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The Formation of Students' Competencies during their Participation in Competitions of Applied Scientific Researches

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La formazione delle competenze degli studenti durante la partecipazione a gare di ricerca scientifica applicata

The relevance of the problem under study is due to the need to improve the practical skills and competencies of students in the course of training in order to prepare them for competition with other job seekers in employment. In this regard, this article is aimed at identifying the expediency of students' participation in competitive selections and grants as a factor that creates conditions for effective practice-oriented learning. The leading method for the study of this problem is a pedagogical experiment, which allows us to comprehensively consider the relationship between students' participation in competitions and their further self-realization and development as young professionals. The article presents the results of monitoring the behavior of students who received an offer to participate in the university-wide competitive selection of student projects, implemented as part of the Program for Supporting Applied Research and Development of Students and Postgraduates of Petrozavodsk State University. The materials of the article can be useful for teaching staff in building a scheme for teaching students and services involved in the recruitment of personnel for large and medium-sized companies that require young professionals to have practical work skills, teamwork skills and creativity.

La rilevanza del tema affrontato si deve alla necessità di migliorare le abilità pratiche e le competenze degli studenti durante il percorso formativo, al fine di prepararli al futuro confronto con altri candidati in cerca di occupazione. A questo proposito, l'articolo mira a verificare l'utilità della partecipazione degli studenti a selezioni competitive o mirate all'ottenimento di borse di studio come fattore capace di creare condizioni per un efficace apprendimento orientato alla pratica. Il metodo principale adottato nella ricerca è un esperimento pedagogico che considera la relazione tra partecipazione degli studenti a concorsi, futura autorealizzazione e carriera come giovani professionisti. L'articolo presenta i risultati del monitoraggio del comportamento di studenti invitati a partecipare a una selezione competitiva accessibile a tutti, parte del Programma per il Sostegno alla Ricerca Applicata e allo Sviluppo di Studenti e Laureati dell'Università Statale di Petrozavodsk. I materiali presentati nell'articolo possono essere utili sia al corpo docente per la formazione di futuri insegnanti sia ai servizi coinvolti nel reclutamento di personale per aziende di grandi e medie dimensioni, che richiedono ai giovani professionisti competenze pratiche, abilità nel lavoro in team e creatività.

Keywords: Self-realisation; Practice-oriented training; Project based learning; Skills; Team work.

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1. Introduction

Currently, enterprises, including enterprises of the timber industry, when recruiting personnel, require from applicants not only strong theoretical knowledge of technological processes, but also practical work skills that graduate students lack. Since there is serious competition on the market today, the company that is faster than others to establish the production of products with the best technical and operational characteristics while minimizing the cost of production is in a winning position. Thus, enterprises are interested in having people in the team among employees who are able to generate new ideas and suggest ways to improve technological processes, in accordance with the current level of development of science and technology. In such a situation, a graduate with the above knowledge, skills and abilities, as well as able to present his skills and achievements, is more likely to take a vacant workplace. In order to increase the readiness of graduates of educational institutions to the requirements of the modern labor market, a project–based teaching method is introduced at the stage of their education at school, and its improved form — a practice-oriented approach is used when studying at secondary and higher educational institutions.

The project method of teaching, in the modern sense, has been used in the USA since the end of the 19th century and for more than a hundred years of existence, enriched with theoretical aspects and practical application experience, has been recognised in most countries of the world, including the CIS countries, despite some difficulties in its application (Ivanova & Demina, 2017).

Some teachers (Sycheva & Arzumanova, 2019) consider project-based learning as the most important part in the preparation of a successful specialist, indicate the possibility during the project to teach a student to work in a team, develop complex problem solving skills and teach how to distribute time to complete the work, and, as an effective mechanism for supporting project activities, the emergence of platforms for the presentation of student projects at the highest level, for example, the competition of projects "My city – my Moscow", is indicated.

The authors of the active learning study (Nguyen *et al.*, 2021) conducted a systematic review of the literature on teaching strategies, including project-based learning and problem-based learning. In most studies, the results of project-based learning were assessed as positive or mostly positive, and the greatest effects indicated that students were deeply involved in the learning process, enjoyed learning, and gained confidence in their abilities.

