown in Fig. 6.

Flexible Endoscope Anatomy

Questions for discussion:

1. What do you know about an endoscope?
2. When is an endoscope used?

Fig. 5. A sample task for the first stage of a CLIL lesson

Read a report on the diagnostic endoscopy. Check the meanings of the highlighted words in the dictionary. Which words do you know? Ask your speaking partner what words he/she does not know.

EXAMINATION

Informed consent was **obtained** from the patient after discussing **risks and benefits** of the procedure. The patient was connected to the **pulse oximeter** and placed **in the left lateral position**. Oxygen was provided through a **nasal cannula** and the **premedication administered** as stated. The endoscope was **introduced into** the oesophagus. At the end of the examination the patient was **transferred** to the **recovery area** to **recuperate**.

Fig. 6. A sample task for the second stage of a CLIL lesson

The *third* stage involves in-depth work on the language students are exposed to. They do exercises to practice the target language. For example they replace the words in the text with those from their active vocabulary (Fig. 7), or they practice the target vocabulary in role-plays (Fig.8).

After connecting the patient to an (1) instrument which measures levels of oxygen in the blood and pulse rate and placing him (2) on his left side, oxygen was provided through a (3) tube in his nose and the (4) drug treatment prior to the procedure administered as stated. Shortly afterward, the endoscope was (5) inserted into the oesophagus. After the examination, the patient was (6) moved to the recovery area.

Fig. 7. A Sample tasks for the third stage of a CLIL lesson

Doctor James is talking his patient through an endoscopy:

Now, I'm *lubricating* the tube with a *jelly* which contains a *local anaesthetic*. It'll help to ensure a smooth passage as it *passes down* and you shouldn't feel too much.

I'm going to *feed* the tube *through* your nose. This is the most uncomfortable part of the procedure but it is very brief. You'll *get used to* the tube in a few minutes time. Ok, when it hits the back of your throat, *take a deliberate swallow*. I'll tell you when.

Fig. 8. A sample activity to practice target vocabulary

As can be seen from these sample tasks, the art of a CLIL teacher is in a skillful combination and maintaining a balance between content and language, while developing students' communicative and cultural competencies.

Conclusion

To sum up, it must be noted that the CLIL approach to teaching engineering students English can be considered to be efficient as it combines learning a foreign language and profession-related content. The approach allows following the requirements of the Standard regarding the development of essential competencies and attaining short and long-term goals of learning a foreign language. The main principles of CLIL – content, communication, cognition and culture – form the basis for designing courses in English for students that are aimed at helping learners to master a language and be able to use it in professional areas at national and international levels to solve various problems.

References

1. Uvarov V.I. [Actual problems of teaching a foreign language in a non-linguistic university and their possible solutions], *Vestnik RGGU. Seriya: Psikhologiya. Pedagogika. Obrazovaniye* [Bulletin of the Russian State University for the Humanities. Series: Psychology. Pedagogy. Education], 2018, no. 3 (13), pp. 145-156, doi: 10.28995/2073-6398-2018-3-145-156 (In Russ., abstract in Eng.)
2. Batunova I.V. [The process of teaching foreign (English) language in non-linguistic universities], *Mezhdunarodnyy nauchno-issledovatel'skiy zhurnal* [International research journal], 2017, no. 1-3 (55), pp. 25-27, doi: 10.23670/IRJ.2017.55.035 (In Russ., abstract in Eng.)
3. https://www.researchgate.net/publication/281444311_Competency-Based_Education_History_Opportunities_and_Challenges/link/55e77f5908ae65b638995a2d/download (accessed 01 March 2021).
4. Nodine T.R. How Did we Get Here? A Brief History of Competency-Based Higher Education in the United States, *Competency-Based Education*, 2016, vol. 1, pp. 5-11, doi: 10.1002/cbe2.1004
5. <https://www.garant.ru/products/ipo/prime/doc/70864602/> (accessed 14 May 2021).
6. Coyle D., Hood P., Marsh D. *CLIL: Content and Language Integrated Learning*, Cambridge: Cambridge University Press, 2010, 184 p.

