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METHODS OF TRAINING STUDENTS FOR TEAM WORLD CHAMPIONSHIP IN PROGRAMMING

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Abstract: The paper studies a cluster of creative competences of IT specialist; the mechanism of organizing Olympiad movement has been described; the peculiarities of organizing championship in programming has been analyzed; the technique of arranging training courses for this kind of championships has been described.

The development of innovative economy and the emergence of the sixth technological structure, involving the priority use of artificial intelligence and process-based bioengineering and nanotechnology bring about new problems into the system of higher education. The innovation activity as a process of turning the results of creative activity (and, first of all, research) into new products, technologies, services, and further organization of industrial production, becomes dominant in the work of a specialist (BA, MA). At the same time, the approach to the selection of the content, educational methods and technologies used at universities, ensuring the development of the necessary skills of a competitive specialist is changing.

The analysis of the Federal Standards of Higher Education in Russia in different areas of training showed the need for clustering competences which were presented there to develop the universal teaching methods for their development and control. In the context of training for the innovation economy the most relevant cluster is the one of creative professional competence [1], which can be described as a set of competencies that have invariant component including the individual's ability to implement successfully activities requiring heuristic or creative level of intellectual activity.

Willingness for innovative activity of graduates in Direction 230100 «Computer science and computer facilities» is defined by the following skills rated among the creative competencies including: aspiration for professional and self-development (CC-6), ability to develop components of program complexes and databases, to use modern tools and technologies of programming (PC-5).

In our opinion, in the context of bachelors and masters' training in Direction 230100 for professional activity the Olympiad movement is of special importance as it is focused on the development of students' creative abilities in the field of information

technology; it helps to form the cluster of creative and other professional competences, which are necessary for the competitive expert. Olympiad movement allows students to develop creative problem-solving skills, to acquire psychological stability and get ready to solve real-world professional problems of modern industry.

The development of creative skills can be promoted by involving first-year students in Olympiad movement in academic disciplines including science and mathematics; the competitions and championships can be organized in the first weeks of studying for all students and include original problems of different complexity which assume the use of knowledge obtained at secondary school. The purpose of these competitions held either at the group or course level is to feel the joy of creativity, to assess students' ability, to see weaknesses in their training, and to encourage them in expression of the heuristic or intellectual activity. In this case the stress is reduced to a minimum as participation is more important than winning.

The students who want to continue their creative development join special microgroups, which are formed according to the results of the initial competitions and personal preferences. It is possible to form several groups with different levels of training and free attendance. For students who want to take part in Olympiad movement, but for various reasons do not have the opportunity to participate in the activity of the microgroups, a joint Olympiad self-information network is established. In Olympiad movement the role of national and international competition is changing because they are considered primarily as a business model under uncertain and competitive activity.

In the course of training of IT specialists for creative activity in the framework of Olympiad movements as a form of organization of training the competitions on programming play a special role, the ACM World Championship in programming (**ACM ICPC**) in particular. Traditions and pedagogical technologies taken as a basis of this competition enable to make positive impact on the development of an invariant cluster's component of creative competence of IT specialist of any applied profile.

It is necessary to mention that the competitive nature of the event can raise the level of student's motivation for learning and scientific creativity.

What is more, the process of solving championship problems is a subjective new reasoning chain structure; at the same time, the instant check of programmers' solutions is exercised on several criteria (accuracy, efficiency in time, the efficiency of memory), which enables to find several solutions. The acquired skills allow students to develop new reasoning chain structures which are an integral part of research activity.

Also the international student's competition in programming gives lecturers an opportunity to improve pedagogical technologies and exchange experience of various methodical schools.

It is necessary to make a special emphasis on the development of creative teamwork competence in the competitive environment, which is required for the organization of effective production in the IT-sphere. The educational techniques used for training university students were designed to develop individual abilities rather than team-working skills. In the majority of educational programs teamwork and the acquisition of skills of sharing responsibilities among the members of the team to deal effectively with the project used to be neglected.

Olympiad movement in programming promotes the development of team-working skills in the competitive environment because the result of the team in a competition largely depends on the team members' ability to share responsibilities and the work on the problems rather than on the individual level of training of each team member. At the same time, teamwork in conditions of limited resources during the competition (one computer per three people) encourages students to work together and share problems within the framework of a project; it also develops team spirit. The ability to work in a

team will help graduates to compete efficiently in the job market as they acquired the necessary skills through their participation in Olympiad movement. Let's consider the accumulated experience of organizing Olympiad movements in programming and training students for the competitions. The first step is to form microgroups. The most common way is to ask teachers to recommend the most capable students. This approach limits the opportunities of some talented students who do not use their full potential in the study of subjects identified by the Federal Standards of Higher Education in Russia; either for some personal reasons, or through primarily reproductive character of educational activity they are reluctant to be involved in this activities.