In the literature review (Harmer, 2014), the author presents the following positive aspects of the project-based learning method: improving academic performance, developing important skills (teamwork, communication, information retrieval, data analysis, creativity, critical thinking, project management, time management, etc.), increasing motivation, enjoyment of classes, the ability to work in a team on a project of different students (according to academic performance, gender, origin), encouraging a student to interact on a project outside of an educational institution (with potential employers, experts, public organizations, representatives of authorities etc.), strong integration between students and teachers, etc.

In the Discussion section of a large literature review (Condliffe *et al.*, 2017) on problem of project-based learning conducted in 2017, it is also indicated that most of the authors of the studied sources speak positively about project-based learning and indicate its positive impact on learning outcomes, however, the authors indicate that in most sources the data do not allow drawing causal conclusions, which specifically in the method had a positive effect on the results of students.

An active learning study (Anazifa & Djukri, 2017) notes the effectiveness of the project-based learning method and examines the experience of its application in Indonesian secondary schools. As part of the study, a survey was conducted among students and teachers to determine their perception of project activities. In general, teachers and students have a positive attitude towards such approaches to teaching. It was noted that in the process of implementing the project, students learn to formulate questions or set tasks for the experiment, determine the dependencies between the parameters, record the experimental data and draw conclusions from the results of their processing. Thus, project participants learn how to effectively apply the acquired knowledge and gain valuable experience.

The results of the study of ways to use active teaching methods (Markula & Aksela, 2022) show that the project method of teaching develops teamwork skills in schoolchildren, allows them to gain

experience in using tools and equipment when conducting research, and teaches them to present the result of their work. However, for the successful application of the method, the teacher needs a flexible and timely response to the progress of the project and timely assistance to correct the work on the project in the right direction.

In the report (Balumen & ÖzerKeskin, 2018), based on the results of a study of the effectiveness of project-based learning in natural science education, it was found that 86% of teachers note an increase in educational indicators among students. At the same time, the authors point to the need to find new and effective ways to incorporate project methods into the traditional educational environment.

A survey (Haatainen & Aksela, 2021) of preschool and school teachers from 28 countries around the world showed that although teachers use project-based learning methods to develop collaboration skills and involve students in the educational process, the authors found differences in application of the methodology, especially when evaluating results. Interviewed teachers often pointed to problems arising at the stage of implementing the project method due to the lack of elaboration of mechanisms to support the implementation of projects. The authors conclude that the competence of science education teachers in using the project method can be improved through joint training of teachers and students.

The study of the effectiveness of the application of the method of project-based learning in higher education, in particular in the field of mechanical engineering, showed (Chu *et al*., 2017) that students are generally positive about its use in teaching. There is also a difference in attitudes when implementing project-based learning methods in teaching courses of individual disciplines. To improve efficiency, the authors recommend taking into account the previous educational experience of students, the correspondence of the learning goal of a particular discipline to the goals of the project-based learning method at the discipline level.

In the materials of the work (Ngadiso *et al.*, 2021), an improvement in the attitude of students to the educational process when using the project-based learning method is noted, mainly it concerned the development of skills and abilities that were given little attention earlier in traditional teaching.

The results (Gomez-Pablos, Pozo, & Munoz-Repiso, 2017), indicate a positive assessment of the project learning method by teachers, more active involvement of students was noted (95%), improved motivation of students (96%) and the opportunity for students to acquire learning skills (90%). The main difficulties identified by the authors in implementing the project method are the lack of support from management (33%) and the inconsistency of the available technical and technological support (34%) with the requirements of project training.

The study (Alamri, 2021) is devoted to the search for the optimal combination of project-based learning and traditional learning methods. A significant relationship was found between the project approach and the effectiveness of teaching, students' satisfaction with the learning process and students' academic performance. It is concluded that the manifestation of these positive effects from the introduction of project-based learning is associated with the ability of students to exchange knowledge and information more widely during a joint discussion.

