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Education of Civil Engineers: Emphasis Upon Team Work or Self-Development?

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Abstract. Recently, Russian education system has begun training civil engineers according to the new educational standard, which stipulates only universal and general professional competencies. The new educational program has twice more academic hours for the development of universal competencies than the old one. Instead of one discipline there are three for forming the specialist's competence. One discipline is included into an obligatory part. Its purpose is to create the universal competencies set in the educational standard. Two other disciplines deepen these competencies. This article gives a review of the content of all three disciplines. It thoroughly describes contents of sections and topics, enlists peculiarities of practical workshops and foresees the future results. In conclusion it is emphasized that those who study in a master's degree program in civil engineering have the right to select their own educational path and put emphasis on team work or on self-development

1. Introduction

The question of non-compliance of the higher education with the needs of the real economy sector has always been open. On the one hand, to work in hi-tech production the university graduates should have a high level of special professional skills [1]. Therefore the universities reject general education disciplines in favour of professional. On the other hand, the employers complain about bad socialization and adaptation of university graduates, their lack of communicative skills [2]. The educational standards of third generation have a particular group of general cultural competencies. Among them there are competencies connected with communication and collaboration [3]. Employers presume that the student acquire these competencies while studying professional disciplines [4]. But it is not so. The mathematician learns to make calculations, the programmer learns to write programs, the building constructions specialist learns to design and build constructions. And nobody is taught communication or team working. Similar problems in education have been noted by students worldwide [5, 6]. As a consequence, teachers include special training courses, which purposefully develop social competencies, in teaching programs of civil engineers [7, 8]. At the Russian universities such courses are included in educational programs for both bachelors and masters [9-12].

With the purpose to overcome a gap between the higher education and requirements of professional community in May, 2017 the latest Federal State Educational Standard of the Higher Education (the FSES of the HE 3++) was adopted for master's degree program "Construction". Unlike previous standards the FSES of the HE 3++ has close connection with professional standards. The professional

standard is a new type of the normative legal act approved by the order of Ministry of Labour and Social Protection of the Russian Federation. Professional standards define the areas of professional activity to which the educational program and professional competencies of graduates are oriented. Universities were given an opportunity to select professional standards on their own and form the educational program according to their preference. Also during the creation of educational program its developers study requirements imposed on graduates in labour market, domestic and foreign experience, consult with the leading employers of the industry. So the graduates can become better trained for professional activity.

Assessment of the graduate is made according to competencies acquired. They, in turn, are estimated by special indicators. Indicators of competency achievement are the generalized characteristics specifying and revealing what is meant under this or that competency. They could be presented in the form of results of study or in the form of the specific actions performed by the graduate. These indicators show that the level of competency acquirement could be checked during training, but not during professional activity.

The structure of competencies in the FSES of the HE 3++ differs from the previous educational standard. General cultural competencies were replaced with the universal competencies (UC). And it is rightly done. In the past general cultural competencies were different for different specialists. Universal competencies are uniform for all educational standards of one education level (bachelor, specialist, master). The FSES of the HE 3++ sets also all-professional competencies (APC). APC differ for the different majors, but all students of this specialty shall have learned these competencies by the end of their study. The professional competencies (PC) are not prescribed by the FSES of the HE any more. The university can select the most suitable PCs from the approximate main educational program or formulate them independently.

Let us analyze the formation of universal competencies in more detail. The universal nature of UC preordained their social-personal orientation. Their role in the society development is emphasized by their identity and universality for the different majors. Any specialist having the higher education at one and the same level (bachelor, specialist, master) should also have the corresponding competencies. We should note consistency of these competencies from the first education level to the second.

It is commonly believed that construction is a joint coordinated work of many people. And that is true. On your own you can build only a small private house. The construction of a complex facility requires the concerted work of an entire team. Therefore, the main emphasis in the social competence of builders is placed on team work. Teamwork requires having special social skills and abilities. These skills should be specially created during training [13, 14]. But skilled construction engineers should also have advanced critical and analytical thinking, self-confidence, time management skills, be able to reconcile local traditions with technocratic and bureaucratic knowledge in the object under construction [15, 16]. This entails mastering other competencies, not social ones, but personal ones. How to ensure the creation of all these diverse competencies within the framework of one master's degree program?

