

## **EXTEND Project: Systematic Approach to Curricula Development**

**Elisabeth LAZAROU**

University Politehnica of Bucharest, Bucharest, Romania

[elisabeth.lazarou@upb.ro](mailto:elisabeth.lazarou@upb.ro)

**Natalya ZERKINA**

Nosov Magnitogorsk State Technical University, Magnitogorsk, Russia

[agatik01@mail.ru](mailto:agatik01@mail.ru)

**Yulia SAVINOVA**

Nosov Magnitogorsk State Technical University, Magnitogorsk, Russia

[savinova\\_july@mail.ru](mailto:savinova_july@mail.ru)

### **ABSTRACT**

*EXTEND project is aimed at modernizing approaches to teaching engineering disciplines in Russia and Tajikistan, increasing quality of education and possibilities of employment for young engineers, students' motivation and making engineering education attractive. Modern universities carry out not only professional training of students, but also prepare competitively capable personnel who can survive and thrive in modern free market relations, accompanied by a variety of forms of ownership and competition. International educational projects are relevant as they supply universities with international experience and job possibilities. Therefore, foreign languages competence is of key importance for engineers of future generation, and is a means of forming professional, communicative, linguistic and cultural competences. Success of teaching foreign languages depends not only on teachers' skills, but on carefully selected and elaborated didactic materials as well. EXTEND project team exchange ideas and experience that result in fruitful discussion of issues concerning elaborating new courses to improve engineering education. International teams, which include EXTEND project participants from European, Russian and Tajik higher educational institutions will carry out the task. Project EXTEND is an open kind of consortium, which implies that members from partner countries subordinate to its leader and share joint responsibility for commitments of the consortium.*

**Keywords:** *EXTEND project, Higher Educational Institutions (HEIs), engineering education, international consortium*

### **INTRODUCTION**

In 2017 project Erasmus + Capacity Building in Higher Education 586060-EPP-1-2017- PO-EPPKA2-CBHE JP «Excellence in Engineering Education through Teacher Training and New Pedagogic Approaches in Russia and Tajikistan» (EXTEND) was won. General impact of the EXTEND project is related to increasing knowledge through research in Russian and Tajik engineering education. It will help to bridge EU educational experience and opportunities for future employment of students in a global context.

The project is being implemented by a consortium of higher educational institutions (HEIs) from partner countries, which includes the following universities:

- 1) Polytechnic University of Bucharest (Romania);
- 2) Riga Technical University (Latvia);
- 3) University of Minho (Portugal);

- 4) University of Warwick (England);
- 5) Bauman Moscow State Technical University (Russia);
- 6) National Research Moscow State University of Civil Engineering (Russia);
- 7) Ogarev National Research Mordovia State University (Russia);
- 8) Nosov Magnitogorsk State Technical University (Russia);
- 9) Tajik National University (Tajikistan);
- 10) Technological University of Tajikistan (Tajikistan);
- 11) Khudjand State University named after academician B. Gafurov (Tajikistan);
- 12) Kulob State University named after A. Rudaki (Tajikistan).

EXTEND project is aimed at modernizing approaches to teaching engineering disciplines in Russia and Tajikistan, increasing the quality of education and possibilities of employment for young engineers, students' motivation and making engineering education attractive. The Project is designed to elaborate the system of university teachers' training according to the principles of Bologna process and European space of higher education. The Project will be open for university teachers and post graduate students, who are planning to be lecturers of HEIs. [1]

Specific objectives of the project are the following:

- 1) The development of comprehensive model and descriptor of the competences of the university teacher of engineering disciplines;
- 2) The establishment of Network of Centres of Excellence in Engineering Education (EXTEND Centres) offering training courses, methodological research and consultations in teaching engineering disciplines in Russian Federation and Tajikistan.
- 3) The development of training programme for PhD students and experienced teachers in teaching engineering disciplines.

Nowadays, the following issues are undertaken by the Project team:

- creating the complex model and descriptors of competences for lecturers who teach engineering disciplines at HEIs;
- studying and mastering the best European practices in teaching engineering disciplines;
- monitoring pedagogic practices in engineering education at universities of Russia and Tajikistan;
- establishment of EXTEND Centres Network – centres which will improve engineering education, provide the base for researches, learning courses and consulting services for teaching engineering disciplines in Russia and Tajikistan;
- scientific research, publication of papers in scientific journals, which are indexed in Web of Science and Scopus databases, monographs and methodical manuals related to the project theme;
- elaboration of new curricula for university teachers and post graduate students according to modern methodology of teaching engineering disciplines within classical format and MOOC (mass open online courses);
- holding international scientific and practical conferences related to the project theme.

