TEAMWORK COMMUNICATIVE SKILLS AND ABILITIES FORMATION IN TRAINING OF ENGINEERS FOR THE FUTURE

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Abstract *— This paper reveals training experience of engineers for the global companies. It is shown that foreign language skills in modern conditions turn into the significant personal and professional characteristic of a specialist. Language training gives grounds to communicative skills formation, including bilingual communication. For modern engineers a foreign language becomes an orientation tool in information space and also a professional problem solving tool in bilingual communication. An integration of language modules into the curriculum is a distinguished feature of the given training system. Thus the principle of gradual problem solving skills broadening becomes a reality. Various interactive training courses and virtual training modules are used during this training. Such approach erases speech barriers, develops ability to communicate in a foreign language and also ability to work in team.*

Index Terms – training experience of engineers, professional characteristic of a specialist, language training, integration of language modules into the curriculum.

INTRODUCTION

The economy current state is characterized by the increasing globalization of the markets. Development of technologies provides broad opportunities for cooperation in different areas - at level of individuals and at level of companies. Emergence of global companies has caused change of requirements to employees. In such conditions abilities to communication are one of important components in the field of interpersonal skills and abilities. Development of abilities not only to dialogue, exchange of thoughts, data, ideas that communication means in the broad sense, but also to various kinds of professional dialogue is very important. It means studying world achievements in areas of engineering and technologies, carrying out research examination, an exchange of experience without which professional work is impossible.

The management of the global companies set tasks of personality formation and training of specialist with sufficient level of the professionalism which competitiveness on a labor market is defined now not only by his high qualification in professional sphere, but also by readiness for the decision of professional problems in conditions of bilingual communication providing processes of information interaction. Foreign language skills turn to the significant personal and professional characteristic of a specialist when the foreign language becomes the orientation tool in modern information field. It demands lingvo-professional training technology change of the specialist that is competitive in the global markets.

THE ENGINEER OF 21 CENTURY: WHAT HE SHOULD BE?

Change of requirements to engineers of 21 century

It is possible to name 21 century "jet age". Rates of development of engineering and technologies, causing globalization of the markets lead to growth of requirements for people and cargo transportation. It demands search of new technologies on the transport capable to develop high speeds for satisfaction of such requirements. Global companies having branches in different countries and parts of the world cause change of requirements to the personnel, particularly to engineers.

It is possible to allocate some aspects of development of the world economy, influencing and defining features of activity of the engineer: engineering and technologies development rates; people and cargo transportation speed; speed of processing, and information transfer; avalanche growth of information volume; speed of decision-making.

All these aspects are interconnected. So, engineering and technology development rates are defined by possibility of communication of specialists, development of technologies of the analysis of the information, a competition in the global markets. Necessity of a sustainable development and transition to green economy can be provided only by the specialist with a developed social responsibility and having an understanding of problems facing mankind. Such problems demand search of the new technical and technological decisions providing social and economic, organizational and technical stability of systems that is impossible without analysis of the adequate information and decision-making depending on a current system condition.

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Universal distribution of technologies and access to the Internet has led to doubling of information volume for the last 2 years. Research has estimated volume of generated data in 2012 to 2,8 zetabyte and predicts by 2020 increase in volume to 40 zetabyte that exceeds former forecasts for 14 %. Avalanche growth of information volumes along with positive aspects also generates problems. EMC Corporation has published research results of Big Data, Bigger Digital Shadows and Biggest Growth in the Far Eastю. This research shows unprecedented growth of the information in the world, only 0,4% of which, according to IDC, is analyzed. For today less than 1% of the available information is analyzed, and less than 20% is protected. The companies which protect their data and derive benefit from it increase their potential; by 2020 developing markets will overtake the developed countries on volume of the created data.

Considering growing requirement of economy for the specialists, capable to provide its development, close interaction with business is necessary, first of all, for expectation analysis, and then for modernization of training system of specialists claimed by the market. It is also necessary to overcome inertness of educational system, using potential and possibilities of computer technologies. The educational system should adapt faster for the economy and manufacture realities which development is possible only due to its development. Thus it is necessary to be guided that rates of training and training of the specialist for practical activities should correspond to requirements of social and economic systems. Besides, the engineer should be competent in effective work of organizational and technical systems.

A considerable number of researches is devoted to a problem of what competences should distinguish the engineer for the global market. Work on large hi-tech manufactures demands qualitatively other level of training, than at traditional training technologies. Educational system should be based on application of innovative training techniques and technologies, on essentially new educational programs of the practical oriented training which are developed with requirements of professional standards, the best world experience of engineer training promoting both development of the person, and a society sustainable development. Authors note that expectations of employers include new competences such as economic knowledge, ecological and social responsibility considering university and business interaction experience in training of engineers for such global companies as Philips and Shell [1]. The sustainable development should be a priority. The author of article [2] notes three objective filters of technical progress: scientists and engineers with the system approach to working out of technical and technological decisions; practical financiers and businessmen who invest money only in perspective decisions; the self-adjustable market as a way of choosing the most socially favorable technologies.

