

The Interdisciplinary Project in Engineering Education

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The paper focuses on the interdisciplinary project aimed at developing engineering student's competence in foreign language within the "Bachelor – Master – PhD" education system. Complex approach is proposed to be used as the theoretical and methodological basis of project elaboration. The proposed multimedia learning package has been developed for the students of Siberian Transport University and displayed in Moodle.

Key words: foreign language competence, interdisciplinary project, complex approach, social oriented learning model, Moodle.

Despite a great number of different technologies, methods and tools applied in the higher engineering education, future engineers demonstrate insufficient knowledge of and competence in professional communication. Today, the communication behavior of students is shaped within various education programs offered by different departments which do not represent unified approach toward education. It hinders the efforts to ensure all-round personality development in future engineers to prepare them for daily professional-related tasks which they would solve based on professional principles.

Importance and relevance of the research problem is defined by the following reasons:

- transition to the innovative engineering education, revision and updating of training technologies based on the modern trends and approaches applied in high-tech engineering, which, in its turn, influences the content of foreign language training that becomes an effective tool in personality professional development;
- the need for foreign language study for professional purposes since foreign language acquisition can help students adapt new social roles to adjust to the requirements of the

current labor market where effective communication skills are highly demanded by the employers;

- the need for successive acquisition of a foreign language within a three-tier higher education system: Bachelor's (Specialist's)-Master's degrees and PhD programs;
- foreign language training based on socially-oriented training (on-line/non-linear) models;
- the need to investigate how relevant professional skills and attributes are shaped at the different stages of future engineers' professional identity development.

The novelty of the problem discussed and soundness of the proposed solutions are determined by:

- the current theoretical basis: multimedia training package (MTP) aimed at developing engineering students' foreign language competence, i.e. a special medium which being analogous to the real one grants learners the possibility of social adjustment;
- methodological basis for MTA development, i.e. complex approach and a set of scientific principles (social adjustment, interactivity, collaboration, syndicate, openness, simplicity, integrity and interdisciplinarity);



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- practical implications of the research: MTP is designed for the on-line foreign language training model (socially-oriented or non-linear) applied in the three-tier higher education system: Bachelor's (Specialist's)-Master's degrees and PhD programs. It enables to optimize educational process and effectively shape the aspects of future engineers' professional competence which are related to the knowledge of bilingual terminology and communicational skills, as well as professional broad-mindedness.

The move toward social software tools and web-technologies is one of the main conditions for effective implementation of the present multimedia training package. The analysis of the relevant bibliographical references has revealed that web-based learning (or web-based training) is one of the forms of distance education provided through the Internet. E-learning 2.0, e-training, on-line learning and etc. are used as synonyms to the web-based learning [10; 11].

In foreign countries, the problem of MTP development is discussed in relation to e-learning and is referred to virtual universities and open educational resources which provide free access to educational materials through the social software tools. It is stated that such multimedia training packages stipulate collaboration of educators and academics in developing education program content (partially or completely) and allow them to adjust it to the definite educational needs. Also, these packages can be applied in all study modes: full-time, distance and hybrid (blended) one [12-15].

In general, educators and academics agree that Moodle is one of the most popular, convenient and free Learning Management Systems in Russia and abroad which allows not only creating, but also updating internet-based courses [15].

As one of the concepts of the web-based learning (non-linear) is socialization, the following social theories and

models have been taken as a methodological basis for MTP development: constructivism learning theory; social constructivism learning theory; practice theory; conversational learning theory; theory of social construction of technology; blended learning model; connectivism theory; social network theory.

Besides the above-mentioned theories and models, a complex approach has been also applied. It is defined as interdisciplinary paradigmatic (the structure of study object), syntagmatic (content of study object) and pragmatic (purpose, objectives, peculiarity of study object use) specific features related to the application of the sum of scientific approaches (system-activity approach, integrated development approach, individual and differentiated approach, context- and content-based approach, pragmatic and competence-based approach) in stage-by-stage development of technological educational product with regard to the general education program.

Involving various approaches and knowledge from a number of different disciplines (pedagogics, psychology, economics, engineering, ergonomics, information science and etc.) is methodically required in terms of the complex approach.

The present interdisciplinary project, i.e. MTP aimed at developing engineering students' foreign language competence within the three-tier higher education system (Bachelor's-Master's degrees and PhD programs), has been developed based on the learning management system Moodle which has the following benefits: 1) collaborative work due to the Wiki tool; 2) individual project work on course topics due to the possibility to interact with a coacher through the webinars; 3) along with on-line education programs, asynchronous learning programs when each student can study course material at his/her own pace; 4) interactivity and active communication during educational process (forum, chat, newsflash, webinars, questionnaire activity) – an instructor can display materials in different formats for

his/her students or a student can share the materials with the members of the online group; 5) building chat communities in an online environment.

The list of social software tools is rather long and freely accessed. Following are the information dissemination systems which are involved in interdisciplinary projects: a) <http://www.youtube.com>; b) <http://learningenglish.voanews.com>; c) <https://www.ted.com>; d) <http://www.howstuffworks.com/videos> and etc.

The MTP includes theoretical, practical and control materials, as well as pedagogical monitoring, computer, scientific-methodological and ergonomic support.

The fact that the content of the present MTP can be changed allowed the authors to develop interdisciplinary projects which can be applied both in classroom and as independent work for the engineering students of the 1st and 2nd year of education: «English for Builders and Architects», «Water in Science and Engineering»; «English for Mechanical Engineers»; «Railway Engineering» [1–9].

Throughout the probation period (2009–2014) it has been revealed that the best results in foreign language acquisition are achieved in a case of

full-time/distance education (blended learning), with the efficiency performance increasing by 20 %.

Based on the conducted research, it is possible to make the following conclusions:

1. The proposed MTP can ensure effective development of engineering graduates' communication skills within the three-tier education system "Bachelor's (Specialist's)-Master's degrees and PhD programs".

2. The MTP contributes to shaping engineering graduates' soft skills which are defined as communication skills required for effective team work and successful career.

3. The perspective lines of further MTP improvement within the three-tier education system can be as follows: a) integration of the English language not only into engineering courses, but also into humanities; b) integrated cooperation of high engineering education and real work experience; c) revision of such multimedia learning packages as «English for Mechanical Engineers», «English for Builders and Architects», «Water in Science and Engineering», «Railway Engineering» in the context of the distance education and assessment tool improvement during professionally-oriented higher education.

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