

## Conference Paper

# Project Training at the Ural Federal University

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## Abstract

The article presents a model of implementation of project training at the Ural Federal University. Project training is presented as a set of mechanisms and tools for the formation of students' competencies demanded by employers and attracting new competencies and resources from the real sector of the economy. The advantages of the approach implemented at UrFU aimed at optimizing the procedure of interaction of student teams with enterprises are described. The authors suggest that the proposed approach makes it possible to effectively build communication between all participants in the process, increase motivation and involvement of students in the process of mastering their chosen educational programs.

**Keywords:** project training, educational programs, model, employers, communication, soft skills development, University, practice

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## 1. Introduction

Currently constant technological, research, social and cultural changes are taking place at a high rate. There is a transition from an industrial society to a digital one. This has an impact on all spheres of life of the individual and society as a whole, including in the field of education. In the era of the Internet, access to information is public and unlimited, modern students no longer need to take notes of lectures and spend hours in libraries in search of the necessary information. In this regard, it is necessary to change the approach to the education system as a whole. Not for nothing is becoming more popular in the school system is the technique of "inverted classes" [1], invented by Jonathan Bergman and Salman Khan, in which students at home instead of homework study theory, and in the classroom already master practical skills and ask teacher questions. This learning model moves the delivery of theoretical knowledge into the personal space of the student, thereby freeing up more time for improving practical skills. A similar approach for the higher education system can be implemented through the introduction of the project form of education. A number of researchers are engaged in

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the implementation of project training in universities [2, 3], among them O. I. Rebrin [4, 5], the methodologist of the project form of training for students of engineering specialties at the Ural Federal University.

The gap between the required and existing funding in the Russian education system is the next factor leading to the need to move from traditional forms of education to project-based training. Today, the vast majority of universities have funding at an extremely low level. Another gap in the education system is the insufficient number of qualified personnel in relation to the existing need. The lack of the necessary amount of highly qualified teaching staff, primarily middle-aged, sets the University the task of attracting additional resources from the real sector of the economy, giving the necessary reoriented competence and providing access to modern high-tech equipment, which is often absent in universities.

An important aspect that dictates the need to move to new more effective forms of organization of the educational process is the lagging of learning outcomes and competencies in practice-oriented educational programs from the realities of modern times. This problem is particularly acute in the industrial regions of the country. Traditionally, a University graduate in the regional labor market has a high fundamental training. However, the real sector of the economy in addition to the requirements to the level of basic training demand profile of a graduate in terms of categories (groups) generic competence: a systemic and critical thinking, development and implementation of projects, teamwork and leadership, communication, self-organization and self-development. The leading way to achieve these competencies is the technology of project training as a kind of contextual learning.

In the established understanding, the participants of the educational process are always two actors - the University and the student himself. The output is a graduate who has high fundamental knowledge, but has not received a sufficient number of practice-oriented skills. To solve this problem, it is necessary to add another link to this chain - "enterprise". This will allow the employer to participate in the implementation of the educational process, making it the learning outcomes that he later expects from graduates. In this case, the University becomes a kind of connecting platform for students' interaction with enterprises and organizations.

To ensure the transition to project-oriented educational programs necessary to solve the problem of ensuring the educational process staff able to use the project approach in the implementation of educational modules involving team projects full life cycle, and the creation of professional communication environment for the implementation of student projects format resource centers and coworking.

## 1.1. The practice of implementing project training at the Ural Federal University

To solve this problem, it is necessary to qualitatively change the content of education, which in UrFU was proposed to implement by introducing mechanisms of project activity, which allows to form a fundamentally new profile of UrFU graduate, able to effectively solve the problems of modern society.

The main principle that guided the University in the development and implementation of project training is a modern rethinking of practice-oriented forms of student learning, when in the conditions of rapid changes in the external environment, the teacher cannot provide training at the current level. From here there is an idea of attraction of experts from the external (in relation to University) environment which on real, interesting for them design works carry out training of students.

