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Student research skills development at University

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Abstract

A review of the global and domestic practice of the application of project-based learning methodologies was carried out from the perspective of the student research skills development; the analysis of the conformity of project-based learning to the standards of Russian higher education has been carried out. As a result, project-based learning is a promising and effective approach to student research skills development. In conclusion, project-based learning is an effective pedagogical approach due to the possibility of being integrated into production and solving real professional problems.

Keywords: Higher education, Research work, Learning.

Desarrollo de habilidades de investigación estudiantil en la Universidad

Resumen

Se realizó una revisión de la práctica global y doméstica de la aplicación de metodologías de aprendizaje basadas en proyectos desde la perspectiva del desarrollo de habilidades de investigación de los

estudiantes. Se ha llevado a cabo un análisis de la conformidad del aprendizaje basado en proyectos con los estándares de la educación superior rusa. Como resultado, el aprendizaje basado en proyectos es un enfoque prometedor y efectivo para el desarrollo de habilidades de investigación de los estudiantes. En conclusión, el aprendizaje basado en proyectos es un enfoque pedagógico efectivo debido a la posibilidad de integrarse en la producción y resolver problemas profesionales reales.

Palabras clave: Educación superior, Trabajo de investigación, Aprendizaje.

1. INTRODUCTION

These days, student research skills development is becoming increasingly important in the higher education system. At the same time, the focus of the academic research work shifts from the traditional forms of students' work to applied sciences, including the project-based approach. In particular, the participants of student scientific contests and competitions are now asked to develop their own projects of practical importance that are tested in production. Grant-funding contests for young scientists have become quite popular in the regions (RADYGINA, 2010). This trend can be explained by the peculiarities of the labor market with a high demand for personnel who: have social and communication skills, are able to effectively organize the work of the working group, as well as to develop strategies and models for solving various problems.

Project-based learning (PBL) is a relatively new and promising teaching methodology, which involves students working together to solve specific problems (BEREZINA, GORYACHEVA, ELISEEVA,

& SLYNKO, 2018). In the context of the research skills development, PBL is of particular importance: it provides students with the opportunity to address real problems through experimental learning (EFSTRATIA, 2014; DZHURINSKIY, 2018). Research data BEREZINA, GORYACHEVA, ELISEEVA & SLYNKO (2018) showed that problem- and project-based learning help students achieve reflection, become more knowledgeable and gain certain authority to influence problems (MUZVIDZIWA, 2015).

It should be noted that the high efficiency of PBL is confirmed by the results of numerous pedagogical experiments (ERGÜL & KARGINB, 2014). The experimental groups that used the project-based approach reported higher academic achievement than the control groups with other forms and methods of conducting classes.

An important aspect of the introduction of the PBL methodologies in the learning process is the conformity of this approach to the goals and objectives of education for sustainable development (ESD), which is focused on the interests and needs of the student (ZAKHAROVA, 2018). In the context of the ESD principles implementation, the synthesis of the project-based approach and students' research work can satisfy students' interests, provide motivation, apply sustainability knowledge in the implementation of specific projects.

The analysis of the PBL development in universities all over the world shows that there is a significant number of developed methods

and forms for implementing the project-based approach when teaching various subjects. For example, an interdisciplinary project was implemented in Macedonia. The students conducted real-life sensory monitoring in the greenhouse. An interesting experience can be obtained when implementing chemistry projects that are based on peer tuition within a group: each of the students acts both as a student and a teacher; all members of the group contribute to the joint learning process.

However, the most popular PBL approaches are focused on creating technological projects to be used in practice and satisfy industrial and domestic needs. For example, in Thailand (RUNGSIRISAKUN, INTARAPONG, LEKPRASERT, TANTIWISAWARUJI, & CENTER, 2019), the students were asked to develop a project for creating a tool to measure sucrose concentration in solutions. The project results showed increased motivation and involvement in the learning process due to the need to perform complex tasks.

Despite all the benefits, the implementation of PBL is still controversial. In the CIS countries, including Russia, the problems of implementing PBL are associated with poor physical facilities, lack of motivation and time, insufficient number of joint projects with potential employers. The following shortcomings were highlighted in foreign pedagogical works: the difficulty in making reports, inaccurate information on the Internet for implementing a project (MCGIBBON & VAN BELLE, 2015), the increased tuition, difficulties in

communication experienced by the students who have never worked in groups SUMARNI (2015) and many others.

Thus, research skills development in the process of teaching students is one of the most important pedagogical tasks for modern education. The urgency of the problem is due to the shift from the traditional need to assimilate a certain amount of material to the acquisition of professional and social-communicative competencies.

