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Development of Global Profession-Related Foreign Language Competency on the Basis of Integrative Approach as an Important Aspect in Interdisciplinary Team Work Training for Petroleum Workers

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Interdisciplinary tasks of petroleum industry boost intensive international collaboration and intercultural cooperation. This necessitates development of global profession-related foreign language competency required for both engineers and middle-ranking staff since it is a crucial factor in interdisciplinary and international team work training for the next generation of petroleum workers. The authors of the present paper suggest educational process design based on integrative approach and relevant principles.

Key words: interdisciplinary teams, foreign-language preparation, integrative approach, global professional foreign-language communicative competency.

Contemporary technologies in oil and gas industry are based on interdisciplinary approach, i.e. their development and implementation involve knowledge from different spheres – chemistry, physics, geology, biology, ecology, economics, information, etc. Such developments related, for instance, to tight oil recovery, environmental safety of offshore fields or associated gas utilization require knowledge and breakthrough technologies from different spheres which are, as a rule, developed unevenly in different countries. It is more effective to organize interdisciplinary cooperation at the international level using advantages of various national engineering and research schools, as well as practical experience of manufacturers – technologists and engineers – from different countries. One of the consequences of the globalization in petroleum industry is fractional production – when its components are produced in different countries, which increases significantly the number of international contacts and their significance. More and more joint upstream oil and gas projects are implemented on the basis of international and interdisciplinary developments, exchange of practical experience, and international cooperation with different share of domestic and foreign capital both in Russia and abroad. The effective interaction within teams becomes more important, the teams being not only interdisciplinary but also international. Now petroleum engineers' proficiency in English is one of the principle skills allowing companies to be integrated in the international professional community. The skill in professional foreign communication becomes of great importance for Russian engineering education, as students are to gain effective language training based on professional communicative competence [1, p. 33]. However, contemporary language training is to be performed in such a way that petroleum engineer could exercise professional activity in an international interdisciplinary team. It is of no doubt that there is a demand for a shift in the language training system towards qualitatively new level of cross-cultural interaction competency, global professional language competency of both students and working specialists based on professional communicative competency.

The efforts to address the problem mentioned above have led to introduction of (ESP – English for Specific Purposes) into the system of professional training. It is considered to be a priority in the sphere of education innovation. ESP training allows using foreign language as a tool to develop global professional language competency (GPLC).

The essential features of the given competency derive from the requirements for education programmes specified by accreditation agencies, as well as from professional functions of a globally competent engineer.

As early as in 2007 the main criterion of all agencies was the demand for global model of engineering accreditation that can be used to assess engineers' global professional skills [2, p. 642]. As a result, in 2008 A. Patil, C.S. Nair and G. Codner distinguished six basic qualities of a globally competent engineer [3], in 2009 A.D. Chan, J. Fishbein and L.G. Brown expanded the list by adding ten qualities [4, p. 4-9]. Having analysed those qualities and requirements of leading international accreditation agencies for a globally competent engineer [5, p. 3-9; 6, p. 17-19; 7; 8, p. 6; 9], we identified five basic blocks of GPLC intended to master language skills of a globally competent engineer.

1. Communicative skills: ability to work and communicate in the national and international environment with representatives of any nations and cultures; transform information; ability to conduct discussions and arguments, brain storming, professional oral and written communication in native and foreign languages; make reports, present projects, ability to argue, and persuade.

2. Independence: ability to study and implement innovations independently in a single-discipline sphere, ability to use up-to-date information technologies; knowledge and skill of searching for and collecting professional information in different databases (library and electron ones); ability to perform self-study, self-development, self-education for the life-long personal professional development.

3. Developed critical thinking: ability to cope quickly with a problem of any complexity, respond adequately; ability to analyze, generalize, observe, interpret, criticize, reason, and act creatively; mastery of critical thinking techniques; ability to select evaluation criteria reasonably, knowledge of value system; ability to analyze, process, and present information in the form of review, report.

4. Skills of professional communication: ability to be a member/leader of multidisciplinary and cross-cultural team; ability to negotiate with employees of other organizations; ability to manage and report to; knowledge of labour market and economics; ability to effectively interact; ability to work in the innovative environment.

