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THE FORMATION OF AN EFFECTIVE STUDENTS PROJECT TEAM IN PROJECT-ORIENTED LEARNING

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Abstract

The article examines the trends in the education development in response to modern challenges of the digital economy and dynamic changes in the labor market. The article analyzes the formation process of modern professional competencies through the project-oriented learning approaches introduction in universities. The article describes the experience of project-based learning formats direct implementation on the example of universities a number. Not only the features of the implementing project-oriented training process, but also the development are highlighted directions. The article presents the using CDIO technology experience, which helps to solve the problems of increasing students' activity through involvement in the project team, developing leadership and communication skills through project activities, and developing professional skills through solving real practical problems. The list of necessary changes for the successful project-based training in higher education organizations implementation is formulated: project work into the learning process integration; the educational process changes in the organization; specialized departments creation that oversee project activities; changes in pedagogical technologies; communication changes. Some project-based learning aspects that require approaches to solve them are noted. The necessity of developing a methodology for the formation and effective project student teams development is justified. This method will help to successfully implement the project approach in teaching students, through the use of the teams role concept at the stage of their formation and tools for developing team knowledge management skills at the stage of functioning.

1. Introduction

The rapid development and introduction of digital technologies in all spheres of human life and activity form a certain system of challenges. Under the influence of digitalization, there is not only the development of new industries and sectors of the economy, but also the need for fundamental changes in functioning industries, including the labor market and education sphere. In the report of the National Research University Higher School of Economics "What is the digital economy? Trends, competencies, measurement" (Abrakhamanova et al., 2019), within the framework of the XX april international scientific conference on problems of economic and social development, there is a tendency to significantly transform the requirements for modern specialists. In the digital economy, there is a growing demand for specialists who have a deep understanding of not only their professional field, but also knowledge and experience in related fields. A modern specialist should be able to determine the opportunities and risks of using new technologies, master project management methods, know the specifics of teamwork, have emotional intelligence, the ability to continuous learning and adaptability to uncertainty conditions. We observe the modification of competence profiles under the influence of technological and organizational changes, they become more dynamic. Changes on the labor market are shaping the key challenges facing the education sector today. In modern conditions, there is a need to create training content that can meet the requirements of a dynamically changing labor market.

2. Problem Statement

One of the most pressing problems in the digital economy is the growing contradictions between the requirements of stakeholders (employers from commercial and government structures, students and their parents) and the quality of training of specialists in universities. These contradictions are both objective and subjective, and represent modern challenges of the digital society to educational institutions and scientific and educational communities (Boiko et al., 2017). Thus, there is a need to consider current trends in education. To do this, it is necessary to analyze new educational approaches that form a dynamic portfolio of competencies of a modern specialist in demand by the labor market of the digital economy. In our opinion, the most modern and appropriate educational concept of practice-oriented learning is CDIO. This concept implies a significant adjustment of curriculums, educational programs and educational technologies used in higher educational institutions. Therefore, based on the results obtained in this article, we seek to justify the role and place of project-oriented learning in the process of adaptation to continuously accelerating changes in the environment.

3. Research Questions

How effective and necessary is practice-oriented education in higher education institutions in modern conditions? What competencies should students develop as a result of project-oriented learning? How can a university become an environment in which a young person will first try himself as a leader or a member of a team that will try to create something new? What educational formats contribute to the productivity of students' project groups? What methods will help to form an effective project team of

students? What tools will make it possible to form knowledge management skills in the project work of students? How strictly should the interaction processes within the project team be structured?

4. Purpose of the Study

The purpose of this study is to analyze modern requests for a new quality of human resources and responses to these requests in the field of education in order to establish a balance between the expectations of the labor market and the supply of education sphere in the conditions of digitalization of the economy. Particularly interesting from this point of view is the project approach used in a number of universities, which allows to reduce the period of subsequent adaptation of graduates to the production or business environment. Over the past decade, this CDIO approach has been used in educational institutions in Europe, Asia, Australia, New Zealand, Africa and the America. This approach is also being successfully implemented in a number of Russian universities. For example, Ural Federal University, Moscow Polytechnic University, Tomsk Polytechnic University, Siberian Federal University, etc. have experience in implementing project-oriented learning (Boiko et al., 2017). However, within the framework of the published results of the implementation of project-oriented learning and its effectiveness, the authors rarely pay attention to the formation of student teams, as a specific group of students with certain characteristics and distinctive features. Thus, in our opinion, it is necessary to pay special attention not only to the practical side of project-oriented learning, namely: solving real cases of organizations and interaction of students with real practices, but also to the process of forming effective teams from student groups. This approach will allow students to develop much-needed in modern times soft-skills, including the skills of performing various social roles, effective communication, information and knowledge exchange, group planning, etc. Therefore, within the framework of this article, the authors aim to show the relevance of both the introduction of practice-oriented project-oriented learning in universities and the emphasis on the organization of effective interaction of students within the project group.

