

**ГЕОЛОГИЯ, ГОРНОЕ И НЕФТЕГАЗОВОЕ ДЕЛО
(ДОКЛАДЫ НА АНГЛИЙСКОМ И НЕЦЕЦКОМ ЯЗЫКАХ)**

**E-LEARNING IN MODERN ENGINEERING HIGHER EDUCATION:
A FOCUS ON RESOURCE EFFICIENCY**

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Integration and interdependence of national economics known as intensive globalization and evident through the processes of economic, political, and cultural interchange across the world leads to inevitable internationalization of particular sphere, but also develop the potential for living and working in the international and global environment.

Besides being a traditional instrument for acquiring knowledge and skills, higher education tends to become an essential element of global competitiveness among the higher education institutions worldwide, as well as among the countries.

Higher education institutions with accredited engineering programmes become today international educational centers since foreign students make up significant proportion of the total number of university students. To ensure a high standard of education teaching students of different nationalities, it is necessary for the educational process to be diverse and individual-oriented. E-learning allows developing an individual learning path, as well as contributes to the efficient use of human and technical resources, which strengthens the university competitiveness.

In the last decade, the issue of resources conservation refers to problems requiring immediate solution. Today, the question of energy conservation and its rational use are intensively discussed in all areas of human life. This situation is due to the imperfection of the technological processes and management systems, deterioration of the material and technical base and lack of traditional resource-rooted notions of "inexhaustible" resources. Therefore, it is higher education that can ensure the dissemination of culture, knowledge and technology resources. It is important to build an educational path that involves students in the development and implementation of resource-efficient technologies.

In 2009, Tomsk Polytechnic University received the status of scientific research university and became National Research University of Resource Technologies 'TPU'. The main objective of TPU is to develop technologies for resource-efficient economy. The priority areas being intensively developed in the university include managing and deep processing of natural resources, traditional and nuclear energy, alternative energy technologies, nanotechnology and beam-plasma technology of materials with desired properties. Currently, the component "Resource Efficiency" is not included in the curriculum in its real form; however, students study topics relating to economical resource use in the form of lecture courses [1].

Under the current economic situation, resource efficiency, in its broadest sense, is half the battle. Tomsk Polytechnic University's (TPU) plan for resource-efficiency expansion complies with the innovation-driven growth strategy of the Russian Federation for the period through to 2020. Furthermore, resource-efficiency expansion is an essential condition for TPU to develop the potential necessary to get into the TOP-100 universities worldwide. E-course-based technology developed in compliance with the TPU plan for resource-efficiency expansion for the years of 2013–2018 implies education on the basis of the electronic learning platform Moodle. Moodle e-courses are one of the ways to implement resource-efficient technologies into education as they contribute to the rational use of time, information, and human resources, which, in its turn, enhances the efficiency of both teaching and learning processes.

The proposed technology corresponds to several trends in the strategic development of the university:

- science (creation and implementation of the developed resource-efficient technologies is one of the priority projects of the TPU plan for resource-efficiency expansion);
- human resources development (as the e-course implementation will involve the university staff into intensive use of the resource-efficient technologies in the process of teaching);
- social development (proposed technology is focused on training the specialists with the capacity for self-studying, self-discipline, and self-control, and promotes respect for resource efficiency among both the staff and students).

E-learning is defined as "the use of new multimedia technologies and the Internet to improve the quality of learning by facilitating access to resources and services, as well as to remote exchanges and collaborations" [2]. Today, due to the rapid development and wide use of the Internet, almost all traditional universities started exploring online technologies in various disciplines. The most popular platforms to support teaching and learning and increase engagement among Russian students are Moodle, Khan Academy and Coursera [3, 4].

E-learning gives pedagogic, administrative and economic benefits: interactivity (instead of passive information higher education. Today, the student of the higher education institution should not only acquire the knowledge in an acquisition); enhanced student-teacher and student-student communication; more time for independent work; individual, flexible optimization of students' progress [5, 6]; improved monitoring of education processes; greater number of students involved in the learning process within fewer academic hours [7]; and reuse of resources and modularization [8].

The implementation of e-course technology in TPU allows expanding the range of educational services of the university and improving their quality. This will contribute to the growth of academic staff and students' satisfaction from the conditions and results of their activity. As a result, this will strengthen the position of TPU among the leaders of modern engineering education. In addition, the use of the suggested technology is not limited to the e-courses proposed: the number of courses can be increased or reduced depending on the requirements of the relevant educational programs. In particular, the course "Resource efficiency" can be implemented as a supplementary educational unit within the modules "Environment", "Media", "Inventors and Inventions", "Education", and "Work".

The e-course is characterized by a number of features, which make it different from the other courses taught in TPU. E-learning aims at the development and accumulation of the educational materials (both for vocabulary and grammar improvement) assigned for student self-study within the scope of curriculum learning modules. The e-courses have clear structure and composition unity. Every section includes the following elements: background information (information about the unit, teacher, grade rating schedule, and glossary); educational resources (Wordlists; Use of English, Reading, and Writing blocks; Essential items for grammar and grammar tasks/activities); tests; supplementary resources (Internet links to the recommended educational resources and course books).

The e-courses, being available for foreign students during the whole semester, allow them to choose an individual learning pathway, which makes it possible to acquire the knowledge independently and progressively, either simultaneously with the course being taught in TPU or after its completion. The volume of the proposed educational resources is sufficient not only to view (scan) a topic but also to study it thoroughly. It obviously contributes to development of individual learning path (learning strategy) stipulated by student's individual needs and academic progress results.

The e-courses are considered particularly contributive, as they not only provide the students with knowledge but also develop their personal qualities, which are of great significance in the system of modern education. For example, every section includes peer-review assignments and implies assessment of students' written work, which is supposed to develop student's autonomy, responsibility, self-esteem, and self-assessment. The e-courses also develop creativity (assigning such tasks as making a presentation) and individual responsibility for the educational outcomes and research results.

In general, English language teaching in TPU is based on blended learning. This approach focused on information technologies, and consequently e-learning has become quite efficient today, as it combines online learning with traditional face-to-face learning and allows improving the educational process of the students who are busy studying their majors and preparing their project works. Teaching languages at technical higher education institutions is traditionally connected with the lack of academic hours, and e-courses do possess the potential to solve this problem. Providing students with the freedom in relation to the subject curriculum and learning intensity, e-courses stimulate student's motivation to education and responsibility for academic results. Moreover, the implementation of blended learning makes it possible to avoid the disadvantages essential for e-learning, such as lack of human interaction (which is particularly important for the disciplines that involve practice) and communication (which is essential for language learning).

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MONITORING OF INDUSTRIAL HYDRODEWAXING PLANT IN THE CONTEXT OF CETANE NUMBER AND LOW TEMPERATURE CHARACTERISTICS OF DIESEL FUEL

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High speed diesel is liquid fuel that is used most abundantly in Russia in a variety of vehicles and appliances, such as cars, buses, tractors, lorries, barges, speed boats, railway engines, irrigation pumps, and generator sets. Diesel is a mixture of hydrocarbon compounds, boiling in the range of (250–360) °C [3].

The cetane number is a measure of the ignition quality of the diesel fuel. The ignition quality is quantified by measuring the ignition delay, which is the period between the time of injection and the start of the fuel combustion