5. Global (ethical) communication: ability to understand the influence of his/her profession on society, industry, nature, and economy at the global scale; knowledge and ability to effectively apply professional ethics; understanding of responsibility in making professional decisions; skill of running international business, solving problems related to national differences; ability to understand diversities and differences between native and other cultures; knowledge of ethical aspects of cultures; knowledge of diverse disciplines and skill of their synthesizing to apply for non-diversified environment; ability to compete and cooperate in international context.

Based on the enumerated qualities required from a global engineer, we regard GPLC as future/working specialist's ability to effectively use language knowledge and skills in the secondary language environment to solve basic communicative, presentation, and technical professional

problems, communicate successfully and ethically in the condition of professional international cooperation, to be a member or leader of interdisciplinary international teams, to think critically and respond flexibly in any conditions of professional cross-cultural cooperation, as well as readiness for life-long professional self-development in the sphere of international communication.

Analyzing GPLC components, it should be noted that communicative skills are not just in a row with other components, but they are basic, central skills, as mastering all other components is performed via, first of all, communication.

When comparing GPLC components, FSES and FSES 3 + requirements for the training petroleum workers of middle and top ranking, it is evident that education standards do not fully meet the requirements of global labour market. At most, one can say that GPLC components are presented separately, as constituents of different FSES competencies.

It is suggested that GPLC of petroleum engineers and students should be efficiently developed by introducing an "Intensive integrative foreign language course" based on integrative approach and interdisciplinarity. The course could be a part of both basic university and further professional development training.

The integrative approach is conditioned by the interdisciplinary character of petroleum engineer's professional activity, as well as more general trends – integration of science, education, and industry resulting in uniting the content of different disciplines [10, p. 222]. The integrative approach makes possible to link the profile disciplines with foreign language that generates sustained interest in language learning and increases motivation. The regular interdisciplinary integration focused on professional sphere at the foreign language classes has a positive effect on development of professional qualities. Interdisciplinary integration allows students to build an integrative professional worldview, develop critical thinking and imagination, increase cognitive activity, develop creative skills, as well as perform intensive cognitive and research activity [11, p. 43]. Such an approach strengthens the preparation for work in interdisciplinary international teams and projects, and can be adopted for both basic and additional education.

The following basic principles of "Intensive integrative course of foreign language" aimed at GPLC development were distinguished: the principle of professional relevance (the content of the course was designed in view of professional functionality), the principle of language authenticity (the course should not only facilitate communicative skills development, but also the skills of correct usage of speech patterns), the principle of time and load management (the course is designed in such a way that student's active and passive vocabulary increases 4 times as compared to that in the traditional training method), context-based principle (the content is selected in such a way that new words are learnt in the process of contextual guess and in the subsequent learning process they become a stimulus for student's reaction), the principle of motivating content (learning content creates professional environment producing situations/problems to encourage students to speak), the principle of integration of all learning activities (communicative skills cannot be separated from other types of language activity, hence, there should be integration of speaking with other language skills and competencies), the principle of teaching to learn (learning content is to teach students to use foreign language as a tool for information search and self-development), the principle of speaking and culture integration (the course content is to be focused on development of speaking interculture), the principle of critical thinking development (tasks are to be focused on development of student's critical thinking, which gives a future specialist flexibility to analyze professional conditions).

SPECIALISTS' TRAINING FOR INTERDISCIPLINARY TEAMWORK AND PROJECTS

The "Intensive integrative course of foreign language" suggests a combination of learning methods forming the conditions of GPLC development, such as: role playing, debates, brain storming, Case-study, problem tasks, jigsaw technique, project method.

One of the ESP goals is to develop foreign language communicative competency related to a set of general culture competences (GC) (for instance, GC 1 – GC 12 of FSES SVE for future petroleum workers) that imply students' proficiency in General English. In the course of our experiment, language communicative competency was a starting point for GPLC development. Therefore, we assume that comparison of language communicative competency levels made before the experiment has confirmed their homogeneity. The test results showed that all groups had approximately the same low level of language communicative competency, since 50-53% of students made less than 50% of the test.