In our research, we consider the student research skills development in the context of project-based learning as a relatively new and insufficiently studied pedagogical approach. The analysis of recent studies and publications demonstrates the ambiguity of opinions on the effectiveness of project-based learning for the indicated tasks. A particularly difficult issue is the introduction of the PBL methodologies in the universities of developing countries, including the CIS countries – Belarus, Russia, Moldova, Kazakhstan, Ukraine, etc. The difficulties in the implementation of the project-based approach are due to insufficient funding for student research, poor physical facilities, the prevalence of traditional approaches to teaching in educational institutions, etc. Based on the above-mentioned information, the purpose of our research is to analyze the state, problems, and prospects of project-based learning to develop students' research skills through the example of the Russian higher education system.

2. METHODOLOGY

The research is based on the literature review of the world and the domestic practice of the application of project-based learning methodologies from the perspective of student research skills development. Within the framework of the study, the main advantages and disadvantages, as well as project-based learning methods have been analyzed and highlighted; the analysis of the conformity of project-based learning to the standards of Russian higher education has been carried out.

The research practical component is the identification of weaknesses and threats associated with the development of the academic research work of Russian students, including project-based learning methods; the development of proposals for optimizing the system of higher education in Russia based on the identified shortcomings; the development of the criteria for evaluating the effectiveness of project-based learning and students' research work.

3. RESULTS AND DISCUSSION

Analyzing the current status, problems, and prospects of the widespread introduction of PBL in the Russian higher education system, we should consider in detail the legal framework, which is the major factor in the implementation of any transformations. According to the Federal State Educational Standard of Higher Education,

research as a type of professional training is included in Bachelor's programmes; Master's programmes consist of research and scientific production work, as well as project activities. In addition, the concept of sustainable development of the Russian education system should be based on the principles of project activities, including openness to external requests and a competitive component (ANTYUKHOV, 2010).

In turn, the Federal Law On Higher and post-graduate vocational education introduces the following activities: conducting experiments and scientific research on a grant and non-grant basis; creation of laboratories for the implementation of scientific and technological activities, etc. In general, the legal framework of the Russian Federation in the field of education and science creates the basis for supporting research and project activities of students but does not contain specific measures for their practical implementation and development.

Let us consider in more detail the current status, problems and prospects of project-based learning for the development of students' research skills in the higher education system of the Russian Federation (Table 1). The sticking point to reforming the education system is often the non-conformity of new teaching methods to the approved curricula, programs and standards. In addition, there are risks associated with the failure to fulfill the curriculum or the poor assimilation of theoretical material due to the involvement in research and project activities.

The problems may be solved by optimizing the approaches to the development of project tasks. In particular, an ecology project can be interdisciplinary: it may include Biology, Mathematics, Physics and Chemistry curricula, etc. Let us give an example of a task for such a project: to develop a mathematical model of the ecosystem changes due to temperature and cadmium pollution. The interdisciplinary approach is especially easy to be implemented when there is a collection of courses related to one specialty.

With respect to the assimilation of theoretical material, it should be noted that any curriculum contains a list of basic definitions, laws, rules or hypotheses that can be included in project tasks. For example, it may be the development of a vehicle model based on certain materials and parts, a description of the physical and mathematical laws of the model's operation, etc. This approach allows the student to independently find and study all necessary information in order to develop the model, as well as make decisions on the proper use of the materials based on their properties. As a result, it is very likely that the acquired theoretical and practical knowledge will be fixed in the student's long-term memory and the material will be better assimilated compared to rote memorization.

Table 1: Status, problems, and prospects of project-based learning for the development of students' research skills

Parameter	Weaknesses and threats	Optimization proposals
Conformity to the goals and objectives of education	1. Risk of failure to fulfill the curriculum due to the time spent on project activities;	1. Introduction of PBL in the framework of the interdisciplinary approach; 2. Introduction of

	<ol style="list-style-type: none"> 2. Risk of poorer assimilation of the theoretical material; 3. Non-conformity to the education standards and curricula 	<p>definitions, laws, and principles into the project;</p> <ol style="list-style-type: none"> 3. Development of projects focused on the skills and knowledge required by the higher education standards.
Legal framework	<ol style="list-style-type: none"> 1. The introduction of PBL and the involvement of students in research activities are not properly controlled; 2. There are not enough legal mechanisms for the implementation of the project and the research activities of students. 	<ol style="list-style-type: none"> 1. Development and introduction of the criteria for evaluating the effectiveness of project-based learning and research activities of students (Table 2); 2. Development of strategies, methodologies and instructional guides on project and research activities of students.
Funding and physical facilities	<ol style="list-style-type: none"> 1. Inadequate funding and physical facilities 	<ol style="list-style-type: none"> 1. Synthesis of project-based and dual education with the implementation of real production orders; 2. Participation of student groups and their leaders in tenders for research and project developments; 3. Submission of some research and project developments to open student competitions.
Student motivation	<ol style="list-style-type: none"> 1. Low scholarship, which makes students combine studies and work; 2. Insufficient financial support for students' research work; 3. Lack of time for research and project activities due to the need to implement the basic curriculum tasks. 	<ol style="list-style-type: none"> 1. Introduction of a grant system following the example of foreign countries; 2. Partial replacement of abstracts and term papers with projects and research work; 3. Involvement of domestic and foreign investors in project competitions that may be relevant for various sectors of the economy.

