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## Cooperative Learning Approach to Delivering Professional Modules to Bachelor and Master Students: TPU Experience

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### Abstract

Modern tendencies in engineering education set certain requirements on the competences to be obtained. To enable a future engineer to work at a highly competitive level and become an internationally recognized specialist, they must possess advanced English speaking and writing skills. At present most universities introduce educational programs that attract bright domestic and international students to ensure that they are in demand at the global market. The Strategic Program on Competitiveness Enhancement of National Research Tomsk Polytechnic University proposes that modules of professional training should be developed and delivered in English as a language of instruction so that the quality of teaching could be raised. To develop their own approaches to teaching, improve their language proficiency and develop courses and their elements in English, TPU teachers are to meet these challenging requirements and design course documentation and teaching aids, and engage modern teaching approaches in order to ensure high quality work with student groups which are often mixed in their abilities in both professional subjects and language proficiency levels. This paper addresses the course “Professional Training in English” which was developed upon completion of the joint program of TPU and the University of Southampton “Delivering through the Medium of English” and has successfully been delivered to bachelor students with the major “Oil and Gas Engineering” using the cooperative learning approach. The cooperative learning approach has proved to be one of the most successful in terms of teaching professional English to groups of students with mixed abilities.

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## 1. Introduction

The importance of human capital and skills in the modern world economy creates certain requirements for the quality of a university graduate. Thus, most Russian universities today are involved in the process of transforming of the teaching process to make it better accord with the professional demand.

Traditional teaching is often substituted for the competence-based approach when its teaching-learning processes are based on a model of competencies and skills associated with professional profiles (Santandreu-Mascarell et al., 2011).

One of the crucial competencies which is included in the personal and professional portfolio of any prospective university graduate is their communicative competence and English language proficiency, which will enable them to compete with a global work force for job positions.

National Research Tomsk Polytechnic University (TPU) regards the development of the English language proficiency and communicative competence of its students and employees as an important strategic goal to be achieved. This is viewed as one of the steps listed in the Strategic Program of National Research Tomsk Polytechnic University Competitiveness Enhancement in the group of Top Level World Research and Academic Institutions (TPU Strategic Program) for 2013-2020 in order “to become one of the world-leading research universities in the area of resource-efficient technologies solving global societal, economic and environmental problems for the benefit of mankind’s sustainable development” (Chubik 2013, 2015). To improve the English language proficiency and increase the communicative competence of students and employees, new approaches to the teaching-learning process are being introduced and new language enhancement programs for university staff members are being developed.

To create the bilingual environment for students and employees in order to attract bright domestic and international students and world-recognized academics, as well as to conduct research and educational activities, some tremendous changes are being made to design new courses and syllabi which are to be taught in English. More than 200 courses are now delivered in English in TPU for bachelor, master degrees and double degree educational programs.

Delivering educational courses in English require the teachers involved in the process to obtain a sufficient level of English language proficiency and training in how to design appropriate teaching materials and apply modern didactic methods and approaches. TPU teachers enjoy the opportunity to join courses to develop their professional competencies to meet the challenges of the Strategic Program.

The course “Delivering through the Medium of English” was created in 2012 as a joint training program between TPU, Russia, and the University of Southampton, UK. The program aims to prepare content teachers to design and deliver educational courses for bachelor and master students of TPU with the use of modern didactic approaches and with regard to current tendencies in professional training of students (Slesarenko, Page, Francuzskaya, & Golubeva, 2015).

The purpose of the paper is to report on the experience of the educational courses developed upon completion of the joint program “Delivering through the Medium of English” which have been delivered in National Research Tomsk Polytechnic University for within one academic year.

## 2. “Delivering through the Medium of English” program details

National Research Tomsk Polytechnic University has more than 16 years’ experience of professional training in organizing foreign language programs for content teachers and university employees. There exist programs for language proficiency improvement and those for professional training of content teachers in methods of teaching in English. Language courses end with exams to obtain a language proficiency certificate (TPU Certificate or international certificates) which is a permit to teach in English. A set of programs is also focused on the improvement of teaching methods used in TPU, as well as methods of teaching domestic and international students in English.

The joint program of TPU and the University of Southampton, which was designed in 2012, provides young people with an opportunity to attend a two-week training program “Delivering through the Medium of English” for young TPU teachers and researchers at the University of Southampton, UK. The three-year run of the program is an

indication of its effectiveness, which is seen in the skills and competencies developed in the course by TPU content teachers. One hundred representatives from most of TPU's institutes have participated in the program at present. On completion of the program, participants design and deliver educational courses which are to be taught in English.