5. Research Methods

Data for the study were collected through a review of thematic literature, publicly available information on university websites, and the results of social observations as part of the implementation of educational and methodological teaching activities.

Thus, the analyzed results of the implementation of project-oriented learning in universities of various industry areas (Boiko et al., 2017, Khandakar et al., 2020, Soboleva & Karavaev, 2020) allowed us to draw conclusions about the feasibility and practical significance of implementing projects within educational processes, regardless of the specifics of the educational institution. The introduction of project-oriented technologies in the educational process allows universities to level the discrepancy between the theoretical knowledge of students and the practical skills necessary in real professional activity in the conditions of vortex changes. In addition, as a result of using this educational technology is levelling between the requirements of employers, digital economy and education, for both production and technical workers and for social and humanitarian spheres.

Moreover, the Global Education Futures report "Skills of the future" notes that in the process of preparing and implementing projects, students develop not only highly specialized skills, but also cross-

contextual and meta-skills (Loshkareva et al., 2017). Cross-contextual skills are applicable in a wider range of professional, social and personal activities. This can be the skills of teamwork, time management. Meta skills are universal and can be applied throughout life and in different situations. We can talk about the ability to put forward goals of activity and realize their achievement; about the ability of self-development; about the ability of self-reflection (self-consciousness) (Loshkareva et al., 2017).

The study of the open experience of Russian educational institutions allowed us to determine that a new approach to learning is being widely implemented in modern universities, which is revealed in the CDIO as "Think - Design - Implement - Manage". Initially, this technology was used to develop engineering creativity in the learning process, but later this idea was successfully implemented in modern classical universities. The purpose of this approach is to form students' competencies necessary for a modern specialist in dynamic realities, starting from the first year of study.

The experience of implementing project-oriented education in universities was interesting. Astrakhan State University has joined the association of universities that have adopted the CDIO standard as the leading technology for organizing the educational process (Baeva, 2012). The use of these technologies allowed the university to solve the following significant tasks: to implement the integration of disciplines and competencies in the curriculum in the preparation of bachelors; to improve the activity, involvement and interest of students in learning outcomes through teamwork in project groups; to develop leadership and communication skills of project participants; to achieve convergence of theoretical training with real practical activities; to form professional competencies of students through solving real modern professional problems (Baeva, 2014).

To formulate conclusions about the effectiveness of the transition to project-based training, the authors conducted an observation in one of the Russian management universities. The authors compared the obtained data with the existing practice of other institutions, as well as with the existing practice of project management in general and the principles of interaction in project groups, in particular. The State University of Management has launched the process of forming a project-oriented training system. The basis of this system is the "Concept of project activity at the university".

The corresponding provision regulates the procedure for organizing project-based training at the university, the study and detailed analysis of which allows to form an integrated view of the principles and specifics of the implementation of project-oriented learning at the university. The purpose of project-oriented learning is to integrate the knowledge gained in the process of hybrid (mixed) training and practical skills in the process of solving various problems of scientific and practical significance. The Department of Academic Policy and Implementation of Educational Programs coordinates the organizational work on project-oriented learning. Methodological support is provided by the Expert and methodological council. The council develops methodological recommendations for the organization of the project approach in educational activities. Permanent consultations are organized for teachers-project managers. The automated information system AIS "Exchange of Projects" is a database of project activities of the university. The purpose of this system is to provide information services to all participants of the university's project activities. An important component of the project-oriented training system of the university is the involvement of representatives of the community of enterprises and organizations that are customers of projects. The university solves this problem within the framework of the competition of student projects

conducting. The competition is organized by the University's Business Incubator. The competition is aimed at solving many urgent tasks: to work out project methods; to organize the interaction of interdisciplinary project groups; to assist in the implementation of projects, to attract investment in projects. Tasks are solved using the service platform BusinessChain.io, which gives access to projects to representatives of the business communities in order to select project ideas for implementation in their structures.