Wolf (1997) [3] notes tendencies which considerably change activities of an engineer and make requirements to educational programs change. These are: huge files of new materials and the processes expanding design possibilities of an engineer; universal use of information technology; the increasing number and complexity of restrictions (for example, cost, safety, ecology); requirement growth to have a special and general technical knowledge; ability to work in a team and wide business knowledge; necessity to long life learning caused by fast rates of changes; globalization, transition from the enterprises working on domestic markets to more cosmopolitan.

Such difficult educational challenges demand revision of an educational paradigm. Thus, authors highlight three basic directions which should form «global competence» at the engineer. The first direction is caused by widening role of the engineer which are engaged not only in designing and product creation, but also in its market promotion, operation, service and recycling. Therefore engineers should have wider interdisciplinary knowledge base, especially in areas which are traditionally considered in engineering education: global socio economic and political systems, international trade and the world markets, ecological systems, scientific researches and technological innovations.

The second direction is development of teamwork skills, interpersonal dialogue in the framework of global cooperation [4, 5 ,6]. Work in a multinational team according to the author of the paper [7] has more chances to be innovative and effective. The third group of competences is connected with ability to communication, ability to live and work comfortably in the transnational engineering environment. Performing difficult transnational projects shows increased requirements to language and communicative skills. Ability to communicate in other languages and easily assimilating to foreign workplaces and a way of life has crucial importance for achievement of professional and vital success [8].

Mission of an engineer of the future consists in construction steadier, more stable and fair world. As engineers bear collective responsibility in the face of future generations for improvement of living conditions all over the world, they should think and operate at a global level.

Possibilities and preconditions for respond to challenges of 21 century in engineer training

Two contexts are used when speaking about competences the specialist: as a result of acquiring higher education on certain specialities and as the profile maintenance competences with the help of which the company selects and employs candidates for work on a certain position, and afterwards trains, develops and estimates already available employees. In the organization profiles competences specialists are made on the basis of model used in it competences. Profiles include key company competences, obligatory for each employee, and also professional competences and level indication which an employee should

develop holding a certain position. Competences are defined in educational standard of an engineer training with reference to a kind of professional work which suits a branch in which the specialist will be occupied. As, on the one hand, kinds of engineer activities become more and more various, and, on the other hand, enterprises want to receive a ready-made specialist for a specific work, there is a contradiction between education and business purposes. Besides, now it is a matter of global competences.

In our opinion a system approach to perfection of educational space for a sustainable development can resolve these contradictions. As the balance between "supply and demand" on engineers with definite competences is dictated by a labor market, so the market itself serves as a link between educational and industrial systems. Mutual interest is obvious: the fuller a university will satisfy requirements of the enterprise for qualitatively trained engineers, the more demanded will their educational services be. At the same time, highly skilled engineers will promote increase of competitiveness of the enterprise, business expansion, and new workplaces. And it will lead to requirement growth for engineers. Such mutual cooperation will promote stability of educational and industrial systems. To make such interaction be rational, it is necessary that a specialist model image or profiles competences at the enterprise and university coincided or were similar. Complexities at conflict resolution between "demands" of industrial system and "offer" from educational system are caused by problems at formalization of the specialist competence estimation system. The traditional education system and professional standardization does not establish norms in the areas on which company efficiency directly depends: decision-making, achievement of arrangements, responsibility, etc. Accordingly, using standard ways of estimation, we can define how a person in highly specialized area is professional, but we can not tell how much he is effective in the company. Model competences serve for such estimation.

For the decision of this problem the national framework of qualifications is created in Russia, professional branch standards are developed where requirements to professional competences of a specialist of a certain level and a kind of activity are reflected. Federal educational standards define requirements to training of specialists, by which the university is guided, developing educational programs. Harmonization of professional and educational standards will allow creating system of engineer training, corresponding to needs of time.

Role of personal and interpersonal competences in increase of engineer competitiveness

Specificity of engineering activity in 21 century and globalization of the companies leads to necessity to changes of personnel enrollment techniques and managing it. Management on competences is a special approach to human resource management of the company which means realization of variety of measures supporting and developing key competences, necessary for strategic company development. This is a management of: knowledge, talents, corporate training, recruiting. Three principal competences are allocated at such approach: educational and informative, that is abilities to informative activity, statement of the purposes and planning, analysis, reflection and self-control, decision of problems and tasks and so on; informational, that is all abilities connected with search, selection, processing, analysis and information interpretation; and communicative, connected with interaction with other people and defining ability to cooperate with them and carry out various social functions and so on.

Thus, personal, interpersonal and system competences become important along with professional competences. It means that personal competences characterize cognitive and affective development of each graduate: ability to think technically and ability to solve a problem; desire to make experiments to open and invent novelty; creativity, systemacy and criticality of thinking; professional etiquette. Interpersonal competences characterize: ability of the graduate to work alone and in a team, including in the interdisciplinary; its ability to be the leader and to communicate effectively inside a team; ability to criticism and self-criticism; ability to work in the international context to perceive a variety both intercultural differences and adherence to ethical values. System competences demand development of instrumental and basic competences as a basis. They include: ability to training and application of knowledge in practice; research abilities and ability to creativity; ability to working out of projects and management of them; abilities to leadership, to the initiative and business; understanding of cultures and customs of other countries and ability to adaptation in new situations; ability to work independently, responsibility for quality and a will to success.

