М.В. Куимова

Национальный исследовательский
Томский политехнический университет

The importance of creativity in engineering education

Successful engineers possess not only good technical qualification and abilities, but also a range of soft skills, including leadership, emotional intelligence, communication, problem-solving, organization, creativity and more. These skills are indispensable for handling the tasks of modern engineering. This paper highlights the positive effects of using creative tasks in both engineering education and the teaching of foreign languages.

Keywords: creativity; higher education; lifelong learning; soft skills; teaching a foreign language.

> *Don't wait for inspiration. It comes while working.*
> *Henri Matisse*

Many things without which our modern life is unthinkable were developed by engineers. All engineering achievements, including those from many years ago, are the results of a creative approach to solving practical challenges. Creativity involves the ability to generate, develop and express new ideas, and create solutions that are valuable and may potentially solve problems. In engineering, creativity facilitates the generation of something qualitatively new and distinguished by uniqueness or originality, such as the development of new equipment, technologies or systems.

Currently, educational programs that promote and nurture innovative thinking and creativity have advanced in higher education. In addition to natural sciences and technical knowledge, engineering education places a strong emphasis on the development of students' analytical, problem-solving and communication skills. This approach aims to prepare graduating students for employment in a globalized economy where they may address worldwide issues.

D. Leonard and W. Swap define creativity as «a process of developing and expressing novel ideas that are likely to be useful» [4]. To develop creativity in engineering students, it is essential to follow certain general principles:

– establish a favourable learning environment that promotes open-mindedness, generates diverse ideas and encourages students to freely express unconventional thoughts without fear of judgment or criticism. It includes the acceptance of ambiguity and risk taking, viewing failure as an opportunity to learn;

– use interdisciplinary projects;

– play games and encourage participation in competitions;

– encourage independent and teamwork (students need to learn to collaborate both within teams and with other teams);

– include creative exercises, such as brainstorming, negative brainstorming, finding similarities and differences, role-playing, mind mapping, ideal final result, etc.;

– promote curiosity and lifelong learning;

– value creativity and reward it [2, 3].

Creativity helps students to approach problems from fresh perspectives, and to enhance critical thinking skills that are valuable for overcoming challenges in their professional and personal life. Universities offer a wide range of opportunities to develop students' creativity:

1. Interdisciplinary coursework. It encourages students to think «outside the box», explore relationships between various academic subjects, and find innovative and effective solutions for practical problems;

2. Creative projects. They deepen the understanding of the topic, enhance critical thinking skills, provide opportunities to explore their own ideas, take risks and learn from their experience;

3. Conferences. Participation in scientific conferences stimulates students' cognitive activities, enables them to independently seek information from diverse sources. Conferences enhance their own skills and knowledge within their field, improve analytical skills, communication skills and promote a desire to advance their foreign language skills;

4. Extracurricular activities. Engagement in extracurricular activities offers opportunities for personal growth, facilitates socialization and collaboration, and enhances academic performance. Here there are a few examples of extracurricular activities: career guidance events; science and technology studies; academic interests and clubs; mass cultural events (festivals, concerts, etc.); excursions; community service and volunteer work; drama and theater clubs; sport competitions, etc.

On the whole, students develop creativity across many academic subjects, and foreign language is among them. Foreign language is one of the subjects that contribute to the deep personal growth of the learner and should be taught in an engaging and interesting manner in a positive learning environment [1]. Learning a foreign language promotes creativity by encouraging students to convey their thoughts and ideas in a language they are studying. Teachers use a variety of activities in foreign language classes to enhance learning. These tasks may include:

– Group discussions. For example, students select a few world inventions in their major fields such as physics, chemistry, mathematics, electronics, computers, etc. that they find particularly interesting. Then they discuss which invention they believe has had the most profound impact on society and propose an invention that they would like to see further developed or improved.

– Projects. Project-based activities offer students opportunities to acquire fresh knowledge, skills and abilities that they can creatively apply in new

situations. These projects can be conducted independently at home or collaboratively in the classroom. For example, the teacher may assign a theme and organize a class competition for a new magazine, feature story or letters addressed to students' favorite fictional and non-fictional characters.