### *2.1. Goals and objectives*

The goal of the program “Delivering through the Medium of English” is to develop pedagogical competence in the field of teaching in English and enable participants to design an educational course based on modern international standards ([http://portal.tpu.ru:7777/departments/kafedra/mpiya/Programms/Tab2/19\\_Osuch\\_prof\\_angl.pdf](http://portal.tpu.ru:7777/departments/kafedra/mpiya/Programms/Tab2/19_Osuch_prof_angl.pdf)).

Participants learn to use the metalanguage of teaching - academic terminology of teaching professional disciplines in English – thus making the language a tool that can enable both teachers and students to achieve greater academic success by gaining confidence in the usage of the language.

Program participants also practice designing teaching materials in English, setting learning objectives and mastering results, applying appropriate methods of teaching and establishing assessment criteria. They are required to review and analyse didactic materials critically and to use modern didactic tools to plan the educational course properly. Such specific training empowers the program participant to broaden their professional outlook and make professional contacts in various interdisciplinary fields.

Program developers regard the final product of the course as greatly practice-oriented and envision it as consisting of two parts:

- such course documentation in English as a syllabus, calendar plan with ranked assessments for students, course annotation;
- teaching materials for the course delivered: lesson scenarios, seminar and lecture notes and presentations.

### *2.2. Program delivery results*

On the completion of the joint program “Delivering through the Medium of English” in 2014, the participants introduced their developed courses into the teaching process in TPU. As reported, 26 participants in 2014 designed 27 courses to be delivered in English. Bachelor degree program courses made up 60% of the total amount, which is 16 courses out of 27. 6 courses, or 22%, were assigned to master degree programs, and 2 courses, or 8%, were designed for double degree programs. Additionally, 2 courses, or 8 %, were created for language enhancement programs. The number of teaching hours of the courses developed ranged from 16 to 288 according to TPU curricula.

One the courses, “Professional training in English”, developed for bachelors majoring in Oil and Gas Engineering was designed during the study in 2014. This course has proved quite successful and is further discussed in the paper.

## **3. Teaching English for professional purposes in TPU**

TPU has always demonstrated effective language training in both general and professional English. Originally delivered by linguists in departments of foreign languages of TPU, English for professional purposes has been taught by content teachers from the field - specific departments since the 2014-2015 academic year. This new approach to teaching English for professional purposes has revealed certain benefits and challenges.

There are some obvious advantages to the approach and one of them is that the discipline is now delivered by content teachers of graduate chairs who are experienced in the field, hold research degrees and have taught such courses in Russian. This enables the students to master the metalanguage of their professional studies. Another advantage is that a wider range of properly selected teaching and guidance materials can be provided due to the content teacher's expertise, research experience and field-specific practical knowledge. The students benefit from this learning through practical materials and real life examples.

Some challenges to realizing the strategy should be mentioned, however. First of all, students' English language proficiency should be taken into consideration as many state financed domestic students do not always demonstrate sufficient language skills. Those who actually do often have to be enrolled in the same groups, thus creating a mixed ability unit which must be approached differently from the perspective of teaching.

Secondly, highly qualified teachers are not always proficient enough in the English language to deliver a course in English for professional purposes properly, and have to take language enhancement courses before they start their teaching practice in this field. Another closely connected difficulty is designing methodologically sufficient teaching materials in English.

Evidently, handling the problem of the teaching staff's English proficiency can solve the difficulties of developing the applicable methodological support for the course in professional English, though some time lag is required as designing, testing and implementing teaching materials is a time-consuming process.

The first problem stated above is more complicated as it involves both pupils' – future students' – secondary education and fundamental education of first and second year students in English. Changing the university admission requirements or additional testing of language proficiency could result in decreasing the number of the students enrolled. One possible solution to the problem could be secondary school outreach activities and extra language support for bachelor students.

### *3.1. Course realisation experience*

The course "Professional Training in English" for bachelor students with the major "Oil and Gas Engineering" was developed upon the completion of the joint program "Delivering through the Medium of English" and has been taught for one academic year (2014-2015). Taking into account all the specific conditions as to the mixed ability of groups of students and the distinguishing features of teaching materials for the course, the discipline has been delivered with the use of a cooperative approach to teaching small groups of students in order to reach the goal and achieve the planned results and mastering of the material.

### *3.2. Goals and objectives*

The goal of the course "Professional Training in English" is the preparation of students for industrial and technological, project and administrative, and managerial activities to enable them to make professional decisions in interdisciplinary fields of modern oil and gas technologies, as well as to develop an ability to provide reasons and defend their own conclusions and deductions in English in front of audiences of various levels of interdisciplinary and professional competence. Apart from that, the course "Professional Training in English" is oriented toward the development of students' professional competencies according to the bachelor program "Operation and maintenance of objects of transportation and storage of oil, gas and petroleum refinery products".