2. Methods and results

The aim of this research was to develop an educational program that would help future civil engineers to form the universal competencies needed for teamwork and personal development. In order to solve this task, the Moscow State (National Research) University of Civil Engineering introduced in the educational program of masters the following series of disciplines: "Social communication. Psychology", "Technologies of teambuilding", "Self-government and self-development technologies".

The experimental part of the study was based on the analysis of normative documents and reflexive analysis, and the method of forming experiment.

Discipline "Social communications. Psychology" belongs to the mandatory part of the educational program. It is studied by all master's degree program students. The disciplines "Technologies of teambuilding" and "Self-government and self-development technologies" correspond to the group of optional disciplines. These disciplines are studied in the next semester. They help develop missing

skills. Students can choose the path of their training on their own: to learn either teambuilding or self-government.

2.1. Social communication. Psychology

Discipline "Social communication. Psychology" includes traditional forms of work: lectures, practical classes, independent work and control. The labour capacity of discipline is 3 credits, of which classes with the teacher participation take 25%.

The lecture course consists of three sections.

Section 1. Self-organization, self-development and adaptation to professional activity.

The topics of the first section reveal the following issues:

Market of labour and educational services.

Structural components of self-organization.

Personality resources.

Section 2. Cross-cultural interaction and social communications.

Modern construction is a work with different people including foreigners. There is a set of differences between cultures within one country and between the countries. Civil engineers should comprehend these distinctions and treat them as real ones. For the best understanding of psychological and social identification of different workers and different cultures the second section offers studying such topics:

Variety of cultures and cross-cultural interaction.

Migration processes and social and cultural integration.

Communicative barriers and overcoming conflict situations in the polycultural environment.

Section 3. Team work and leadership.

The third section gives an overview of management of teamwork. Skills of teamwork have been already got at the previous education level. Master's degree allows the graduate to manage work of a team. For that reason students study topics:

Teambuilding.

Motivation and different styles of team management.

The lecture course puts forward theoretical preparation. Students can apply the knowledge gained and get the corresponding experience during practical classes, which are given in the form of role-plays and business games, discussions, solution of cases [17].

At the first practical lessons students learn to set the purposes of professional growth correctly, to apply self-diagnostics methods for specification of priorities in educational and professional activity. Mastering these skills will allow them to identify their own peculiarities of self-organization and self-government, to plan ways of correction if it is necessary.

Identification of individual distinctions helps to acquire experience of interaction in polycultural environment. Construction is studied, as a rule, by students of different cultures and nationalities. A practical training as regards the second section topics gives a chance to feel difficulties which civil engineers meet in real time and to learn to overcome them. Students study behaviour models of workers in different situations, models of adaptation and integration of workers in production area. They solve the training cases and analyze real conflict situations between students of an educational group. Students learn to analyze the conflicts, models of conflict behaviour of representatives from different cultures; to find ways of conflict management. Special attention is paid to studying of stereotypes, communicative barriers and ways of their overcoming.

During final practical lessons students gain experience of management of their classmates. They learn to set the goals for a group of students, to motivate their activity, to estimate their work, to represent results of group work before audience. These exercises help to reveal organizing and managerial skills of students, to define ways of their further development.

During independent work students study additional theoretical material, carry out self-diagnostics, do their homework, prepare for control works.

Control works for discipline are the following: a classroom examination on the topic "Cross-cultural interaction and social communications", homework on the topic "Self-organization, self-development and adaptation to professional activity" and credit after the theoretical part. The set of these works makes it possible to evaluate all the indicators of mastering competencies formed by this discipline completely.

2.2. Technology of teambuilding

The discipline "Technology of teambuilding" includes such forms of work: practical classes, independent work and control. There are no lectures. The labour capacity of the discipline is 3 credits. Classes with the teacher participation occupy 15%. At practical lessons students gain experience in team formation and management. All classroom lessons have a format of trainings.

The discipline includes 2 sections.

