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Resource Efficiency in TPU: Implementation of English Language E-courses

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Abstract

This article considers e-learning as one of the efficient technologies implemented in National Research Tomsk Polytechnic University (TPU) for teaching Russian and foreign students. The paper introduces the courses designed for teaching General English. The authors have analyzed the results of e-learning implementation in TPU and identified the advantages and probable disadvantages of the technology. One of the most significant benefits of e-courses is optimization of learning technology, which contributes to efficient use of human and technological resources and enhances the national education system in general. Avoidance of the recognized disadvantages suggests a blended learning strategy.

Keywords: E-learning; resource efficiency; TPU; platform MOODLE; e-courses; English language; blended learning.

1. Introduction

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 higher education. Today, the student of the higher education institution should not only acquire the knowledge in a

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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.

TPU today is an international educational center since foreign students make up about 23% of the total number of TPU 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.

2. Resource-efficient technologies and e-learning

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 (Bolsunovskaya & Naidina, 2011).

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" (The European Union, EU, 2001). 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 (Akimova et al, 2015; Aikina et al, 2015).

E-learning gives pedagogic, administrative and economic benefits: interactivity (instead of passive information

acquisition); enhanced student-teacher and student-student communication; more time for independent work; individual, flexible optimization of students' progress (Morgan, 2000; Aikina & Zubkova, 2015); improved monitoring of education processes; greater number of students involved in the learning process within fewer academic hours (Weller, 2004); and reuse of resources and modularization (Wiley, 2000).

3. Content modules

3.1. E-courses for General English

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, 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.

3.2. Research and findings

The undergraduate students studying General English via the e- courses on the LMS Moodle were involved in the survey to represent their e-learning experience. The teachers were also surveyed to evaluate every activity in terms of resource efficiency. The survey was presented according to the following items:

- assignments/activities presented in e-courses;
- forms of students' interaction with teachers;
- benefits/drawbacks of e-learning;
- difficulties related to e-courses;
- necessary time of English study via e-courses;
- possibilities to be prepared for the exam.

3.3. Results discussion

As seen from Table 1, the majority of students (80%) did the assignments for Reading and Use of English, and 62% of students intensively studied additional resources. More than one third of students participated in Forum, Chat, Wiki and reviewed the papers of their group-mates. It is important to note that every assignment or activity presented in Table 1 was carried out by students online, which saved class hours. The activities used in e-learning, for example, Forum/Chat/Wiki, are efficient to develop communicative skills; however, the learning process should be well organized, as the students often lack abilities of team work. The reviewing tool allows students to assess another group-mate's written work, minimizing teachers' involvement.

Table 1. Assignments/activities via e-courses

Assignments/activities via the e-course	Advantages	Disadvantages
Forum/Chat (33%)	develop communicative skills	working in Forum takes a lot of time to monitor and analyze feedbacks
Peer review assignments (36%)	teachers are not involved in the assessment process, saving teaching hours	students are not always ready for critical thinking activity
Wiki-project (36%)	develop communicative skills	not all students are ready to work in teams
Activities for Reading/Use of English (80%)	mastering language skills individually	technical problems
Study of Additional resources (62%)	availability of a large amount of teaching material	sometimes students are not ready to use extra teaching materials

Taking into account the data from Table 2, we may conclude that most teachers (75%) gave face-to-face instructions to students and 63% of teachers discussed their results in the classroom. As for teaching via Forum, this tool is not so popular among teachers (only 32% of teachers used the tool intensively).

Table 2. Interaction of students with teachers

Forms of interaction	Advantages	Disadvantages
Teachers' instructions via Forum (35%)	anytime assess of teachers' instruction	technical problems
Discussion in Forum (32%)	communicative skills development (mostly in writing)	lack of face-to-face communication
Teachers' instructions in classroom (75%)	opportunity to define and clear up possible difficulties in doing tasks in a classroom	waste of classroom time/hours
Assessing of students' outcomes in classroom (63%)	possibilities to help to correct mistakes	no

In the students' opinion, the main advantages of e-learning are as follows: availability of learning materials (73%); opportunities to get extra credits (65%); and to have consultation with the teacher at any time (59%). The students did not point out at any considerable difficulties connected with the use of e-courses: only 27% of students had problems with e-courses (lack of access, limited deadlines of assignments, improper (unclear) instructions, lack of time and face-to-face communication). Moreover, half of students considered e-courses quite handy in exam preparation and contributive to efficient use of class hours.

4. Conclusion

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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