The course B1.VM4.1.1 "Professional Training in English" will prepare bachelor degree students for the following types of professional activities: research, industrial, and project and technological performance in the field of oil and gas engineering (Saltyakov, 2014).

### *3.3. Course structure and contents*

The course "Professional Training in English" is divided into four sections, each lasting for a semester. Each section is comprised of 69 to 76 teaching hours which are delivered in the form of practice. The main goal of each teaching session is to promote students' oral and written communication on professional topics.

Table 1. Contents and structure of the course “Professional Training in English”

Semester number	Section contents	Number of teaching hours
Semester 5 (Year 3)	Acquiring skills in the use of the metalanguage in the field of future professional performance according to program track 21.03.01 “Oil and Gas” in the specialization of “Construction and maintenance of pipeline transport system objects”.  1. Metalanguage practice in English metalanguage in the field of future professional performance according to program track 21.03.01 “Oil and Gas” with specialization in “Construction and maintenance of pipeline transport system objects”.  2. Matching American and European units of measure	69
Semester 6 (Year 3)	Acquiring skills in the use of the metalanguage in the field of future professional performance according to the program track 21.03.01 “Oil and Gas” with specialization in “Operation and maintenance of objects of transportation and storage of oil, gas and petroleum refinery products”.  1. Metalanguage practice in English metalanguage in the field of future professional performance according to program track 21.03.01 “Oil and Gas” with specialization in “Operation and maintenance of objects of transportation and storage of oil, gas and petroleum refinery products”;  2. Introduction to the system of international standards a. British and American standard systems. Similarities and differences. b. European standard of metal industrial pipelines EN13480: conditions of selection and implementation of pipes, pipeline classes, pipeline systems and their component engineering; calculations of pipeline strength and flexibility; c. European standard EN14161: engineering criteria, tracing and selecting construction materials, insulation, corrosion protection; station and reservoir park engineering; construction, testing, and adjusting and startup procedures.	69
Semester 7 (Year 4)	Development of professional reading and writing skills in the field of future professional performance according to program track 21.03.01 “Oil and Gas”  a. Reading and critical analysis of resources, including up-to-date research papers on the topic of students’ bachelor theses in English;  b. Writing in English on the topic of students’ bachelor theses in English.	74
Semester 8 (Year 4)	Speaking and discussion skills development in the field of future professional performance according to program track 21.03.01 “Oil and Gas”  a. Reporting and presenting in English on the topic of students’ bachelor theses in English;  b. Group discussions in English on professional topics.	74
Total number of teaching hours		288

### 3.4. Expected mastering results

On the completion of the course B1.VM4.1.1 “Professional Training in English,” a bachelor student acquires the following knowledge, skills and experience which are demonstrated in English and ensure the achievement of goals numbered 1, 4, and 5 in the educational program “Oil and Gas Engineering” curriculum:

- Graduates’ readiness for industrial, technological and project performance, which provides modernization, implementation and operation of equipment for oil and gas extraction, transportation and storage;
- Graduates’ readiness for organizational and administrative activity in decision making in the interdisciplinary fields of modern oil and gas technologies on the principles of management and administration;
- Graduates’ ability to give reasons and defend their own conclusions and deductions in front of audiences of various levels of interdisciplinary and professional competence.

On the successful completion of the course B1.VM4.1.1 “Professional Training in English” students will be able to:

- Understand the vocabulary which is essential for oral and written professional communication in English;
- Perform professional functions through the medium of English such as holding negotiations and discussions without the need for an interpreter.

### 3.5. Final assessment

The final assessment method on the completion of the course is a presentation of research results, and a report on them in the format of a mini conference.

## 4. Pedagogical conditions

With the goal of effective program realisation, special pedagogical conditions have been designed and provided for. The course B1.VM4.1.1 “Professional Training in English” has been delivered for one academic year (2014-2015).

The basic challenges to course delivery have been the insufficient general educational background of the students and their low motivation to develop professional competencies in English. This could be explained by the fact that the majority of the department graduates on the completion of their bachelor’s degree receive invitations from major oil and gas companies, or that their education is originally financed by those companies. Another challenge is the incomplete development of methodological support and teaching materials, which is due to the recent course implementation in the university teaching process.

The advantages of the course developed have been quite prominent, however. One should mention the marked increase in the number of research papers and reports in English prepared by the students of the course for the international symposium which is annually organized on the premises of the Institute of Natural Resources, TPU. Another advantage is that more students have gained an interest in developing their professional skills in English and in participation in double degree programs. The teacher continues the follow up revision and quality improvement of the teaching materials by way of an annual update of the bank of professional topics based on students’ research projects completed by the students thanks to the learner-centered teaching approach.

