Development of engineering students' foreign language competence via authors' e-learning courses

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Abstract

The new social order requires teaching a foreign language as a means of international communication, forming a student's personality that absorbed the values of native and foreign language cultures and preparing for international communication in all spheres of life. These ideas are reflected in the definition of new goals and approaches to teaching a foreign language in the university.

The main criteria for evaluation of foreign language competence of engineering students are: preparedness for professional work after graduation from the university, fluency in oral and written foreign language communication, motivation, and an adequate level of foreign language competence (B2 – Vantage). The paper describes a model for development of engineering students' foreign language competence by means of information technology (IT) on such stages as conceptualization, interiorization and trainig. The use of IT-means can engage students in a system of professional and socio-cultural relations on the basis of non-verbal forms of communication, global and interactive communication systems, as well as solve a series of tasks to enhance students' motivation. Foreign language competence allows realizing such aspects of professional activity as a timely introduction to new technologies, discoveries and trends in the development of science, establishment of professional contacts with foreign partners.

Keywords: foreign language competence; interactive communication systems; conceptualization; interiorization; information technology.

Introduction

Modelling is one of the methods of scientific research in pedagogy. The modeling method is integrative, it allows combining the practical and theoretical parts in the pedagogical research. To solve the problems in the foreign language teaching to engineering students, we made up a theoretical model, which aims to develop students' foreign language competence in the professional context with the use of information technology means. The model, which consists of four components, ensures the development of the ability and willingness of technical students to solve their communication problems in the field of professional activity as well as to read and to work with scientific, technical literature and different kinds of documents in English language, to search and analyze necessary information, to study foreign experience in the chosen specialization.

Methods and the research organization

The primary and ultimate goal of education is to provide an active foreign language possession of non-linguistic university graduates as a means of shaping ideas in the socio-cultural and professionally-oriented areas of communication. Theoretical researches and practical experience of foreign language teaching suggests that the way to the ultimate goal should be labelled with intermediate learning objectives, which are formed as follows (Slastenin, 1996):

● to re-orient the students psychologically to understand a foreign language as an external source

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of information and as a means of foreign-language communication, the mastering and use of language to express their own utterances and understanding other people;

● to prepare students for natural communication in oral and written foreign language communication;

● to teach students to see in a foreign language a means of obtaining, extending and deepening the systematic knowledge on the speciality and a means of independent improving of their professional qualifications;

● to open to students that a foreign language is a potential opportunity to enhance their language, linguistic-cultural and socio-cultural competence.

In this part there is a description of theoretical model for the development of engineering students' foreign language competence (FLC).

1. «Goal component» includes the purpose, objectives, approaches, principles of FLC.

Considering the competence of a desired outcome of a specialist with higher education, almost all researchers CBE-approach (competence-based education) tend to describe it in the presence of a set of competencies. Using the competencies as primary target plants in the preparation of a specialist with higher education means a significant shift towards personality-centered learning. In the system of the innovative education the competence-based approach involves the orientation on the international standards of quality in the training of specialists in technology spheres (Bespalko, 2002).

In this particular case, the goal is to reach B2 - Vantage level of English proficiency of engineering students according to the document of the Council of Europe «Common European Framework of Reference: Learning, Teaching, Assessment» (Common European Framework for Languages, 2003).

The level system of competence-based language training reflected in educational standards of foreign language teaching was also admitted in Kazakhstan.

Thus, according to state standards for higher professional education of the Republic of Kazakhstan aims and objectives of discipline «Foreign Language» at the bachelor's level of technical specialties is the development of FLC at B2 level, postgraduate students must achieve a level of C1, PhD doctorals — C2 level, so in the context of our research work we are interested only in first four levels (A1, A2, B1, B2).

2. «Substantial component» includes the structure and the content of FLC in total 3 blocks. Analy-sis of current trends in Kazakhstan higher education system, in Kazakhstan and international documents that describe the requirements for training of the modern qualified specialist, as well as regulations in the field of foreign language education, including profile-centered foreign language training, has allowed us to identify the content and structure of foreign language competence, which we defined as an integrative quality of a future specialist, which includes three blocks:

● motivational-value
● professional-communicative;
● cognitive-activity

Motivational-value block (an interest in foreign language training and awareness of its importance for future career). This block represents an adequate self-assessment of students' abilities and fosters a sense of responsibility for success in academic and future professional activities as well as develops:

● understanding of the essence of their future profession, the responsibilities of serving the community, a sense of responsibility for professional decisions, including social and environmental contexts;

● the ability to work effectively individually and as a team member.