In order to adapt the best practices for the implementation of project training, a lot of attention was paid to the learning of the experience of other universities, in particular such universities as St. Petersburg Polytechnic University named after Peter the Great and Moscow Polytechnic Institute.

The work carried out on the formation of a list of basic requirements from enterprises, allowed to allocate them and classify them according to the degree of importance.

Construction of the system of project training in Urfu, which is carried out in accordance with the requirements of GOST [7], includes a set of interconnected information systems and services of the University, providing the process of passing the module "project training" by students. During the implementation of project training, the current processes of the University and existing information systems ensuring their implementation were studied in details: planning of educational programs, load distribution, implementation of academic disciplines, including assessment procedures.

The analysis of the current systems revealed that the University systems do not have modules: "statement of the project task for student teams" and "team work of students". The analysis of existing solutions on the market showed that ready-made solutions that meet the identified requirements for the system have not been created yet. In this regard, it was decided to independently develop the missing components of the future system of project training. To each developed component the set of requirements both at the level of user requirements, and at the level of requirements of other used components of system is defined, according to the approaches stated in A. Levinchuk's book "System Engineering thinking" [6].

Prior to the preparation of the technical specifications and transferring it to the development team of programmers spent designing processes top-level processes lower-level project-based learning using the IDEF0 (Integration Definition for Function Modeling) notations on the upper level and BPMN (Business Process Model and Notation) notations and the procedure at the lower levels. The depth of processing reaches 5 levels. An important step was the coordination of the resulting process model with stakeholders both internal and external to the University. A General description of the project learning process is presented in Figure 1. (System of project-based learning). After verification and approval of the process model, new components of the system were developed: "employer's Personal account", "project team interaction Service" and "project reporting Service" and their integration with existing information systems of the University.

An important step for the pilot implementation of the project training system is the legalization of new processes at the University, for this purpose a set of normative documents has been developed, the main of which is the provision on project training. Regulations on project training, fixes the main participants in the process of implementation of project training, identifies key stakeholders, typology of student projects and the difference in working with them, approves the forms of documents used in the processes of project training, describes the rules of work of all participants at different stages in information systems integrated into a single system of Project training.

For testing of this system at the Ural Federal University was selected several pilot institutions: Institute of new materials and technologies, Institute of Radioelectronics and information technologies-RTF, Ural power engineering Institute. At the moment, the system is being tested in real conditions. During the tests, the problem areas are fixed, deviations from the specified requirements are analyzed, their verification and validation of the obtained results is carried out in accordance with the approaches described in his textbook by the scientific Director of the "school of system management" Anatoly Levinchuk [6]. All detected discrepancies between user requirements and the completed implementation of the system are recorded in full, while an additional set of requirements is collected, which was not detected initially during the system design. It is planned to implement the next version of the system, in which these discrepancies will be taken into account.

This system of project training allows: customers (employees of enterprises-employers) - to place the topics of projects; students-to choose topics from the list and form individual educational trajectories; University-to plan the educational process,



and involvement of students in the process of mastering their chosen educational programs, taking into account individual trajectories, as well as to identify the most talented students who are able not only to master the educational program of higher education more quickly and in depth, but also to actively develop knowledge for the development of universal and professional skills. In such a situation, the employer will be able to consider the University as a platform for testing their hypotheses and a place for nurturing and hiring formed teams for their professional activities.

## 2. Conclusion

Elements of project education exist at UrFU in various forms. It is obvious that in today's constantly changing, external conditions, this approach is the most effective for training graduates who are guided by the world's technological trends and have competence in some of them. To involve employers from professional and local communities in the educational process, to optimize the interaction of student teams with various enterprises, it is necessary to develop a unified methodology for the implementation of project education, including a scheme of interaction of all active participants in this process. The system of project training implemented at the Ural Federal University is not only a mechanism for the formation of students' competencies demanded by employers, but also a significant tool for attracting new competencies and resources from the real sector of the economy in the development of educational, research and innovation activities at the University. Thus, the UrFU project training system can be considered as an adaptive education system in a constantly changing external environment and as a field for the integration of education and industry.

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