Selecting the personnel for the global companies a complexity is that such companies are compelled for the branches in different countries to accept specialists living and trained at university in the given country. Thus diplomas with excellent marks and other documentary certificates of professionalism of the specialist, does not allow to assert that it is capable to carry out all necessary things at a high level in real operating conditions. Besides, it is not clear, how a new worker will be entered in culture and norms of the company. Globalization process has resulted in the universal use of English language in business sphere. Today many companies declare availability of corporate language, usually English: it concerns not only the joint ventures which are in territory of Russia, but also to the Russian enterprises working in the global markets. Communicating with business partners, we hear the verbal stream of the information directed on us. Distinctions in intonation contours, melodic pattern of languages can lead to distortion of situation understanding. At grammar level communication failure can occur because of the grammatical categories which are not found in a native language. As values and the

word compatibility, meaning this or that notion in various languages are different, incorrect use can entail semantic error interfering adequate perception of speaker's intentions. Therefore problem solution of intercultural communication is important. Communicating with foreign partners in a foreign language, each of us bears a national mentality in itself, the vision of the world and simultaneously faces other logic of attitude, the way of thinking, expressed in mentality of other ethno culture bearer. In the framework of professional communication, a speech activity is carried out in a wide social context which defines true sense of the statement. Distinctions in speech behavior and mentality can lead to emergence of semantic barriers in the course of communication.

ROLE OF LANGUAGE TRAINING IN PERSONAL AND INTERPERSONAL COMPETENCE FORMATION

Problems of bilingual engineering education

The analysis of personal and interpersonal competences testifies that knowledge of a foreign language is necessary for their formation. We mean an English language in overwhelming majority of cases. It is caused by globalization of the markets, and that English language is recognized as a science language in scientific community [9]. Problems of development and mastering of bilingual communication skills are considered in works of many authors as one of problems of modern engineer training. The author of the paper [10] considers experience of training in bilingual university in Puerto Rico. The technique named classroom translanguaging is described here which is based on use of several languages in a discourse that is beyond traditionally known concepts of linguistics: code-switching, code-mixing, or language alteration.

This paper [11] is devoted to studying of requirements for formation of bilingual communication skills among engineers depending on a kind of their professional work. Authors investigate interrelation between form of professional activity and requirement for different skills of bilingual communication.

Formation of bilingual professional communication skills

Work of the engineer in the global company demands of bilingual communication skills which can differ substantially depending on a professional work:

1) To use a language for: (a) participation in design; (b) control of design; (c) manufacture control.
2) To communicate with foreign engineers in English.
3) To communicate by phone in (nontechnical) language.
4) To cope with an everyday life in the foreign country.
5) To conduct business and technical correspondence and to send faxes in English.
6) To read the advanced technical literature in English.
7) To conduct significant conversations and direct negotiations in English.
8) To design engineering specifications in English and manuals for a consumer.

As the global companies can open assembly manufactures abroad, so engineer who will participate in the given processes, skills 1-8 will be necessary. If the company develops a dealer and service network abroad an engineer in this case should acquire skills 2-7.

Features of competences development in the field of foreign communication at engineer training for the global company consist that language modules are integrated into the curriculum on the basis of gradual expansion of skills and a range of problems to be solved. At a stage of a problem statement and analysis carrying out of the studied subject students do the review of scientific and technical researches in English and prepare presentation on these materials. The following stage assumes participation in the international conferences, Olympiads and projects where students can communicate with the colleagues from other countries. Interactive training courses and virtual training modules are used during training session.

Such type of training organization is understood in design activity at which students develop projects under the teacher's supervising. Depending on a planned result (a poster, a drawing, a broadcast, a video film, presentation of poll results, a holiday scenario etc.) the given work can be done during one or several classes. Thus for gathering necessary information students should carry out searched task which assume work with additional literature, interviewing fellow students, teachers, people in the street, video and photographing. Activity of students is based on group interaction which is not only mode of study, but also a natural component of educational process.

Designing is the activity directed on a specific topic, but not on the specific language purposes in which various kinds of speech will be involved. At network interaction of different universities of different cities and countries telecommunication projects can be carried out. Such projects are unique for us in respect that they give the chance to create the real language environment while it is traditional teachers of a foreign language have been compelled to be limited at lessons to conditionally speech exercises and situations thus it was impossible to generate original requirement for dialogue, and accordingly, original communication.

Computer technologies essentially improve process of a foreign language teaching, having towards traditional methods such advantages as: information capacity; intensification of unsupervised work of each student; increase of informative activity of students, and also motivation strengthening; creation of a communicative situation, personally significant for each student.

The great value has advanced training of foreign language teachers which should be competent in the sphere of their professional work and be able to use professional

terminology. Training is carried out in close interaction with the partner companies for which personnel training is carried out.

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