In a study of a particular case of industrial design training using elements of team project learning (Colaborativa *et al*., 2021), it turned out that students united in teams, rivalry prevails over cooperation, which means they lack an understanding of the importance of cooperation in achieving the set goal. The conclusion is made about the need for additional measures to integrate student teams in the development of joint decisions and the choice of actions to achieve them.

The introduction of project-based learning in an educational institution is accompanied by deeper emotional experiences not only of students, but also of their teachers. Thus, in the study of the impact of project-based learning on teachers (Tsybulsky & Muchnik-Rozanov, 2021), it is noted that future teachers who taught students in natural subjects, the use of project-based learning brought both negative and positive emotional experiences, and the latter were more (joy, enthusiasm and satisfaction).

In the study of the effectiveness of modern technologies (Al-Abdullatif & Gmail, 2021), the integration of the project learning method into the information environment of the university, as well as the support system for the project learning method, is investigated. The results of the study showed that the use of such an integrating system allowed to increase the involvement of students in the learning process, and also had a positive impact on their academic performance.

In the study of the impact of project-based learning on the quality of undergraduate education (Ibragimov, 2021), it was noted that design and research activities contribute to the development of students' skills of cooperation when working in groups, the emergence of experience and culture of choosing topics for independent work, understanding real problems and the ability to find solutions to them.

The authors of the study of general education schools for gifted children (Kozhevnikov *et al*., 2021) concluded that an effective education system in a general education institution should be supported not only by pedagogical, but also by motivational support, as well as by socialization both in educational and extracurricular learning processes at all its levels.

Researchers in the study of the effect of project activity in the teaching of chemistry (Zhao & Wang, 2022) conducted an experiment during the school year on a group of students from one class, which showed that the introduction of project training in natural science subjects, for example in chemistry, leads to more successful results of studying the discipline — students are more motivated to learn, they show creativity and desire to learn, it is easier for them to understand the subject in the future.

According to the results of the study of the problems of professional communication of future engineers (Shageeva, 2022), it is noted that it is advisable to develop the ability for professional communication among engineering students at the level of university training, and the rationale for its effective development through the creation of a complex of appropriate educational environment is given.

The report on the results of the implementation of project-based learning in a Swedish school (Fjellström, 2014) also indicates that a practice-oriented approach and project-based learning are impossible without a good material base. The PBVE-environment, a school playground, where students build real houses using the most modern technologies and energy efficiency requirements, helps Swedish students to successfully receive a professional building education.

The authors in the study of the practice-oriented approach at the higher educational establishment (Dolgopolova, Zhukova, & Gavrilenko, 2018) present the results of a pedagogical experiment aimed at substantiating the practice-oriented approach, conducted with the involvement students of agronomic directions. The authors note that a practice-oriented approach makes it possible to prepare a specialist who meets the modern requirements of the labor market, whose level of competence will meet the expectations of a potential employer.

Currently, the possibilities of new computer technologies, such as web-2.0 and virtual environments, can be considered as an opportunity to partially solve one of the problems of implementing project-based learning in educational courses — the inconsistency of the educational institution's database with the needs of students. The authors of the article (Márquez Lepe & Jiménez-Rodrigo, 2014) describe the experience of using virtual environments for project-based learning at the University of Seville (Spain), which allowed students to choose their own study time, supporting communication between teachers and students, being a means of collaboration.

The results of the pedagogical experiment (Egorova, 2013a) prove the effectiveness of forming a student's readiness for teaching and research activities on the example of involving students in such activities organized in a virtual research environment. In addition, the author of the study (Egorova, 2013b) proposed to introduce modern information and communication technologies into the practice of organizing research work of students. In particular, it is proposed to use the "Young Researcher" virtual research environment specially designed for these purposes. The author confirms the readiness of students for educational and research activities, provided that it is organized in a virtual environment in the work.

Project-based learning is the basis of modern concepts of STEM and STEAM-education. The authors of the study of modern teaching methods (Anisimova, Shatunova, & Sabirova, 2018) analyzed the experience of various countries in the implementation of STEM and STEAM education and identified effective ways to structure technical disciplines, arts and creative activities into a single integration program, which will potentially allow students to develop the skills and competencies necessary for graduates for a successful career in the conditions of the fourth industrial revolution.