7. Somers Th. Multilingualism for Europeans, Monolingualism for Immigrants?: Towards Policy-Based Inclusion of Immigrant Minority Language Students in Content and Language Integrated Learning (CLIL), *European Journal of Language Policy*, 2018, vol. 10, no. 2, pp. 203-228, doi:10.3828/ejlp.2018.12.
8. Meyer O. *Basic Issues in EFL Teaching*, Universitätsverlag Winter GmbH Heidelberg, 2013, pp. 295-313.
9. https://www.unifg.it/sites/default/files/allegatiparagrafo/21-012014/mehisto_criteria_for_producing_clil_learning_material.pdf (accessed 14 May 2021).
10. Wood R.E., Mento A.J., Locke E.A. Talk Complexity as a Moderator of Goal Effects: A Meta- Analysis, *Journal of Applied Psychology*, 1987, vol. 72, no. 3, pp. 416-425.
11. Reeve J., Jang H., Carrell D., Jeon S., Barch J. Enhancing Students' Engagement by Increasing Teachers' Autonomy Support, *Motivation and Emotion*, 2004, vol. 28, no. 2, pp. 147-169.
12. Johnson D.W., Johnson R.T., Holubec E. *Cooperation in the Classroom*, Edina, MN: Interaction Book Company, 1988, 328 p.
13. <https://languages.dk/archive/clil4u/book/CLIL%20Book%20En.pdf> (accessed 14 May 2021).
14. Johnson D.W., Johnson R.T. Learning Together and Alone: Overview and Meta-analysis, *Asia Pacific Journal of Education*, 2002, vol. 22, no. 1, pp. 95-105.
15. Van Lier L. *Interaction in the Language Curriculum: Awareness, Autonomy and Authenticity*, London: Longman, 1996, 248 p.
16. Bloom B.S. *Taxonomy of Educational Objectives*, Boston, MA: Pearson Education, 1984, 131 p.
17. Gibbons P. *Scaffolding Language, Scaffolding Learning: Teaching Second Language Learners in the Mainstream Classroom*, Portsmouth: Heinemann, 2002, 165 p.
18. Walqui A. Scaffolding Instruction for English Language Learners: A Conceptual Framework, *The International Journal of Bilingual Education and Bilingualism*, 2006, vol. 9, no. 2, pp. 159-180, doi:10.1080/13670050608668639
19. Dong X. Cultural Differences and Cultivation of Cross-cultural Communicative Competence in Chinese FLT, *International Education Studies*, 2009, vol. 2, no. 2, pp. 22-25, doi:10.5539/ies.v2n2p22
20. Kramsch C. *Context and Culture in Language Teaching*, Oxford: Oxford University Press, 1993, 295 p.
21. Mehisto P., Marsh D., Frigols M.J. *Uncovering CLIL: Content and Language*, Oxford: Macmillan Education, 2008, 238 p.

Список литературы

1. Уваров, В. И. Актуальные проблемы преподавания иностранного языка в неязыковом вузе и их возможные решения / В. И. Уваров // Вестник РГГУ. Серия: Психология. Педагогика. Образование. – 2018. – № 3 (13). – С. 145 – 156. doi: 10.28995/2073-6398-2018-3-145-156
2. Батунова, И. В. Процесс обучения иностранному (английскому) языку в неязыковых вузах / И. В. Батунова // Междунар. науч.-исслед. журнал. – 2017. – № 1-3 (55). – С. 25 – 27. doi: 10.23670/IRJ.2017.55.035
3. Ford, K. Competency-Based Education: History, Opportunities, and Challenges. – Текст : электронный / К. Ford // Center for Innovation in Learning and Student Success. – 2014. – 23 p. – URL : https://www.researchgate.net/publication/281444311_Competency-Based_Education_History_Opportunities_and_Challenges/link/55e77f5908ae65b638995a2d/download (дата обращения: 01.03.2021).