Section 1. Team creation.

Team goals and strategy.

Roles in the team. Rules of work.

At the first class, students team up and learn to align their own purposes of studying discipline with those of the team. For many this task is very difficult. Students with high leadership potential would not like to be subordinated to other participants. In such case, the composition of the team could be changed. Students distribute team roles and conduct SWOT-analysis of their team. Based on the analysis, the team outlines a strategy for its activities.

Section 2. Organization of work and team management.

Team work plan.

Managing the team.

Increasing efficiency.

Work on the project.

Effectiveness evaluation.

At subsequent classes, students learn to plan team activities in different settings. They gain experience in leadership behaviour and managing the group; determine characteristics of motivation and seek ways to influence motivation of each other. This gradually results in the actions of the group members becoming more consistent. Efficiency of operation is increased. The number of conflicts is reduced.

The penultimate lesson is both diagnostic and control. It shows the acquired experience of team work. Each team develops a project of a construction object in the university environment, creates this object, conducts a presentation and evaluates their work. This task helps students see their work from the outside and get feedback.

At the final classroom lesson, students perform a reflexion of their own activities and assess the effectiveness of the team.

During out-of-class time students study additional material, carry out self-diagnostics and reflexion of acquired experience, do home tasks: "Command roles" and "Motivation and psychological influence in the team". The interaction of a team of students during out-of-class time and joint work on other educational projects are also encouraged.

Competencies development is evaluated on the basis of the set of control works done.

2.3. Technologies of self-government and self-development

The discipline "Technologies of self-government and self-development" includes such forms of work: practical lessons, independent work and control. There are no lecture classes. The labour capacity of discipline is 3 credits, of which classes with the teacher participation take 15%. The discipline allows students to deepen the level of competencies acquired in the field of self-organization and self-government, self-improvement and personal growth in educational and professional activity. The classroom lessons are based on the individual work of the students.

The discipline includes 2 sections.

Section 1. Technologies of self-organization and self-government.
Priorities of professional activity and personal growth
Targeting and achieving goals in educational and professional activities.
Self-organization and self-government.

During studying this section, students learn to determine and set life and professional priorities, set purposes, plan for their achievement, and manage their time. The main task is to master the techniques of self-organization and self-government.

Section 2. Technologies of self-development and personal growth in educational and professional activity.
Overcoming personal constraints on the path to the purpose.
Resource state.
Path of professional development.

After defining professional purposes, students learn to identify their own resources to achieve purposes. These are not material resources, but personal ones: emotional, intellectual, personal limitations. With the help of a large number of diagnostic tests and practical techniques, students learn to understand themselves, their opportunities for professional development and career building better. At the end of the discipline study, each student builds a path of their own professional development taking into account the requirements of the labour market and self-assessment.

In out-of-classes time students study additional material, carry out self-diagnostics and reflect on the acquired experience, do home tasks: "Technologies of self-organization and self-government" and "Technologies of personal growth". Compiling CV and interviews with employers are also encouraged.

Competency development is evaluated on the basis of the set of control works done.

3. Conclusions

Employers' dissatisfaction with the level of university graduate training [9] has led to the update of educational standards. The close connection of the educational program with professional standards makes it possible to make the training of specialists more "targeted", oriented to professional activities. Simultaneously, the time needed for the creation of universal competencies has been doubled (from 3 [18] to 6 credits) in the educational programs of civil engineers. This brings Russian education closer to major technical universities in the world, where the amount of the humanities, social and behavioural sciences is up to 9 credits [19, 20]. In Russian circumstances, such change in priorities is justified. Most master's degree program students already work in the construction sphere. They gain basic professional skills directly in the workplace. Obtaining a master's degree allows them taking a leadership position or be promoted on the career ladder. For this purpose, in addition to deepening professional knowledge and skills, civil engineers need to be able to adequately assess their capabilities, plan their professional growth and be able to organize a team of like-minded people around them. The modern educational training program has two stages in formation of universal competencies. At the first stage their primary formation of skills takes place. Students can also choose the path of further learning. At the second stage students can deepen the level of selected competencies: self-development or management of the team [21].

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