A study on ways to improve the effectiveness of STEM-education through modern training of technology teachers (Lin *et al.*, 2021) describes an experiment in which 28 technology teachers participated. The study shows with statistical certainty that there is a difference in the effectiveness of teachers' work

when preparing for the new EDP-STEM-PBL program (project-based learning with the use of engineering creativity training) and for the usual STEM-PBL (project-based learning) program, which will allow them to build the educational process more effectively and transfer knowledge to their students.

In the analysis of group work of students (Okuneva, 2015), the author came to the conclusion that the work of students on the implementation of projects can serve as a means of measuring their competence in the field under study. With such activities, the student inevitably has to make certain decisions based on the situation, relying on his knowledge and skills, as well as interact with colleagues in achieving the goal.

In the study of the experience of foreign experience (Zagorodnyuk, 2020) the author considered the organization of team project activities within the framework of the educational process in Western Europe, the USA and Taiwan, indicated the relevance of developing a new direction in teaching methods — team project learning and the importance of studying issues of methodology of formation and management of school project teams.

During the literature review, it was found that the effectiveness of preparing a student, including higher education, for further work depends on the methods used in training. At the same time, it is possible to increase the student's readiness for work and his self-realization through the use of a practice-oriented teaching method, which is based on design and research activities.

2. Materials and Methods

Objective: to identify factors for increasing the level of mastering the universal competencies of students when they are involved in scientific and practical work in the form of grant competitions. The method of pedagogical experiment was used to achieve the objective (Kochetkova & Tazaracheva, 2020; Borisenko, 2021).

The objectives of this project are to investigate the factors that enhance the students interest in supplementary activities that are related to the primary educational process; to identify active students and involve them in design and research activities that offer remuneration and rigorous reporting of the outcomes achieved; and to establish the competencies acquired by students during this work.

During the initial phase of the project, it was imperative to identify enthusiastic students who aspired to engage in design and research pursuits. To achieve this objective, third-year students enrolled in the specialty "Forestry" at Petrozavodsk State University (PetrSU) were invited to participate in the university-wide competitive selection of student projects executed within the framework of the Program of Support for Applied Research and Development of students and postgraduates of PetrSU. This initiative aims to make a significant contribution to the innovative growth of the economic and social sectors of the Republic of Karelia.

Teams of two to five people, consisting only of students, could take part in the competition. Within each team, a leader was chosen from among the students-participants. The incentive factor for participation in the experiment was the monetary reward paid to students for the performance of the amount of work specified in the application for the project. According to the terms of the competition, students themselves had to propose a topic of work, indicate the amount of work to be done and the amount of funding that they need to complete the declared amount of work. All university students could take part in the project competition. According to the terms of the competition, the theme of the work had to correspond to one of the priority directions of development of the Republic of Karelia. The end result of a team of students should be a scientific and technical product. The selection of applications at the final stage involved a face-to-face public defense of student projects before an expert board consisting of university representatives, specialists and business leaders, representatives of ministries of the Republic of Karelia, and a regional venture fund. The number of winners of the competition was limited.

In order to determine the level of skill of the experiment participants, the following criteria were established.

The ability to present your knowledge, skills, achievements

The students who expressed a desire to participate in the competitive selection process were required to prepare a presentation. In their presentation, the students were required to justify the scientific nov-

elty and significance of the project topic, evaluate the significance of the project outcomes in terms of their contribution to the innovative development of the economy and social sphere of the region, demonstrate the scientific and technical proficiency of the project, demonstrate the practical significance of the project and the prospects for implementing its outcomes, and demonstrate the qualifications of both the project manager and the project implementers. Furthermore, as the work progressed, the students compiled interim reports and presented them to the expert council, along with a presentation. At the end of the project, students presented their results to the expert council.

Hence, the execution of the project necessitated the inclusion of multiple presentations by students at the commencement, progression, and conclusion of the project. This enabled a comparative analysis of the caliber of the presentations and the degree of proficiency among students at the commencement and conclusion of the project.