Therefore, we are strongly convinced that international projects improve engineering education at HEIs in general, and collaboration within the international consortium contributes to it, in particular.

## **INTERNATIONAL CONSORTIA AS A FORM OF IMPLEMENTATION OF COOPERATION IN THE SPHERE OF SCIENCE AND EDUCATION**

In EXTEND project interaction between HEIs is implemented in the form of cooperation within the international consortium – a network of 12 universities from European countries, Russia and Tajikistan, which collaborate on in-depth educational issues with the aim to elaborate new

educational programmes at the international level. In our case, consortium is a means of organizing mutual activity of 12 HEIs from different countries for a 3-year- period for successful implementation of EXTEND project activities, which unites goals, possibilities, technologies, intellectual property, traditions and experience of these HEIs. Project EXTEND is an open kind of consortium, which implies that all members from partner countries subordinate to its leader and share joint responsibility for commitments of the consortium. Undoubtedly, international educational projects implemented within the consortium result in novelties and qualitative improvement in the sphere of higher education, which bring together educational systems of various countries as much as possible, thus gradually forming unified, world educational space.

Thus, project-grant activity becomes a key component of higher education internationalization. The main tendencies of this activity include: combination of bilateral, multilateral and net projects; forming cross-cultural nets of partner universities representing different countries; transformation of projects having subject-matter basis into interdisciplinary ones; elaboration of new educational programmes, courses and techniques; holding educational seminars, workshops and conferences; internship of university teachers, students and PhD students abroad. These are the characteristic features of the consortia activities, which are implemented in EXTEND project as well.

According to experts, consortium serve as a good example of HEIs integration based on coordination and is “the most perspective form of the union, as it represents the quickest and cheapest way of global strategy implementation” [2]. By mutual collaboration within the consortium educational experience is significantly increased and possibilities of students and teachers from various parts of the world become equal.

Global space of higher education erases the borders and distances, inasmuch as within the consortium specific communicative culture is established, based on new communication forms and channels, informal relations between the consortium members, democracy, mutual respect, friendly and collaborative atmosphere in the international team.

The distinctive features of the consortium are the following:

- multiplicity of participants, inasmuch as the consortium is an association of two and more organizations;
- voluntary character of uniting participants, possibility of providing maximum openness and transparency of activities, improvement of communication within the consortium and outside it as well;
- the goal of the consortium activity is elaborating new knowledge-based production having, as a rule, a distinct innovative component;
- temporary character of activity, determined by the focus on implementation of some project with the possibility of reforming on achieving the planned result;
- mutual use of united resources of participants, with the aim to overcome qualitative and quantitative resource limitation of each organization;
- shared responsibility of all participants of the consortium for the process and results of the implemented activities;
- openness of the consortium, manifested in its interaction with outer partners in the process of activities aimed at the achievement of the set goal;
- its own organizational structure with possibilities to coordinate the activity of the consortium activities and its interaction with outer agents in the process of representing the interests of the consortium in the external environment [3, p.198].

## **ELABORATION OF NEW CURRICULA AS ONE OF THE MAIN OBJECTIVES OF EXTEND PROJECT**

Within the framework of EXTEND project university self-assessment «The use of educational technologies in engineering training programs» was undertaken. The self-assessment allows determining the maturity level of the educational technologies management system, including the availability and the level of development of the teacher advancement training system in the sphere of educational technologies application. The self-assessment is exercised in accordance with the key elements of the management system.

1. Policy of educational technologies development
2. Deployment of policy in the field of educational technologies
3. Exchange of knowledge, information and the best practices in the area of educational technologies
4. Infrastructure for educational technologies
5. Monitoring of effectiveness of educational technologies implementation
6. The use of electronic (digital) educational technologies
7. The use of active educational technologies
8. Professional development in the area of educational technologies application
9. Postgraduate training.

Thus, basing on the results of university self-assessment the consortium agreed upon elaboration of courses. Within the framework of the project implementation, it is planned to elaborate the following courses:

1. *Project Based Learning (PBL)*. Focus: why and how to implement PBL in engineering programs considering different approaches and contexts (interdisciplinary, cooperation with industry, etc.).
2. *E-learning and ICT Tools*. Focus: how to use different ICT tools in teaching practice and how to prepare an e-learning course.
3. *Foreign Languages for Engineering + Academic Writing*. Focus: how to introduce foreign languages in engineering programs (e.g. academic writing, intercultural contexts, etc.).
4. *Research Based Learning (PhD Students)* Focus: learning through the use of research / inquiry approaches and learning how to use research methods.
5. *Active Learning Strategies*. Focus: why and how to implement different active learning strategies to improve teaching practice (Team Based Learning (TBL) + Flipped Learning + Gamification).
6. *Curriculum Design and Development*. Focus: processes to be taken into account in order to plan, develop and deliver a curriculum (learning outcomes and competences, activities, content, resources, assessment, etc.).
7. *Assessment*. Focus: alternative methods of assessment in engineering education - "assessment for learning".
8. *Design thinking*. Focus: how to use design thinking tools in teaching and learning.
9. *Communication*. Focus: communication techniques and tools for teaching practice: storytelling, feedback, rapport, backtracking, etc.