As has already been mentioned, proper regulatory support is one of the main factors in reforming the education system. In Russia, there is a lack of properly controlled legal mechanisms to ensure the introduction and development of research and project-based learning at universities. This problem could be solved by developing strategies and instructional guides providing methods of project-based learning, topics and examples of project tasks, project work criteria, lists of open databases for students to conduct research, etc.

As it is noted in the work of LITSVIN (2016), the lack of motivation and involvement can become an obstacle to project-based learning if the importance of the work is not clear to the student. The Russian higher education system is also characterized by other factors affecting student motivation: inadequate financial support for research activities, low scholarships and lack of time due to the need to implement the basic curriculum tasks. Thus, research activities are most probable when they are part of the curriculum.

The possible solutions to the problem of inadequate research funding and financial support for students, as well as the issue of poor physical facilities, include the following: Synthesis of project-based and dual education with the implementation of real production orders; participation of student groups and their leaders in tenders for research and project developments; submission of some research and project developments to open student competitions.

The advantages of the dual education system are (TERESCHENKOVA, 2014; LITSVIN, 2016) the involvement of students in the educational process, improvement of practical skills, communication with a potential employer and many others. In addition, dual education allows the development of real production technologies or problem-solving models in project-based learning, which can be funded by the customer and contribute to the motivation of students as performers.

The development and introduction of the criteria for evaluating the effectiveness of the project and research activities of students are also important (Table 2). The criteria were combined into 3 groups: 1) learning experience; 2) the effectiveness of students' research activities; 3) foreign cooperation.

Let us focus on learning experience and consider the optimization of the quality indicators of graduate qualification work (GQW). A graduate qualification work is often an abstract or a study based on the results of basic and simple experiments. In the context of the student research skills development, there are good reasons to transfer GQW to project-based learning. The study will acquire scientific novelty, theoretical and practical relevance; it will be authentic and may be tested in production. This approach will significantly improve GQW quality. It is most likely that students will have an opportunity to better familiarize themselves with the conditions of their future professional activities through solving real theoretical or applied problems.

The main group of criteria includes student performance indicators. Let us consider the quality and number of publications as one of the key parameters for evaluating scientific work as a whole (Table 2). A significant drawback in assessing publication activities of the academic staff and students is the same rating scale at universities, which includes publications in scientometric databases or publications in the periodicals of the State commission for academic degrees and titles. It follows that a student with two publications in the RSCI abstract journal will have a higher rating than a student with one publication in the Scopus database. In this regard, quantitative indicators of student research are often promoted for faster abstract publications.

Table 2: Criteria for evaluating the effectiveness of project and research activities of students

Criteria	Indicator
Learning experience	<ol style="list-style-type: none"> 1. Overall performance indicators and final examination grades; 2. Quality indicators of graduate qualification work: authenticity, scientific and practical relevance, testing; 3. The results of students in science competitions.
The effectiveness of students' research activities	<ol style="list-style-type: none"> 1. Number of international and national conference tracks; 2. The number of publications in the periodicals of the State commission for academic degrees and titles, scientometric databases (Web of Science and Scopus), Q1-Q3journals; 3. The number of grants for student research activities; 4. The number of grants and other types of competitive assistance for student research activities; 5. Students' theoretical and applied research results; their scientific novelty, practical relevance, and

	testing.
Foreign cooperation	<ol style="list-style-type: none">1. The number of students involved in research activities;2. The number of foreign students involved in research activities;3. The number of Russian students who take part in research in foreign educational institutions.

The problem may be solved by introducing competitive score ranges in various rating scales evaluating publications based on the significance of the scientometric base, the impact factor of the journal or its quartile score (Q1-Q4). This approach will allow students to focus on high-quality research in the learning process and obtain theoretically relevant and applied results. The effectiveness of student research activities also depends on research funding, grants and other types of support. Nowadays, in Russia and foreign countries, there is a significant number of grants and research competitions that are also available to students. The introduction of this criterion is very likely to motivate the academic staff and the students to conduct research, as well as to implement various projects.

In the era of scientific knowledge globalization, the academic mobility processes along with the exchange of experience with foreign countries are of particular importance. Therefore, the number of foreign students involved in the research activities of the university should be highlighted. Almost all leading foreign educational institutions are characterized by international staff. In Russia, such an example is the Skolkovo Innovation Center which provides scholarships for foreign students and scientists.