The ability to fulfill assumed obligations within established time frames

In addition to obtaining the final technical product, the project required the fulfillment of a number of other obligations. Therefore, each participant was required to fulfill certain criteria, which included a certain number of articles of varying significance, a certain number of applications for patents for inventions, registration of computer programs, cost estimations, and a work schedule. While implementing the work, the expert group monitored the volume and timeliness of student fulfillment of these obligations.

The ability to design, develop and test a scientific and technical product

Throughout the course of the projects execution, its participants diligently worked to produce a scientific and technical product that aligned with the technical specifications formulated during the initial stage of work, while simultaneously acquiring design expertise. In order to demonstrate the functionality of the produced product at the conclusion of the project, it was imperative to conduct tests and refine it. The quality of the finished product was evaluated by comparing the actual values of the indicators to the values specified in the technical specifications.

Each criteria was scored on a five-point scale (1 is the lowest score, 5 is the highest).

The evaluation of the advancement of competencies was conducted by an expert group comprised of members of the teaching staff.

3. Results

After being called to participate in the aforementioned competition, many students refused to participate in it. The primary reasons and motives for declining to participate were as follows: a lack of self-assurance – 40/16%; apprehension of not meeting reporting deadlines – 40/50%; reluctance to undertaking work that is not related to the educational process – 30/67%; a lack of original scientific ideas – 10/50%; inability to establish ones own student team – 30/0%; reluctance to collaborate in a team led by a peer – 10 + 0%; reluctance to refuse social benefits – 20/0%. The first number refers to the group of students majoring in "Technologies of logging and woodworking production", the second number characterizes the group of students majoring in "Forestry".

86 student teams of the university expressed their desire to take part in the above-mentioned competition. 20 winners were selected from them.

From among the third-year students of the specialty "Forestry", the winners were the application of a student team consisting of two people (Kozyr A.S. and Kempi E.V.) "Development of a training table for germination". These students became the object of observation during the pedagogical experiment. In preparation for the competition, students, based on the theoretical knowledge gained during the training, as well as on their personal experience of perceiving educational information, brainstormed under the guidance of teachers (Neustroeva, 2019; Stefanenko, 2021) as a result of which the potential for creating a universal training table for seed germination was established, which is a combined table-greenhouse for experiments with germination of plant seeds and growing seedlings, which is distinguished by its versatility compared to known similar constructions.

Having united in a creative team, the students demonstrated the ability to work in a team, as well as the ability to conduct a dialogue, find compromises and agree on the division of labor responsibilities within the team.

During the implementation of the project, the students demonstrated the ability to put into practice the theoretical knowledge gained during the training. Students independently studied the known methods of seed germination, the design of tables and installations for demonstration, got acquainted with modern electronics that could potentially be used. When performing this work, the students managed to attract teachers in the relevant profile disciplines as consultants, not only those with whom they had previously studied, but also those with whom they had not known until that moment, while the students received the skill of business communication.

To participate in the competition, students compiled a project application, which provided for the rationale for the scientific novelty of the proposed project, drawing up a calendar plan for its implementation, as well as drawing up a cost estimate, while students mastered the important competence of compiling business and technical documentation.

When preparing the tender documentation, students attended relevant seminars, participated in meetings and thus gained experience in business negotiations and collaborations.

During the presentation of their project to the competition commission, the students demonstrated their ability to present scientific projects to the public and prove the effectiveness of their proposals in the face of the expert board.

The results of assessing the level of competence development in the study group showed that: the ability to present their knowledge, skills and achievements increased from 4.0 to 5.0 points, a rise of 20%; the ability to fulfill one's obligations on time grew from 4.0 to 4.5 points, a rise of 10 %; the ability to design and test a scientific and technical product increased from 3.5 to 5.0 points, a rise of 30%.

4. Discussion

Numerous students declined the invitation to participate in the competition. The primary basis for developing recommendations for modernizing the educational process can be an analysis of the reasons for refusal to participate in projects:

- A lack of self-confidence and a lack of willingness to accept responsibility. Unfortunately, it is almost impossible to change personality traits within 2–3 years of study. Work on compensatory motivation is necessary.
- The apprehension of speaking in public. It is essential to introduce systematic presentations to the educational process, preferably in front of an unfamiliar audience.
- Several students expressed concern that they would be unable to combine additional work on the grant with educational activities. This scenario frequently arises when a student fails academically and lacks a scholarship. Therefore, measures are required to enhance class attendance.