Program principles: 1 ECTS = learning = 10 contact hours

Program of Modules: 8 Modules x 1 ECTS

A Module development team: 3 persons (8 mod \* 3 p = 24): one (1) coordinator per institution; two (2) participants per institution. The modules were selected according to the interest and engagement level.

It is worth mentioning that all courses in question will be elaborated by international teams, which include EXTEND project participants from European, Russian and Tajik HEIs. Each team comprises representatives from 3-4 universities, which jointly collaborate with the aim to elaborate new courses compiling with the new methods and techniques in this area. Each team is supervised by the group leader, who monitors the process, makes corrections, guides the work, and bears responsibility for the group work.

Internationalization of teams will undoubtedly contribute to enhancement of quality of the elaborated courses due to the fact that the final product will represent a combination of various educational systems, experience and existing researches. Moreover, cross-cultural communication within the international teams promotes rapprochement of cultures, team building, exchange of the best experience and, as a result, more detailed and careful curricula elaboration. "In the new third millennium, the requirements to foreign languages knowledge from the standpoint of the language classical grammar have already shifted towards the level of communication skills formation, the ability to combine the tools of native and foreign languages to solve industrial, educational and other common problems. A person must have a certain stock of knowledge on history, culture, system of national values, beliefs and traditions, in addition to knowledge of the linguistic structures themselves, even communicating at a professional level". [4,p. 37]

There exists a practical need in engineering specialists with a good level of language proficiency, who will use it as an instrument of their future professional activity. In this paper attention will be focused on the relevance of such course as "Foreign Languages for Engineering. Academic Writing", which will enable both students and university teachers to enhance their specialization and professional, linguistic and cultural training as well.

A high demand in such courses is explained by a growing role of international contacts of all kinds, including contacts between engineering specialists. In the elaboration of this course, much attention is given to the possibilities of using foreign language as a means of studying another subject area of technical orientation and exercising future practical activity of learners in the engineering field. The course "Foreign Languages for Engineering. Academic Writing" is aimed at developing the linguistic competence of engineering students and university lecturers teaching engineering disciplines. "Bologna Process to which Russia joined in 2003, defined the direction of integration in the sphere of the higher education that caused need of foreign languages studying in general and the professionally oriented foreign language in particular." [5,p.108], [6]

In our opinion, the course will be efficient if:

- it meets the individual requirements of students in the field of their professional development;
- methodological framework includes systemic, competence, person-oriented and activity approaches, which enable teachers to create favourable psychological and pedagogical conditions for effective processing of information.

It should be noted that the systemic approach will be applied not only for the elaboration of these courses, but for teaching them as well, due to the fact that 9 courses represent a system and develop both "soft" and "hard" skills, which are of key importance for an engineer of the new generation. Interdisciplinary communication is exercised in the course as well, which implies integration of the basic subject "Foreign Language" with general professional and specialized courses. It is planned to elaborate such sub-courses as "Foreign Languages for Power Engineers", "Foreign Languages for Civil Building Engineers", "Foreign Languages for Mining Engineers", "Foreign Languages for Machine-Building Engineers", "Foreign Languages for Metallurgists", etc.

Course organization technology includes the use of the Internet, active methods of teaching, such as Project-Based Learning (PBL); Team-Based Learning (TBL); Research-Based Learning (RBL); Flipped learning, etc. "Active learning methods aimed at developing communicative and collaboration skills, encouraging students to take responsibility for their own work were studied for further dissemination. These methods include collaborative learning groups, student-led review sessions, games, analysis or reactions to videos, film making, student debates, analysis of case studies, etc." [7, p.72]

Variation of these methods provides for building learners' communicative, professional and personal capacity; fundamentals of academic writing will be incorporated in the course for improving skills and abilities of written business communication, writing papers indexed in Web of Science and Scopus databases, which is one of the key priorities for PhD students and university teachers nowadays.

However, to achieve the set goals of EXTEND project, and elaborate a truly effective course, it is necessary to rely on some specific approaches as well.

Firstly, on the culturally sensitive approach, which considers a person as a protagonist of culture and provides for his/her general cultural training. In other words, it develops a future engineering specialist's culture.