– Open-ended writing tasks. Students read a short fable, fairy-tale or a story and make up an alternative ending.

– Short video (role-play, dramatization) based on home reading. It serves as a good option to traditional book report assignments. It improves memory, challenges students to summarize and analyze the book they have read. Students select a key idea or scene from the book and make a short video (role-play or dramatize) illustrating it.

– Theater activity. Engagement in theatrical performances encourages independent thought, leading to a more profound grasp of the plot and character emotions. It increases the motivation to learn a foreign language, improves communication skills, raises socio-cultural awareness among engineering students, sparking interest in the lifestyle and culture of the countries associated with the language being studied.

Any TPU (Tomsk Polytechnic University) student interested in acting on stage, participating in theatrical dramatizations, dancing, acting in a real play or singing songs in a foreign language is welcome to join the «Inspire Theatre» club organized by the Division of Foreign Languages at TPU. Its head, Irina A. Saraeva develops a script for each performance in which each participant has his/her own role tailored to suit his/her acting nature. Irina A. Saraeva coordinates rehearsals, delivers instructions and creates a positive atmosphere that enables students to freely express their creativity. TPU's theater club has been active for 20 years. Some titles of recent performances include: «Little Town Dreamer», «Theatre Rush», «Red», «Someday at Christmas», «Theatre Mosaic», and more.

Thus, in today's information age, engineering has evolved beyond its traditional emphasis solely on technical disciplines. To become a well-rounded engineer, it's essential to acquire technical and scientific training, cultivate creativity, to generate innovative ideas and effectively solve problems. Technical universities implement creative assignments and activities to prepare graduates for global competitiveness and contemporary challenges.

Литература

1. Кобзева, Н.А. Edutainment как современная технология обучения / Н.А. Кобзева // Ярославский педагогический вестник. – 2012. – № 4(II). – С. 192–195.

2. Badran, I. Enhancing creativity and innovation in engineering education / I. Badran // European Journal of Engineering Education. – 2007. – № 32(5). – P. 573–585.

3. Baillie, C. Enhancing creativity in engineering students / C. Baillie // Engineering Science and Education Journal. – 2002. – № 11(5). – P. 185–192.

4. Leonard, D., Swap, W. Fostering creativity: expert solutions to everyday challenge / D. Leonard, W. Swap. – Boston, Massachusetts : Harvard Business Press, 2010. – 96 p.

О.А. Лапко, Ю.В. Безнис

Белорусский национальный технический университет

**The ways of organizing engineering students' independent work
in the process of teaching a foreign language**

The article examines the aspects of engineering students' independent work in the process of technical foreign language mastering. The ways and methods of its effective practical implementation are discussed. The possibilities of using information technologies as an effective way to increase students' motivation to learn a language are analyzed. The role of the teacher in the organization of independent work is considered.

Key words: the organization of independent work; self-study; professional competence; motivation; information and communication technologies; electronic educational and methodological complexes; web quests.

It is difficult to imagine the methodology of teaching a foreign language at a technical university without planning and organizing students' independent work. Training a specialist with a high level of professional competence is possible only thanks to a close partnership between students and their teacher. Students' independent work is an important requirement for achieving this goal. Interacting with the teacher students plan, implement and evaluate their results.

Unfortunately, the number of in-class hours for teaching a foreign language provided by the curriculum is insufficient to master all competencies required by a future specialist. Organizing productive self-study for engineering students is a very urgent and important aspect of modernizing the education system at a technical university.

In general, in modern conditions the role of teachers in organizing students' self-study is getting more significant. It is important for a teacher to manage this process effectively. Students' independent work won't be productive if there is no feedback between a student and a teacher. Without a doubt, it is the teacher who has to take the main responsibilities for organizing the autonomous activities of students, determine the goals that can actually be achieved by them, based on the level of their skills and abilities formation, support and guide them. However, it should be noted that being a linguistic subject, a foreign language creates many challenges for technical students who