There were also students who were receiving social benefits and expressed a desire to participate in the competition, but chose not to do so due to the fear of losing a reliable source of income in the form of social benefits. These were two students, one of whom soon found employment in a logging company. The second student, subsequent to presenting her final thesis in a competitive manner, commenced employment in a mining enterprise and is currently addressing issues related to timber harvesting, while concurrently pursuing a master degree. These students are employed by medium-sized regional companies. During the course of preparing their graduate qualification work, both students presented the intermediate outcomes of their graduation thesis at the conference. Therefore, their non-participation was only explained by their unwillingness to risk a stable income.

After the announcement of the winners of the competition, it was noted that a small part of the students who refused to participate in it, looking at the success of their comrades — the winners of the competition, expressed their desire to take part in the next similar competition.

During the preparation of the competitive application, the participants of the competition attracted a number of university teachers as consultants, which indicates their active position and the acquisition of competence in the formation of research teams. To achieve the stated goal of their project, the students conducted an information search, analysis of scientific and technical information, thanks to which they consolidated in practice the relevant theoretical knowledge gained during the training on the organization and conduct of scientific activities. Also, students, while preparing the tender documentation, received good practical experience and relevant skills in working with regulatory documentation.

In the course of further work on their project, students will gain experience in putting their ideas into practice, turning them into a real scientific and technical product. At the same time, project participants will have to turn to third-party organizations to perform certain work, for example, cutting and welding materials, manufacturing parts on various machines, programming microcontrollers, etc., which will allow students to acquire the appropriate communication skills and show organizational skills. Participation in the project provides for strict reporting on the implementation of planned activities, which contributes to the development of self-discipline of the members of the creative team and a sense of responsibility, as well as the ability to prepare reporting documentation.

The data obtained during the pedagogical experiment confirm the hypothesis put forward at the beginning of the study, which is that students participating in addition to the educational process in applied research work are more in demand in the labor market, and due to this and self-confidence can afford not to grab the first opportunity they can find a job, or they can choose a more paid and better job in terms of working conditions. Already at an early stage of the preparation of the application for the attracted students, there was a coincidence with the data (Harmer, 2014) in the field of information retrieval and data analysis for obtaining a patent.

This circumstance was noted during the observation of students participating in the annual competition of scientific developments "UMNIK". This competition is annually held by the Innovation Promotion Foundation [https://umnik.fasie.ru/] on the basis of Petrozavodsk State University. This competition is aimed at attracting students to research work and developing practical work skills and in the same way provides for the submission of a competitive application by the student, its defense before the commission and the fulfillment of its obligations. But unlike the current competition, the "UMNIK" competition implies individual student work "outside the team". The competition under consideration, implying work as part of a team, contributes to the development of additional competencies related to teamwork and the manifestation of leadership qualities. At the same time, teamwork skills, in contrast to (Markula & Aksela, 2022), are better formed among students of one specialty and worse for different specialties.

Based on the results of monitoring graduate students teaching in the specialty "Forestry", it was noted that the vast majority of students who were involved in practical work in the course of the implementation of various kinds of grants, including independent projects implemented, for example, within the framework of the "UMNIK" program stayed to work in the forest industry, i.e. employed in their specialty.

One individual among the students participating in this project enrolled in the masters program and was awarded a heightened scholarship for scientific pursuits for the publication of a series of articles, which was facilitated by their participation in this study. Another individual was employed at Petrozavodsk State University in the Department of Technology and Management of Forest Industry Complex and currently is actively involved in the implementation of a project aimed at modernizing the training program in the field of "Forestry." Another participant in this project was invited to the position of specialist in the forestry department of a logging company, which holds the second position in terms of logging and timber processing in the country.