Secondly, on the communicative approach, which is responsible for building the learners' communicative capacity during classes, and implies the use of communicatively-oriented tasks and exercises, recreating as much as possible situations of real professional communication, rather than doing substitution exercises.

Thirdly, on the interdisciplinary approach, which takes into account inter-subject links, relevant for the future engineer from the point of view of their future profession.

Fourthly, on the cognitive approach, where attention is focused on a cognitive function of the language, and linguistic units are studied functionally, i.e. directly in the professional context.

The aforementioned approaches enabled us to identify principles, relevant for the elaboration of the course:

- principle of integration of teaching with science;
- principle of professional and creative orientation of teaching;
- person-oriented principle;
- principle of interdisciplinary integration;
- principle of practical orientation of the educational process;
- principle of integration of professional and personal orientation of educational information;
- principle of ICT application;
- principle of multifunctionality of exercises;

As far as the active methods of teaching are concerned, we are strongly convinced that they are able to intensify learners' independent activity, enable them to proceed from the reproductive level to the productive and creative one. Role and business games, "gallery walks", discussion clubs, problem question, case method provide ample opportunities for engaging learners in situations of real professional communication.

The main difference between standard Foreign Language courses and the new one concerns strategies that are used at the lessons. In the new elaborated course "bottom-up strategy" will be used instead of the "top-down" one. As a rule, at the traditional classes teachers themselves define proper goals, content, methods and techniques of teaching, while in the new course it is possible to tailor them to individual learners' needs.

The elaboration of the course will include the following three stages:

1) *Preparatory stage.* At this stage the course developers analyze authentic texts, dealing with the learners' specialties, identify their morphological, grammar, genre, stylistic and lexical peculiarities, characteristic for sub-language of learners' specialty. Authentic texts should be a key component of the course (i.e. taken from professional context and intended for professionals), with the volume approximately 2500-3000 characters. Such volume of the text is enough, in our opinion, for detailed consideration of the dealt issue. In order to facilitate perceiving a big volume of information, it is recommended to divide it into sub-texts with titles, as it is psychologically easier for learners to read, perceive and anticipate information, learnt earlier.

Selected texts should retain all difficulties of the original variants, rather than be simplified and annotated. Methodical adaptation of texts can include lexical and grammar comments before or after texts, identifying a terminological core of the text, saving schemes and illustrations.

Foreign language learning will be actual for students only in case if texts do not contain information, which has already been known to them. Inasmuch as they have a relatively high level of engineering training, the cognitive gap between the existing knowledge and new information will create motivation for overcoming this gap.

2) *Material systematization stage.* At this stage the obtained material is processed, systematized, and methodical-didactical framework is prepared. This framework includes composing linguistic units in exercises. There exists an urgent need in making a special system of exercises, based on the theory of gradual forming of mental acts and utterance creation.

Receptive, reproductive, productive and communicative (creative) exercises will be extensively used in the course, and it is worth noting that the latter exercises have a prevailing role in the educational process. They are aimed at mastering both oral and written skills, enable the learners to take the lead and, therefore, actively participate in defining goals, content, methods and techniques used at the lesson (“bottom-up strategy”).

As soon as the text perception is over, learners start dealing with linguistic units (e.g. tasks for search of equivalents in native and foreign languages), gradually proceeding to the level of meaning (e.g. answer the questions, fill in the gaps, etc).

3) *Implementation stage.* Piloting courses are implemented in the curriculum of partner countries HEIs, which later can be used in EXTEND centres and other HEIs of EU, Russia and Tajikistan.

## CONCLUSION

International consortia are an effective institution for excellence in higher education, being very significant in elaborating of new curricula, solving a number of issues concerning internationalization of higher education, facilitating innovative potential of universities and disseminating the best practices in the sphere of higher education.

International consortia give a unique opportunity to combine theory and practice together, and implement the achieved results for the well-being of future generation education, and give a platform for approbation and implementation of the researched results.

Organization of EXTEND centres and online access to courses will broaden the educational horizons for learners. Regardless of the place of their living, students will be able to complete the elaborated courses at any partner university of the consortium, or use their electronic databases. All this significantly increases the possibilities of future EXTEND centres, and provides accessibility of education for students from various countries. Moreover, the accessibility of education will be provided by means of distance technologies according to the international specifications and standards. Thus, a unified e-platform will be elaborated for all partner universities.

To sum it up, foreign language is a means of developing professional, communicative, linguistic and cultural competences, and is a tool, which opens up new possibilities in the professional sphere, erases linguistic barriers and promotes them to a qualitatively new level of personal and professional development.

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