4. Nodine, T. R. How Did we Get Here? A Brief History of Competency-Based Higher Education in the United States / T. R. Nodine // *Competency-Based Education*. – 2016. – Vol. 1. – P. 5 – 11. doi: 10.1002/cbe2.1004
5. Об утверждении федерального государственного образовательного стандарта высшего образования по направлению подготовки 12.03.04 Биотехнические системы и технологии (уровень бакалавриата) : приказ Минобрнауки России от 12.03.2015 г. № 216. – Текст : электронный // Гарант.ру. – URL : <https://www.garant.ru/products/ipo/prime/doc/70864602/> (дата обращения: 14.05.2021).
6. Coyle, D. CLIL: Content and Language Integrated Learning / D. Coyle, P. Hood, D. Marsh. – Cambridge : Cambridge University Press, 2010. – 184 p.
7. Somers, Th. Multilingualism for Europeans, Monolingualism for Immigrants?: Towards Policy-Based Inclusion of Immigrant Minority Language Students in Content and Language Integrated Learning (CLIL) / Th. Somers // *European Journal of Language Policy*. – 2018. – Vol. 10, No. 2. – P. 203 – 228. doi:10.3828/ejlp.2018.12.
8. Meyer, O. Introducing the CLIL-Pyramid: Key Strategies and Principles for CLIL Planning and Teaching / O. Meyer // *Basic Issues in EFL Teaching*. – Universitätsverlag Winter GmbH Heidelberg, 2013. – P. 295 – 313.
9. Mehisto, P. Criteria for Producing CLIL Learning Material. – Текст : электронный / P. Mehisto // *Encuentro* 21. – 2012. – P. 15 – 33. – URL : https://www.unifg.it/sites/default/files/allegatiparagrafo/21-012014/mehisto_criteria_for_producing_clil_learning_material.pdf (дата обращения: 14.05.2021).
10. Wood, R. E. Talk Complexity as a Moderator of Goal Effects: A Meta-Analysis / R. E. Wood, A. J. Mento, E. A. Locke // *Journal of Applied Psychology*. – 1987. – Vol. 72, No. 3. – P. 416 – 425.
11. Enhancing Students' Engagement by Increasing Teachers' Autonomy Support / J. Reeve, H. Jang, D. Carrell [et al.] // *Motivation and Emotion*. – 2004. – Vol. 28, No. 2. – P. 147 – 169.
12. Johnson, D. W. Cooperation in the Classroom / D. W. Johnson, R. T. Johnson, E. Holubec. – Edina, MN : Interaction Book Company, 1988. – 328 p.
13. The CLIL Guide Book. – Текст : электронный. – URL : <https://languages.dk/archive/clil4u/book/CLIL%20Book%20En.pdf> (дата обращения: 14.05.2021).
14. Johnson, D. W. Learning Together and Alone: Overview and Meta-analysis / D. W. Johnson, R. T. Johnson // *Asia Pacific Journal of Education*. – 2002. – Vol. 22, No. 1. – P. 95 – 105.
15. Van Lier, L. Interaction in the Language Curriculum: Awareness, Autonomy and Authenticity / L. Van Lier. – London : Longman, 1996. – 248 p.
16. Bloom, B. S. Taxonomy of Educational Objectives / B. S. Bloom. – Boston, MA : Pearson Education, 1984. – 131 p.
17. Gibbons, P. Scaffolding Language, Scaffolding Learning: Teaching Second Language Learners in the Mainstream Classroom / P. Gibbons. – Portsmouth : Heinemann, 2002. – 165 p.
18. Walqui, A. Scaffolding Instruction for English Language Learners: A Conceptual Framework / A. Walqui // *The International Journal of Bilingual Education and Bilingualism*. – 2006. – Vol. 9, No. 2. – P. 159 – 180. doi:10.1080/13670050608668639
19. Dong, X. Cultural Differences and Cultivation of Cross-cultural Communicative Competence in Chinese FLT / X. Dong // *International Education Studies*. – 2009. – Vol. 2, No. 2. – P. 22 – 25. doi:10.5539/ies.v2n2p22
20. Kramsch, C. Context and Culture in Language Teaching / C. Kramsch. – Oxford : Oxford University Press, 1993. – 295 p.
21. Mehisto, P. Uncovering CLIL: Content and Language / P. Mehisto, D. Marsh, M. J. Frigols. – Oxford : Macmillan Education, 2008. – 238 p.

**Предметно-языковой интегрированный подход
к обучению иностранному языку студентов
инженерных направлений подготовки**

**Н. А. Гунина, Е. Ю. Воякина,
Л. Ю. Королева, Т. В. Мордовина**

*ФГБОУ ВО «Тамбовский государственный
технический университет», г. Тамбов, Россия*

Ключевые слова: CLIL (предметно-языковое интегрированное обучение); английский для профессионального общения; коммуникативная компетенция; университетские курсы.

Аннотация: В современной системе обучения иностранным языкам используются различные подходы к формированию языковых компетенций, необходимых для профессионального общения. Один из них – предметно-языковое интегрированное обучение (CLIL), инновационный метод обучения языку, в котором изучение иностранного языка происходит параллельно с изучением профессионального содержания. Рассмотрен опыт разработки курса английского языка для студентов, обучающихся по профилю «Инженерное дело в медико-биологической практике» с элементами подхода CLIL. Представлено теоретическое обоснование для внедрения CLIL в рамках компетентностного подхода. Приведены основные принципы предметно-языкового интегрированного обучения. Дано описание особенностей проектирования учебного курса и его структуры, а также основных критериев отбора учебных материалов. Показаны примеры заданий, используемые в условиях предметно-языкового интегрированного обучения.

© Н. А. Гунина, Е. Ю. Воякина,
Л. Ю. Королева, Т. В. Мордовина, 2021