Professional-communicative block combines foreign language communicative competence in the field of occupational and general (personal, beyond-subject) competences, which are professionally important qualities and skills of the future bachelor. This block develops:

● the ability to use different methods of effective communication in a professional environment and in the society (such as writing reports, presentation materials, delivery and reception of clear concepts and patterns);

● foreign language sufficiency to communicate while working in international teams;

● knowledge on items of project activity;

● creative research in the profession, awareness of the need and ability to self-directed learning throughout their lives, etc.

Cognitive-activity block — in the process of studying the course «Foreign Language» development of the individual with a high level of general culture and information is possible, freely oriented in the world information space and using its resources for self-development, provided a systematic introduction to the educational process of high school teaching approaches that promote mastery of all kinds of speech activity (reading, speaking,

writing, listening). The solution to this problem is provided by a specially designed standard for the content of the training course «Foreign Language», which includes the experience of cognitive activity (the system of linguistic knowledge − a cognitive block), the experience of the methods and experience of creative activity (activity block).

3. «Technological component» includes two steps of FLC development:

• students' taking possession of the English basic course (General English − GE);

• students' mastering the professional-centered English course (English for Specific Purposes − ESP); stages and levels of learning language material: conceptualization, interiorisation, training; types of speech activity, which occurs through the mastering the linguistic material.

Structurally, the full basic and professional-centered foreign language course consists of a mandatory course on basic foreign language − for 1-2 year students (I, II, III and IV semesters), and elective course of professionally-oriented discipline «Technical translation» for 3-4 year students (V, VI, VII and VIII semesters).

«Technological component» also includes the development of the FLC funds: information technology support. The developed professional-centred course reflects the specifics of engineering students, equips students language knowledge and skills in the professionally important types of communication skills and provides the development of foreign language competence in professional context. The course includes the teaching-methodical complex (TMC) on the subject «Technical Translation» for 3-4 year students of specialities «Physics», «Mathematics», «Power engineering», «Information systems»; the development of the Internet-project «Alternative energy sources»; e-learning courses in English for students of Kazakh and Russian groups, teaching aids «English for Specific Purposes» for engineering students of Kazakh and Russian groups; English-Russian-Kazakh terminology dictionary in Physics, Mathematics and Computer Science, the development of a special course, «English for business communication» for the 2nd year students on the specialty of «Information Systems»; collection of authentic texts on the specialty for practice reading, listening of specialized texts; a list of topics and situations of professional communication to assess oral communication skills; development of the assessment and criterion system of foreign language competence of engineering students. Thus, in the

European educational space the term «professional-centered» learning takes place, in which the basic meaning of foreign language teaching in higher education is revealed. We believe that it would be advisable for Kazakhstan professional education space to use the term as «a professional-centered approach», taking into account the geopolitical and economic and social identity and a consistent experience of entering the Kazakhstan educational system into the European one.

«Professional-centered» refers to an approach based on the needs of students in learning a foreign language, dictated by the peculiarities of the future profession or specialty, which, in turn, require its consideration.

Despite the recent increased interest in Kazakhstan to the problems of professional foreign language training, the analysis of data obtained in the course of studying the situation in the field of English teaching in the Kazakhstan higher educational institutions, indicate the existence of serious problems in this area:

• poor quality of training materials for ESP, which do not meet the needs of students in mastering a language as a means of communication in the field of professional activity;

• insufficient use of language learning speciality of new technologies, especially IT, that stimulate the activity of students and develop key competencies needed a modern specialist;

• poor mastering of technical universities graduates in English professional communication skills;

• as a consequence of these shortcomings - low motivation of students in learning English on a speciality, their unwillingness to take responsibility for the results of training, lack of awareness of the role of a foreign language in their future professional career.

Four levels of FLC are formed: reproductive - the level of A1, empirical − A2, heuristic − B1, research − B2.

Mandatory minimum: levels A1, A2, B1 provide the required auditorium training in the I, II or III, IV (depending on the distribution of hours in the curriculum) semesters on the discipline «Foreign Language» (total − 270 hours), level B2 involves classes on the elective discipline «Technical translation» in the III-IV, or V-VI semesters. The number of academic hours for this step depends on the department. In 2007-2009s 58 hours were assigned for the speciality «Mathematics», 60 hours for the speciality «Physics». From 2012, two credits were

introduced for a professional component of foreign language learning, which was 90 hours.

«Technological component» also includes the organization of students' learning activities.