Based on the findings of the study, it can be inferred that the students have acquired competencies pertaining to the ability to search, critically analyze, and synthesize information, employ a systematic approach to address assigned problems, and also, within the context of project development and implementation, determine the range of tasks necessary to achieve the objective and select the optimal solutions, taking into account the available resources and limitations.

Petrozavodsk State University has a practice of encouraging students who have achieved good results in scientific work with additional scholarships, including a scholarship from the Government of the

Republic of Karelia, a scholarship from the Government of the Russian Federation. The encouragement of students is carried out on the basis of a submission by the directorate of the Institute, while only those students who, among other things, have completed the last four semesters with "excellent" are submitted to the scholarship. Observations show that students who have diligence and perseverance in memorizing the material they have passed often receive an excellent grade, but at the same time these students rarely take the initiative and reluctantly take up additional practical work, and creative personalities are looking for applications to their capabilities, often to the detriment of exam grades.

Monitoring the progress of students showed that not all participants who expressed a desire to participate in the competition program were excellent students. There was a coincidence with the observations (Chu *et al*., 2017) and (Dolgopolova, Zhukova, & Gavrilenko, 2018), that it is desirable to intersect the goals of the won project and the educational experience of students, for example, specialty and learning goals.

Based on observations of the implementation of this pedagogical experiment and the behavior of students participating and not participating in applied scientific research, it was noted that practice-oriented student learning is implemented to a greater extent through attracting students to participate in applied scientific research competitions than through encouraging students through scholarship programs based primarily on academic grades. The payment of remuneration to students as part of the implementation of the grant they won is perceived by students as an opportunity to receive additional income for active work, an analogue of a bonus in production, rather than as a fixed monthly payment that does not depend on anything — a scholarship. Also, with participation in the project, the problem noted in (Fjellström, 2014) is solved — the creation of a good material base, while the materials are purchased exactly those that are needed in the project.

A comparison of the effectiveness of various forms of implementation of practice-oriented learning, which were discussed above in the literature review, showed that the most effective form of teaching engineering students is to attract students to participate in competitive selections that involve teamwork, to which participants are allowed without taking into account current performance, as this was organized in a pedagogical experiment through the participation of student teams in the university-wide competitive selection of student projects, implemented as part of the Support Program for Applied Research and Development of Students and Postgraduates of PetrSU, which provide a significant contribution to the innovative development of economic and social sectors of the Republic of Karelia.

It should be noted that the rivalry noted in (Colaborativa *et al*., 2021) was practically absent, as evidenced by the fact that some members of the formed teams were involved in several projects simultaneously.

At the current level of development of grant systems aimed at students, it is not possible to implement the proposal made in (Anisimova, Shatunova, & Sabirova, 2018), to create an integration program that includes the study of disciplines and creative activity.

5. Conclusion

Employment of a young specialist requires not only theoretical knowledge, but also practical experience, the ability to conduct independent activities, make decisions, create, manage and work in teams and the ability to present their ideas and proposals, as well as a willingness to quickly learn to meet the requirements of modern rapidly changing labor market. The theoretical knowledge that students receive in the course of classical education according to the curriculum can be significantly supplemented by practical skills and skills for solving real practical problems in practice-oriented learning.

Practice-oriented training can be effectively introduced into the educational process through attracting students to participate in competitions and grants that provide for the preparation of a project application, its practical implementation in compliance with strict reporting on each stage of work related to its implementation.

Through student competitive selection and grants, enterprises can select and train potential personnel even at the stage of student education. This will allow them to hire already trained personnel with minimal additional training at the workplace. During the execution of work on grants from specific enterprises, students will get acquainted with the activities of these enterprises, gain practical work ex-

perience and thus be able to prove themselves to the management of the enterprise and be in a more advantageous position compared to other graduates in employment.

Stimulation of such activities must be organized by introducing compulsory participation in competitive work into educational programs and going through the mandatory stages of preparing and presenting a project. When assessing the competencies developed in educational activities, the results must be taken into account.

The conducted pedagogical experiment showed that the participation of students in various kinds of grants, their own student projects, both individual and group, involvement in the implementation of research and development projects implemented on the basis of educational institutions helps to increase the competitiveness of young professionals in their future employment.

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