It's not necessary for all students to take part in competitions at the first stage of selection. They can be tested in the course of studying; their involvement in Olympiad movement can be organized though offering additional evening courses in programming. Students can find information about these courses from their mates and group leaders as well as from the ads of the center for university students' Olympiad movement.

Students are usually placed in groups and attend 5–7 classes aimed at intensive training of relevant material in algorithmization and programming in high level language and solving simplest problems.

As a result of training it is necessary to form a group of students who wish to participate in competitions and have necessary abilities and skills and teach them to solve more complicated problems. At the same time it is advisable to continue the process of creative training for other students, giving them the opportunity to join the advanced group.

Solving problems for participation in programming championship is based on doing relatively simple tasks, which are often repeated. To compile the program of studies, we recommend to analyze a large number of the Olympiad problems (ACM ICPC has a huge collection of problems from past competitions) and highlights the most commonly used tasks. Reducing the time to solve these tasks gives students more freedom for developing new combinations of tasks and obtaining the desired result.

The experience in organizing Olympiad movement in programming has allowed us to develop the methodology for training students. The lesson in microgroups will be organized under the following scheme.

1. Creating the environment for problem solving as close as possible to the championship:

– problems are presented in English;

– input and output is carried out respectively in the input.txt and output.txt files;

– problems verification system is similar to the system which is used in the competitions.

Problems are based on the tasks sorted out from the real Olympiad problems which were reviewed in the class earlier (45 minutes).

2. Ten minutes' break: organizing games and other activities to release tension and stress (5 minutes), free time (5 minutes).

3. The analysis of new tasks (45 minutes).

4. Ten minutes' break: organizing games and other activities to release tension and stress (5 minutes), free time (5 minutes).

5. Team work on Olympiad problems which are based on processed tasks (40 minutes).

6. The content of homework promotes the development of programming skills acquired in class (5 minutes).

If students make progress in solving competition problems, it is possible to increase the load by adding an additional lesson a week to practice the skill of

independent solving of ACM ICPC problems; at this stage it is not necessary to arrange teams and to begin team work.

In order to train students for active participation in Olympiad movement it is advisable to introduce the course “Forms of organizing professional training” or “Olympiad movement as a form of learning” in the educational program [3, 4], or arrange self-studying of creative self-development in a single Olympiad information network.

Promoting Olympiad movement in the educational process and creating effective Olympiad teams on programming using the proposed technique enables to raise the level of students’ creative competence development and to train new staff for innovative economy. Students who have shown great creative skills and readiness for creative team work in competitions can quicker and more effectively join the activity of small innovative commercial enterprises based at university involved in scientific research and experiencing the need for highly qualified personnel in the field of programming.

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Методика подготовки студентов к командному чемпионату мира по программированию

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Ключевые слова и фразы: олимпиада; олимпиадное движение; творческие компетенции.

Аннотация: Рассмотрен кластер творческих компетенций специалиста в области информационных технологий; описан механизм организации олимпиадного движения; проанализированы особенности организации олимпиадного движения по программированию; приведена методика проведения занятий по подготовке к олимпиадам.

Methodik der Vorbereitung der Studenten zur Kommandoweltmeisterschaft im Programmieren

Zusammenfassung: Es ist der Cluster der schöpferischen Kompetenzen des Fachmannes auf dem Gebiet der Informationstechnologien betrachtet, es ist der Mechanismus der Organisation der olympiadischen Bewegung beschrieben, es sind die Besonderheiten der Organisation der olympiadischen Bewegung im Programmieren analysiert, es ist die Methodik der Durchführung des Unterrichtes in der Vorbereitung zu den Olympiaden angeführt.

Méthode de la préparation des étudiants pour le championnat mondial sur la programmation

Résumé: Est examiné le claster des compétences créatives du spécialiste dans le domaine des technologies informatiques, est décrit le mécanisme de l'organisation du mouvement olympique, sont analysées les particularités de l'organisation du mouvement olympique sur la programmation, est citée la méthode de l'organisations des classes de la préparation pour l'olympiade.

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