Organization of students' learning activities

According to A.A. Verbitsky the technology of learning context involves three basic forms of the students' learning activities such as an activity of academic type, quasi-professional activity and professional activity, each of which corresponds to the semiotic model of learning, in which the mastery of linguistic rules and technical terms are held; the relevant key concepts of language specialization, mastering different kinds of reading; development of their own style of note-taking; execution of self-correction tests, etc. (Verbitskiy, 1998).

4. «Productive component» includes the results of students' training by means of electronic learning courses. In this process the following types of foreign language communicative competences are developed:

• everyday life communication skills;

• professional and country-study texts reading skills;

• listening abilities for understanding the tutor and classmates' speech of general topics;

• writing skills;

• public speech skills;

• skills and abilities for use of the information technology means;

• authentic information reading skills;

• professional texts listening skills;

• text summarization skills;

• Initial skills of the written analysis of texts;

• skills of professional communication;

• skills and knowledge of business correspondence.

Skills have been developed on the basis of the monograph «Common European Framework for Languages: learning, teaching, assessment» (2003).

Implementation of the e-learning courses as a part of experimental work

The results of the use of IT-means for the development of FLC of engineering students were shown during the experimental work, whose objectives were:

• to adapt the theoretical model aimed at foreign language competence development of engineering students through information technologies.

• organization of effective foreign language teaching based on the theoretical model, improving

the quality of student learning a foreign language by means of information and technological support, testing the possibilities of using information technologies in the development of foreign language competence.

Experimental learning program included:

1) lessons on General English with the use of IT-means for the 1st − 2nd year students of experimental groups;

2) lessons on the elective course «Technical translation study» for mastering the language for specific purposes of the 3rd year students of the experimental groups;

3) organization of the Internet-project on the elective course «Technical Translation» with the 2nd − 3rd year students.

The use of information technologies included the work with the online materials, communication via e-mail, chat and forum, lessons on the author's e-learning courses in English. To collect the data necessary for experimental work we used the following methods: teaching observation, interrogation (conversation, interview, questionnaire), testing, peer review, self-appraisal of students.

During the pilot training for the 1st − 2nd year students the authors' electronic book «English for Specific Purposes» (Certificate on state registration of the rights to an object of copyright No. 874, June 6th, 2011) has been implemented for groups of the Kazakh and Russian languages teaching for the development of oral speech communication skills in the professional sphere.

The main purpose of this textbook is to develop professional communication skills, on the basis of the proposed text material of scientific and technical subject. Degree of difficulty of the texts assumes availability of the basic educational level of students' communicative competence development, which will allow using different types of reading: from information-search to advanced adequately to the proposed tasks (Raissova, 2011).

Students have the opportunity to choose a module for training, pass a test on the modules, as well as work with the «Help» system. There is a thesaurus of technical terms.

The program menu includes a catalogue of modules that allow students to receive teaching material on this course, the final tests (trial test), and a multimedia thesaurus. Modules are opened on a separate window as a list of hyperlinks.

After studying a particular topic the skip is executed to the exercises and tasks. Tasks are interactive in nature, are made depending on the specifics of the exer-

cise: putting in the correct word, sentence translation, grammar tasks doing, selection of the correct answer, etc. On the form, the button (in Kazakh) Тексеру — Checking is put, the click on that displays the correct and incorrect (in the form of a sign) responses.

At the end of each module the student can make the transition to the test of current module. Tests are of different types: closed, with an open response, finding of an equivalent.

Each theme is reflected in the final test with at least 10 test tasks.

Test results are presented in the form of the test report, which displays a list of wrong answers. After passing the test the transition goes to the main programme window.

The theoretical material has an additional button. This button takes to the thesaurus. The term meaning is displayed on a separate window in Kazakh and Russian languages.

In this textbook authentic text materials are included from newspapers, journals and the Internet. The text content of the textbook is designed to make the students work more active in the development process of foreign language competence.

The results of the work are students' knowledge and practical skills on the discipline «English for Specific Purposes».

Results and discussion

The students of control and experimental groups have passed the final tests and questionnaires for distribution their levels according to the levels of the FLC in professional and communicative, cognitive and activity, motivational-value components. To evaluate the data of monitoring and control activities the tutors of our department have been invited (Table 1).

Table 1. Levels of the FLC development according to the results of the students' self-assessment before and after experiment.