Organization of project-based learning at the university includes several stages: the first stage of work on the project is starting the design works of students of 1 course on discipline "Fundamentals of professional development". There a strong interest is formed in project activities through self-development by students of project ideas, determining the design concept; the second stage of the project activities is aimed at the formation of readiness for project cooperation, which, within the framework of the discipline "Teamwork and leadership" lays the basis for the creation of project teams and skills of team work are being developed. Third stage is the design (the actual design) stage, which includes the process of formation of students' design competencies through the mastering the discipline "Fundamentals of project management". Senior students are guided on the development of projects aimed at solving real practical problems, based on the gained experience. All these aspects are reflected in the bachelor curriculum integrated into project-oriented learning. Since the system of project-based training at the university is at the stage of formation, therefore, some of its components are being finalized.

6. Findings

In general, we have to observe that universities are looking for answers to most questions on their own. Project-based training is often implemented in the absence of the necessary standards, techniques, and resources. This significantly slows down the process of creating viable project teams at the universities. But despite this, most universities are open to learning new experiences and applying best practices.

Having considered different approaches to the implementation of project-oriented training, several aspects were identified that require additional analysis. First, it is necessary to develop a model for the formation of effective project teams of students. The model can be implemented in practice, taking into account the use of tools for determining the role characteristics of each participant and creating a personal composition of the project team through the selection procedure from the available candidates, as well as support tools through active training methods. And secondly, our study of the implementation of project-based learning in Russian universities showed that there is a lack of sufficient attention to such important aspects of the functioning of project-oriented teams as:

– large volumes of knowledge processed and created within the project team, because the project approach itself causes the need to develop a new, unique product that has a certain degree of innovation;

– high demand in difficult to formalize expertise and experience caused by the innovative focus of project teams;

– the need to develop and use effective mechanisms for the dissemination and exchange of knowledge of team members responsible for different areas of activity and working in different subject areas.

Of course, within real project organizations, the creation and diffusion of knowledge occurs at different levels and with the inclusion of various departments and officials in the process. So there are 3 levels of knowledge dissemination in the organization:

– P2P (Project-to-Project) – transfer of knowledge between projects implemented in the company;

– P2B (Project-to-Business) – dissemination of knowledge from individual project teams to specific central business functions of the organization;

– B2P – (Business-to-Project) - development of knowledge, experience, and skills of members of the same project team.

It should be noted that the lack of a regulated knowledge management system in project teams also leads to the loss of knowledge after the closure of projects. This will result in firms encountering the same difficulties and mistakes, and an additional waste of time and other resources (Hermano & Martin-Cruz, 2020). Within the framework of project-oriented learning, students may also face the loss of accumulated information and knowledge by the end of the 4th year and during the writing of the final qualification work.

These features of the activities of project teams determine the need for appropriate training of students within the CDIO standard, since the knowledge management process within this technology must be implemented at every stage. A distinctive feature of knowledge management in a student project team will be that this process should be focused only on one project environment – B2P. Other knowledge dissemination environments should be developed and implemented by the university management.

The student project-oriented learning program should also take into account the possibility of implementing two project knowledge management strategies: personalization strategies and coding strategies. The personalization strategy involves the exchange of knowledge directly through personal contact and direct interaction between the carrier (creator) of knowledge and the rest of the team members. This method, implemented through the integration of processes between individual members, is suitable for flexible teams and quite unique projects. The diffusion of knowledge in this case is carried out in the process of meetings among team members, informal discussions, mentoring, meetings and briefings.

The coding strategy also involves coding knowledge and ensuring that it is stored on the knowledge base of the company or project team. This strategy is more relevant for companies that generate and use large amounts of knowledge, information, and data. And the dissemination of knowledge within the framework of this strategy is carried out through the use of joint project documents, templates, etc. (Zholtaeva, 2017).

Thus, in our opinion, within the framework of project-oriented learning, one of the main and primary tasks of student project teams should be the task of developing a knowledge management system, within which team members should develop effective and appropriate approaches to the creation, storage, dissemination and exchange of knowledge.

So, the system tested by us in the framework of project-oriented learning at the Department of Personnel Management of the State University of Management is a three-way approach, which involves the formation of project teams to answer three questions:

1.How is knowledge created and updated?

2.How is knowledge stored?

3.How does knowledge spread?

The answers to this question require project teams to solve the following tasks:

– defining principles and rules for creating and updating knowledge in a project,

– the appointment of a guardian of the system, and assess for team members;

– categorization of knowledge and identification of current methods and means of storing data, information, knowledge on tangible, digital media and in the cloud environment;

– development of communication schemes in the project with the indication of responsible persons, time, periods, as well as moderators and communication rules;

– defining online and offline communication tools in the project team;

– development of an effective system for planning project work, including using modern digital technologies.