To evaluate the effectiveness of the suggested principles and the approach to GPLC development, we carried out an experiment involving prospective oil field equipment technicians trained at Almetiev Polytechnic College, as well as a group of working oil field equipment technicians from the departments of Tatneft "Yamashneft" (graduated no later than 6 years ago) in the framework of additional education. In total, 70 students and workers were involved in the experiment.

In the course of the experiment the English language was taught on the basis of selected material integrated with the major disciplines of professional profile. To implement the integrative approach a variable set of practical tasks was used with the problems close to those faced in the professional condition and global interdisciplinary environment. For example, during communicative games students were divided into teams, each with its own role of future profession, for example, geologist, geotechnician, technician etc. Competitive base and high level of independency in the problem solving intensified motivation to learn professional English. The students solved relevant professional problems of cross-cultural and interdisciplinary character. For example, during business role playing, projects, and problem tasks the students could address the issues of presenting new petroleum field equipment, studying methods of oil and gas production used abroad. While performing the task, it was necessary to follow rules of decorum, cross-cultural conventions, take into account national and cultural features of foreign colleagues.

Test was chosen as a form of placement and final assessment of GPLC development. It consisted of blocks corresponding to designated earlier GPLC components. Tests consisted of 5 parts, each containing: foreign language context: tasks aimed at checking the level of communicative skill development – 10 points; tasks on revealing the ability to self-study and self-develop in the sphere of professional communication – 10 points; tasks on the ability to think critically in the professional environment – 10 points; tasks revealing the level of professional interdisciplinary communication skills – 10 points; tasks stating the ability to communicate ethically in cross-cultural environment – 10 points. The criterion of assessment was percent of tasks performed correctly. Therefore, 3 levels of GPLC development were defined, where, in its turn, 3 levels were specified: low level (0-50% of correctly performed tasks); average level (51-75% of correctly performed tasks); high level (76-100 % of correctly performed tasks).

The results of the experiment have shown that the number of students with low and average level of GPLC is significantly lower in the experimental groups in comparison with the reference group. The diagram (Fig. 1) shows the average dynamics of changes in all components of GPLC.

If we take the levels (low, average, high) of GPLC development as grades (3, 4, 5), correspondingly, then qualitative

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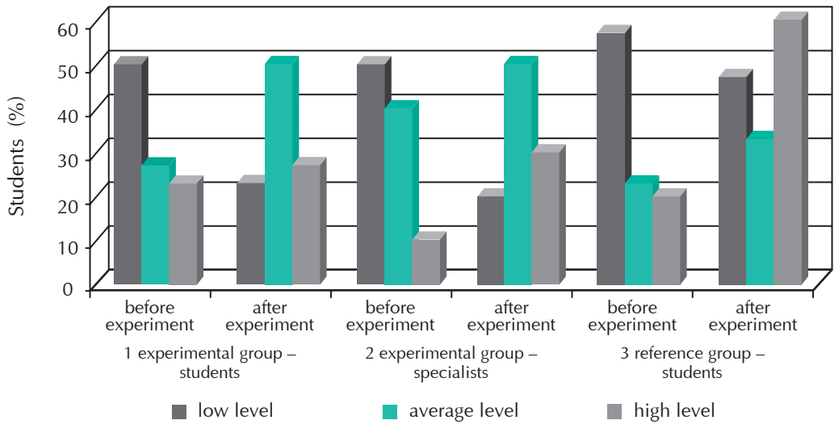
Fig. 1. Dynamics of students' GPLC development



Dynamics of students' GPLC development levels before and after experiment (%)

performance in groups before and after experiment can be presented in the graph (Fig. 2) that shows positive dynamics. The quality level in the experimental groups grew by 27-30%, whereas in the reference group the results increased by 10%. The experimental results confirm that GPLC is effectively developed within "Intensive integrative course of foreign language", content and structure of which are based on integrative approach and a set of suggested organizational principles.