Components/ levels/groups	Control groups				Experimental groups			
	before experiment		after experiment		before experiment		after experiment	
Cognitive-activity	%	absolute number of students	%	absolute number of students	%	absolute number of students	%	absolute number of students
A1 −Break through	51	18	45	18	53	19	2	1
A2 − Waystage	30	11	33	14	27	10	32	13
B1 - Threshold	13	5	15	6	16	6	43	18
B2 − Vantage	6	2	7	3	4	1	23	9
Total	100	36	100	41	100	36	100	41
Professional-communicative	%	abs. n.	%	abs. n	%	abs. n	%	abs. n
A1 − Break through	71	26	64	26	69	25	4	2
A2 − Waystage	22	8	25	10	23	8	41	16
B1 − Threshold	7	2	9	4	8	3	33	14
B2 − Vantage	0	0	2	1	0	0	22	9
Total	100	36	100	41	100	36	100	41
Motivational-value	%	abs. n.	%	abs. n.	%	abs. n.	%	abs. n.
A1 −Break through	34	12	28	11	33	12	4	2
A2 − Waystage	38	14	40	17	39	14	36	15
B1 − Threshold	28	10	30	12	28	10	42	17
B2 − Vantage	0	0	2	1	0	0	18	7
Total	100	36	100	41	100	36	100	41

To prove the reliability of the results changes in the levels of the experimental and control groups before and after experiment the method of Spearman's rank correlation was used, which measures the strength and direction of correlation between two hierarchies of attributes.

To calculate the Spearman's rank correlation is necessary to have two sets of values that can be ranked. In this case, the ranking is done by levels of FLC.

This was performed according to the experimental groups data:

1) The ranking of indicators before and after the experiment. Their ranks are listed in columns «Rank A» and «Rank B»;

2) The calculation of the difference between ranks A and B was produced;

3) The squaring of each d difference;

4) The sum of the squares was calculated;

5) The calculation of rs rank correlation coefficient was calculated on the formula:

$$r_s = 1 - 6 \times \frac{\sum d^2}{N \times (N^2 - 1)}$$

6) The critical values were determined. Result: $r_s = - 0,709$. Critical values for N = 11.

At N=11, $p_{0.05} = 0.61$, $p_{0.01} = 0.76$

Answer: H0 is rejected. The correlation between A and B is statistically significant. In control groups the correlation is less pronounced (Table 2).

Table 2. Levels of FLC development on the results of the experts' review before and after experiment.

Components/ levels/groups	Control groups				Experimental groups			
	before experiment		after experiment		before experiment		after experiment	
Cognitive-activity	%	abs. n.	%	abs. n.	%	abs. n.	%	abs. n.
A1– Break through	49	18	31	13	50	18	2	1
A2 – Waystage	31	11	37	15	28	10	18	7
B1-Threshold	15	5	26	11	16	6	58	24
B2 – Vantage	5	2	6	2	6	2	22	9
Total	**100**	**36**	**100**	**41**	**100**	**36**	**100**	**41**
Professional-communicative	%	abs. n.	%	abs. n.	%	abs. n.	%	abs. n.
A1–Break through	73	26	61	25	72	26	3	1
A2 – Waystage	21	7	28	11	23	8	46	19
B1– Threshold	6	3	9	4	5	2	30	12
B2 – Vantage	0	0	2	1	0	0	21	9
Total	**100**	**36**	**100**	**41**	**100**	**36**	**100**	**41**
Motivational-value	%	abs. n.	%	abs. n.	%	abs. n.	%	abs. n.
A1– Break through	36	13	25	10	36	13	0	0
A2 – Waystage	38	14	44	18	35	13	36	15
B1– Threshold	26	9	28	12	29	10	40	16
B2 – Vantage	0	0	3	1	0	0	24	10
Total	**100**	**36**	**100**	**41**	**100**	**36**	**100**	**41**

Through the test after passing the pilot study, we set the task to trace the dynamics of change in the results due to the use in the learning process of information technology means. The test results could be quantitatively confirm or refute the hypothesis of the study. The results of the final test on the tables show a significant improvement in the experimental groups compared to control ones. The distribution of the results of the diagnostic testing after the application of information technology means in the students' training process is of a statistically significant and natural character, and not due to random factors.

The reliability of test results was proved by the Student t-criterion.

The analysis of this experiment confirms our hypothesis with 95% confidence that the application of e-learning courses leads to the optimization of training process and improves students' knowledge and skills.

Conclusions

Inter-connection of cognitive-activity, motivational-value, professional-communicative blocks of engineering students' FLC characterize its cognitive, communicative, motivational and behavioral areas. All of the above blocks are closely related. They determine the effectiveness of the development of the investigated phenomenon.

The analysis of trends in the intensification and informatization of foreign language education has revealed the following needs: 1) taking into account students' professional interests, 2) development of a new model for learning course «Foreign Language» with the release of interactive methods (e-learning courses, projects, role plays, selective use of multi-media teaching aids), as well as traditional lessons and intensive interactive sessions in the computer lab.

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