It should also be noted that the communicative component is very important in the implementation of project training at the university due to the fact that it allows students to develop the skills of organizing educational cooperation and joint interaction both within the group and with the supervisor. Argumentation and presentation of their opinions, as well as understanding and discussing alternative points of view, planning their own activities and the activities of the team as a whole, public speech and public discussions, as well as the use of digital technologies to solve various communication and information tasks (Soboleva & Karavaev, 2020).

7. Conclusion

The most relevant trends in education are: continuing education or lifelong learning, project-based learning, distance learning, "self-learning" organizations, etc. Project-oriented training promotes the development of creative thinking, the ability to solve real complex problems, interest in conducting research, experiments, and developing innovations. The use of project-based learning technologies helps to shape students' system thinking, understanding the relationships between disciplines and knowledge gained, and understanding interdisciplinary connections. The development of critical thinking is reflected in the ability to identify weaknesses and risks in decisions made in real business situations. Project-based organization of learning makes it possible to improve students' ability to work in a team, be leaders and effectively interact with each other, but this is difficult to implement without efforts on the developing of emotional intelligence. The ability to create, design, implement and manage a project is essential for a modern specialist at enterprises, in business and in the social environment (Baeva, 2012).

This study is of an overview nature and is an assessment and study of the views of different authors and university leaders on the implementation of practice-oriented education in higher education institutions. The limitation of this study is the lack of empirical and statistical data on the results, as well as the pros and cons of implementing project-oriented learning and, in particular, focusing on the internal processes of interaction within student teams. This aspect of the study in the article is levelled by the inclusion of data and information directly related to the authors' experience in the implementation of project training at the university, as well as in the management of project work of students. To confirm the conclusions formulated by the authors in future studies, it is advisable to conduct sociological surveys of individual students, student teams and the scientific and pedagogical staff of the university. Such studies would allow us to form the most accurate idea of the need and relevance of the implementation of certain tools in the framework of

project-oriented learning, as well as to determine the degree of involvement of students and their supervisors in project work and the existing obstacles on improving its effectiveness.

Today, knowledge management is one of the main factors of an organization's competitiveness, which makes it possible to reduce time costs, reduce the number of errors, develop the most effective solutions, and improve the quality of products and services. Therefore, the development of knowledge management skills in the framework of project training is an important task of real practical training of students of higher educational institutions. The results of the study can be used as a basis for the methodology of formation and development of project teams of students. This methodology can be recommended for use by university departments that organize the implementation and methodological support of project training, as well as for scientific supervisors of student projects.

References

Abrakhamanova, G. I., Vishnevskiy, K. O., & Gohberg, L. N. (2019). What is the digital economy? Trends, competencies, and measurement. https://conf.hse.ru/mirror/pubs/share/262126147

Baeva, L. V. (2012). MIT and Harvard experience at Astrakhan State University. *Volga, 148*(26214). http://asu.edu.ru/images/File/ilil3/baevacdio.pdf

Baeva, L. V. (2014). Project-based training in a modern university: Experience in applying CDIO standards for training students in social and humanitarian fields. *Knowledge. Understanding. Skill, 1, 82-89.*

Boiko, E. A., Shishmarev, P. V., Karabarin, D. I., Yanov, S. R., & Pikalova, A. A. (2017). Implementing CDIO project-based learning in training of heat and power engineers. In A.V. Dedov (Ed.), *The International Conference "Problems of Thermal Physics and Power Engineering" (PTPPE-2017). Journal of Physics: Conference Series, 891*(1) (012367). IOP Publishing.

Hermano, V., & Martin-Cruz, N. (2020). The project-based firm: A theoretical framework for building dynamic capabilities. *Sustainability*, *12*, 6639.

Khandakar, A., Chowdhury, M. E. H., Gonzales, A. P., Touati, F., Emadi, N. A., & Ayari, M. A. (2020). Case study to analyze the impact of multi-course project-based learning approach on education for sustainable development. *Sustainability*, *12*, 480.

Loshkareva, E., Luksha, P., Nikonenko, I., Smagin. I., & Sudakov, D. (2017). Skills of the future. What you need to know and be able to do in a new complex world. https://worldskills.ru/assets/docs/media/WSdoklad_12_okt_rus.pdf

Soboleva, E. V., & Karavaev, N. L. (2020). Characteristics of the project-based teamwork in the case of developing a smart application in a digital educational environment. *European Journal of Contemporary Education, 9*(2), 417-433.

Zholtaeva, A. S. (2017). Knowledge management as a factor of successful project implementation. *World Science, 2*(26), 49-54.