## 5. Cooperative learning approach

The learner-centered approach makes it possible to activate the cognitive and educational activity of every student and provide them with opportunities to practice oral communication. A prominent example of the approach is the method of teaching and learning in smaller groups – cooperative learning – arranging students into smaller groups for their collective activity (Korzyuk, 2013). One of the important goals of cooperative learning is regarded as the organization of students’ active classroom work in various professional situations, as well as the development of communicative and intellectual skills of critical thinking. This approach creates favorable conditions for the development of mutual cooperation and common thinking within a group of students. It can also be effectively used in a group of international students studying in English (Boyarintseva, 2007). The cooperative learning approach meets the demands of teaching the course “Professional Training in English” in “Oil and Gas Engineering” as it makes it possible to achieve the goals and to master subject material.

Advantages of teaching smaller groups of students are illustrated by international studies such as those by D. Johnson, R. Johnson, S. Ragan, R. Slavin and many others (Johnson & Johnson, 1994; Kagan, 1994; Slavin, 1994). Teaching smaller groups is based on the principles of cooperation in the group, positive dependence of group members on one another, and their equal participation for the benefit of the whole group. This positive dependence, which stimulates learning, is possible to arrange in a variety of ways, but the group should have something in common that encourages cooperation (a common target, a reward, learning materials, etc.) (Selevko, 1998).

When arranging group work, special attention is to be paid to such aspects as students’ skills which enable them to work in groups; supporting all the tasks with clear instructions; providing the students with adequate time limits for task completion.

The cooperative learning approach is also effective due to such features as:

- performing a split-level approach to teaching a course (Boyarintseva, 2007);
- experiencing “skill interchange” among students with each other in the process of working in a small group;
- methodical diversity of teaching sessions and switching the mode of teaching that keeps students’ working capacity going;
- activating students’ performance through group work (Khanin, 2005).

A teacher’s methodical readiness to arrange students’ work should also be mentioned as its lack leads to some typical mistakes:

- the work is arranged so that some students have to work really hard while others remain passive and do not participate at all;
- poor assignment of roles and duties that enables group leaders to exclude some students from the group activity and perform the work by themselves;
- some of the ideas generated in the group work remain unattended (Boyarintseva, 2007; Selevko, 1998).

Realisation of the cooperative approach through teaching smaller groups requires activating teacher performance as a moderator and guide who coordinates the work of a student group to achieve the planned results (Boyarintseva, 2007).

A smaller group also proves effective when arranging students’ independent work, for instance, when preparing presentations on project results, or when working on the projects as one of the forms of final assessment (Korzyuk, 2013).

A systematic analysis of group work organization enables the teacher to maintain the quality of students’ work in accordance with high standards. Besides, any group work can benefit from a teacher’s ability to listen to students and hear them out, to ask them thought provoking questions, and to provide constructive feedback (Selevko, 1998).

The cooperative learning approach is easily combined with many other approaches to teaching and learning. Many studies of the concept of teaching in small groups state that this approach is most effective when combined with a traditional teaching format.

## **6. Results of implementing the cooperative approach**

On the basis of one year of course delivery with the implementation of the learner-centered approach and cooperative learning through teaching smaller groups, and the realisation of the whole system of professional training in English by the graduate departments of TPU, some positive results can be reported.

The teaching achievements of the course include an increase in students’ motivation to learn, and what is more, to use the English language in the learning process and research. An increase in the number of students’ reports and research papers in English at student conferences can be mentioned, as well as students’ participation in courses delivered in English by visiting academics from international universities, which indicates improved language proficiency. The interest that students’ demonstrate in double degree programs also proves the necessity to continue the course based on the learner-centered approach, and to further develop the course’s methodological support and teaching materials. Another aspect that should be taken into account is the language and methodological enhancement of the teaching staff of the graduate departments which conduct the programs in professional English as well as the implementation of the system of blended learning in order to improve the students’ autonomy.

## **7. Future prospects**

The course “Professional Training in English” has demonstrated positive results of the use of the approaches developed through the joint program of TPU and the University of Southampton. For the further course development the following steps should be taken:

- Additional and further work on methodological support and teaching materials should be performed;
- The blended learning approach could be introduced into the teaching and learning process as it makes it possible to optimize the work of mixed ability groups of students and to increase the flexibility of the educational process which will result in students’ better learning abilities and in mastering course material.

## 8. Conclusion

The educational course “Professional Training in English” developed through the joint program of National Research Tomsk Polytechnic University, Russia, and the University of Southampton, UK, is based on a cooperative learning approach and has been delivered to bachelor students with the major “Oil and Gas Engineering” for one academic year. The course has demonstrated that the application of a learner-centered approach combined with a cooperative approach promotes students’ communicative competence in both written and oral speech, as well as in their field-specific English skills.

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