Competitiveness of contemporary production is provided by a specialist of new type capable of working at global international scale, performing effective professional activity in international interdisciplinary teams. We strongly believe that the shift of foreign language training towards development of global professional language competency is a turning point in change of focus on foreign language training of national engineering community and medium level specialists of not only petroleum engineering, but also other industries with high potential of international cooperation and interdisciplinary developments.

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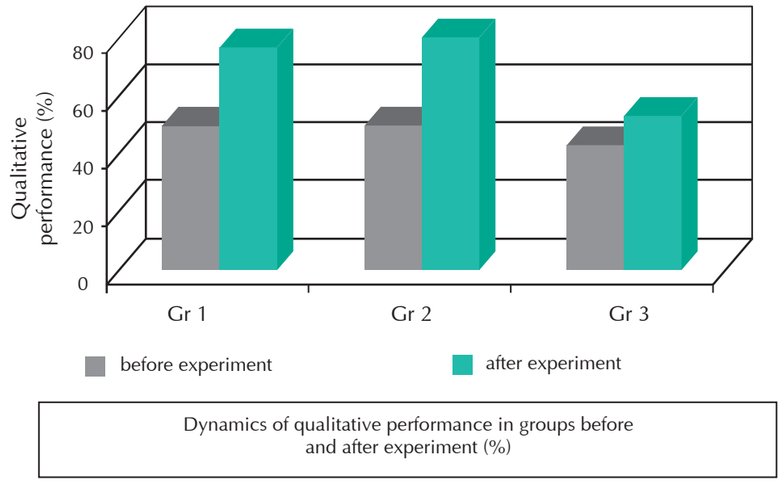
Fig. 2. Dynamics of qualitative performance in the experimental and reference groups



Dynamics of qualitative performance in groups before and after experiment (%)

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Economic, Scientific and Technical Factors in Quality Management

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The article examines interaction of economic, scientific and technical factors in quality management training including not only development of new approaches, but also design of integrated systems based on the principles of total quality management. In order to estimate efficiency of interdisciplinary projects, multi-criteria and multi-model approaches are considered essential.

Key words: quality management, integrated systems, total quality management, scientific and technical factors, economic factors, estimation of project efficiency, multi-criteria approach, multi-model approach.

By the end of the 20th century, people have come to understand that quality management rests on the strategies and tactics to achieve economic well-being of a certain employee and society in general.

The 21st century was rightly called a Century of Quality by UNESCO. The current approaches to quality management do not only concern engineering process, but also direct and control an organization and society as a whole. In fact, quality is an integral notion that involves engineering, technical, economic, social, philosophical and other aspects, as well as their interaction. Today, quality management is of great importance as it is regarded as a strategy to improve economic efficiency within the international integration frame.

Different market processes stipulated the origin of various quality management systems based on the principles of Total quality management (TQM). The modern toolbox to enhance quality and productivity in business has been recently enriched by such approaches as Project Management, benchmarking (a method to compare key metrics), teaching organization theory, Balanced Scorecard, the concept of "6 sigma", Business Excellence, Total Productive Maintenance (TPM) [1, p. 82].

Managers of the companies have started to use more often various methods of analysis and problem solving which encourage and develop creativity. Benchmarking continues to grow in popularity and is used to enhance economic efficiency of organizations. Project management that allows creating flexible project-based and horizontal organizations also develops, though, not as rapidly as desired. Among the approaches that are likely to grow in popularity, Balanced Scorecard and Knowledge Management are worth mentioning. The requirement for a life-long learning has become an inevitable reality.

It is obvious that the basic concept of Scientific Management is directly dependent on the quality policy, which, in its turn, is the basis for effective implementation of other strategies of a company. Today, quality management is gradually becoming the key method to control and direct business, i.e. management of the fourth generation [2, p. 25].

The end of the 20th century witnessed a transition from "Mass production" to "Lean production". The beginning of the 21st century is viewed as a period of a new type manufacturing, called by a number of authors "Agile Manufacturing". Lean production, agile manufacturing, and simple use of process approach in line with the standards ISO 9000 can eliminate the borders, first of all, between organizations, then, between countries [3, p. 16].

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