Thus, project-based learning is a promising and effective approach to student research skills development. It should be noted that poor efficiency of the project-based approach can be caused by a number of methodological and organizational factors (MICHASOVA, 2016) the lack of a developed methodology for project activities, the removal of grades and certificates, the lack of independent work skills, etc. This confirms that project-based learning should be gradually introduced into the Russian higher education system through developing teamwork skills, providing teachers and students with scientific and methodological material, as well as integrating projects into traditional education.

4. CONCLUSION

We considered the development of students' research skills through the example of project-based learning. The results of the study showed that project-based learning is an effective pedagogical approach due to:

- The possibility of being integrated into production and solving real professional problems;

- The possibility of being implemented along with dual education and the interdisciplinary approach;

- The possibility of improving the quality of education due to better assimilation of theoretical material when putting it into practice;

- The possibility of establishing a closer relationship between the student and the employer, etc.

- The negative aspects of project-based learning that have been discussed in the study are poor physical facilities and inadequate funding for scientific research in Russia and other CIS countries; difficulties related to group communication; lack of scientific and methodological developments to promote project-based learning in Russia, etc. We have proposed measures to minimize or neutralize all these negative aspects in order to optimize project-based learning in Russian universities.

- The practical relevance and scientific novelty of the research includes the identification of weaknesses and threats to the development of the research activities of Russian students, including through the project-based methods; the development of recommendations for optimizing the higher education system in Russia; the development of the criteria for evaluating the effectiveness of project and research activities of students. The research results can be used to optimize the education policy and legal framework of Russia and other countries, including the CIS region, as well as to develop the methodology for the organization of project and research activities of students.

- The prospects for further research are associated with the development of instructional guides and other materials to optimize the development of students' research skills through project-based learning.

REFERENCES

- ANTYUKHOV, A. 2010. "Project-based learning in higher education: problems and prospects". **Higher Education in Russia**. Vol. 10, pp. 26-29. Russia.
- BEREZINA, S., GORYACHEVA, V., ELISEEVA, E., & SLYNKO, L. 2018. "Professional competence development in the students of a technical university through a chemistry course". **Modern high technology**. Vol. 2, pp. 122-126. Russia.
- DZHURINSKIY, A. 2018. "Education for people of the third age in Russia". **The Education and science journal**. Vol. 20, N° 10: 156-175. Switzerland.
- EFSTRATIA, D. 2014. "Experiential education through project based learning". **Procedia-social and behavioral sciences**. Vol. 152, pp. 1256-1260. Netherlands.
- ERGÜL, N., & KARGIN, E. 2014. "The effect of project based learning on students' science success". **Procedia-Social and Behavioral Sciences**. Vol. 136, pp. 537-541. Netherlands.
- LITSVIN, A. 2016. "Dual learning in Russia: concepts and practice". **Education and Science**. Vol. 3, N° 132: 44-56. Germany.
- MCGIBBON, C., & VAN BELLE, J. 2015. "Integrating environmental sustainability issues into the curriculum through problem-based and project-based learning: a case study at the University of Cape Town". **Current Opinion in Environmental Sustainability**. Vol. 16, pp. 81-88. Netherlands.
- MICHASOVA, O. 2016. "Application of the project-based approach and the active learning methods for the development of systemic thinking in students". **Bulletin of the Lobachevsky**

- State University of Nizhny Novgorod.** Vol. 1, N^o 41: 179-184. Russia.
- MUZVIDZIWA, I. 2015. "Women Educational Leaders and the Empowerment of Others1". **Journal of Sociology and Social Anthropology.** Vol. 6, N^o 3: 365-376.
- RADYGINA, S. 2010. "Young specialists for innovative Russia". **Bulletin of Udmurt State University.** Vol. 2, pp. 28-31. Russia.
- RUNGSIRISAKUN, R., INTARAPONG, P., LEKPRASERT, B., TANTIWISAWARUJI, S., & CENTER, R. 2019. "Using Project-Based Learning in a Fundamental Chemistry Course: An Experience Report". **Psychology.** Vol. 9, N^o 1: 6-10. Russia.
- SUMARNI, W. 2015. "The strengths and weaknesses of the implementation of project based learning: A review". **International Journal of Science and Research.** Vol. 4, N^o 3: 478-484. Russia.
- TERESCHENKOVA, E. 2014. **The dual education system as the basis for training of specialists.** Concept. pp. 1-6. Russia.
- ZAKHAROVA, I. 2018. "Machine Learning Methods of Providing Information Management Support for Students' Professional Development". **The Education and science journal.** Vol. 20, N^o 9: 91-114. Switzerland.



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