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ORIGINAL PAPER

PRACTICE-ORIENTED FORMS OF TRAINING SPECIALISTS IN THE CONSTRUCTION INDUSTRY OF THE REGION

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Abstract. The article examines the existing in Russia practice-oriented forms of training of specialists in the construction industry known for its high specialization. Currently, there is a growing need for people with practical skills and knowledge necessary for the design and construction of technically complex buildings and structures. To meet these needs, a number of techniques are used in the training of specialists for the construction sector, including internships, on-the-job training and vocational training. The article presents an expert assessment of the advantages and limitations of various approaches in training specialists in the construction industry in the regions of Russia. One of the solutions to the problems facing the construction industry and the need for constant innovation and investment in training programs is to create in the Novgorod region on the basis of the Novgorod Construction College a unique educational and production platform for training qualified personnel, taking into account the opinions of employers in the School–College–University–Enterprise paradigm.
The article presents the prerequisites for creating a comprehensive training program for the construction industry in the Novgorod region, including such national and local challenges and directions as the need for early career guidance for school students, the gap between the requirements of the real labor market and training at school and institutions of secondary vocational education (colleges) in major subjects, increasing the number of students from the municipal districts of the region, etc.
The authors have determined that the main target audiences of the program (school, institutions of secondary vocational education (colleges), university, employers) gain a number of synergistic effects that ultimately contribute to the growth of the well-being of the population and the development of the region's economy. The model for the development of the practice-oriented School–College–University–Enterprise program proposed by the authors has a number of strategic priorities for the regional economy, including the introduction of a system of educational, social and professional elevators for students, territorial attachment, guaranteed employment, etc.
Keywords: construction industry, education, practice-oriented forms of training, region, specialist training

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ОРИГИНАЛЬНАЯ СТАТЬЯ

ПРАКТИКО-ОРИЕНТИРОВАННЫЕ ФОРМЫ ПОДГОТОВКИ СПЕЦИАЛИСТОВ В СТРОИТЕЛЬНОЙ ОТРАСЛИ РЕГИОНА

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Аннотация. В статье рассматриваются существующие в России практико-ориентированные формы подготовки специалистов для строительной отрасли, которая известна своей высокой специализацией. В настоящее время растет потребность в персонале, обладающем практическими навыками и знаниями, необходимыми для проектирования и строительства технически сложных зданий и сооружений. Для удовлетворения этих потребностей применяется ряд приемов, используемых при подготовке специалистов для строительного сектора, включая стажировку, обучение на рабочем месте и профессиональное образование. В статье представлена экспертная оценка преимуществ и ограничений различных подходов при подготовке специалистов для строительной отрасли в регионах России. Одним из способов решения проблем, стоящих перед строительной отраслью, а также связанных с необходимостью постоянных инноваций и инвестиций в программы обучения, является создание в Новгородской области на базе Новгородского строительного колледжа уникальной образовательно-производственной платформы для подготовки квалифицированных кадров с учетом мнений работодателей в парадигме «Школа – Колледж – ВУЗ – Предприятие». В статье представлены предпосылки создания комплексной программы подготовки кадров для строительной отрасли на территории Новгородской области, среди которых такие национальные и локальные вызовы и установки, как необходимость ранней профориентации школьников, разрыв между требованиями реального

рынка труда и подготовкой в школе и учреждениях СПО по профильным дисциплинам, увеличение контингента студентов из муниципальных районов региона и др. Авторами определено, что основные целевые аудитории программы (школа, СПО, ВУЗ, работодатели) получат целый ряд синергетических эффектов, способствующих в конечном итоге росту благосостояния населения и развитию экономики региона. Предложенная авторами модель развития практико-ориентированной программы «Школа – Колледж – ВУЗ – Предприятие» имеет целый ряд стратегических для региональной экономики приоритетов, в числе которых внедрение системы образовательных, социальных и профессиональных лифтов для студентов, территориальная привязанность, гарантированное трудоустройство и др.

Ключевые слова: строительная отрасль, образование, практико-ориентированные формы подготовки, регион, подготовка специалистов

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Introduction

The issue of personnel training for various sectors of the country's economy is particularly acute and requires constant regulation of personnel shortages. One of the key directions of improving the quality of education is the development of practice-oriented forms of education that contribute to the readiness of graduates of secondary vocational education institutions (colleges) and universities to enter regional labor markets.

The construction industry is one of the most important industries in the world. Its development is directly related to the qualification of specialists engaged in this sphere, and therefore the formation of an effective system of personnel training for the construction industry is one of the priority directions of education development in many countries.

In Russia, the construction industry is of great importance, and the construction of housing, commercial facilities, roads, bridges, and other infrastructure is a key sector of the economy. Therefore, the training of qualified personnel in the construction industry in Russia is an important task that requires improvement and modernization of training methods.

Practice-oriented forms of training of specialists in the construction industry are of particular importance for Russia, where the problem of personnel shortage is quite urgent. One example of such forms of training can be educational institutions, which together with large construction companies, provide students with the opportunity to work on real projects and thus gain experience and knowledge [1].

In addition, Russia is actively developing professional standards that describe the requirements for professional knowledge and skills of specialists in the construction industry. They serve as a basis for creating training programs focused on practical skills. Also, in Russia, there is a system of training in the profession of Builder, which includes practical training, master classes and internships at construction sites.

The main purpose of the article is to study theoretical and practical approaches and formulate an expert assessment of the advantages and limitations of training specialists in the construction industry in the regions of Russia.

The tasks are to study domestic and foreign experience in training specialists in the construction and related sectors of the economy, to examine experience and search for bottlenecks in the training of students in the leading construction universities of Russia, to identify prerequisites for the formation and implementation of a comprehensive training program for the construction industry in the Novgorod region, to develop the architecture of the practice-oriented School–College–University–Enterprise program model.

Regulatory legal acts and government documents establish the priority of the education system in the state policy, declare the need for successful scientific and professional training and innovative educational activities of future specialists. Many scientific studies of both Russian and foreign researchers are devoted to the formation of professional competence among students. Thus, in the work by Y.Y. Orekhova, L.K. Grebenkina and others, pedagogical conditions imitating the real professional activity of students are defined and attention is focused on the creation of an innovative and creative environment for the successful development of professional competence of future specialists [2].

The lack of competent specialists significantly hinders progress in the construction industry. The study by A. Chesnokov, V. Mikhailov, I. Dolmatov examines the issues of project-based training of students and the formation of their professional skills of engineers in actual professional problems including consideration of the whole project, selection of suitable ways of its implementation, numerical modeling, and laboratory modeling of structures [3].

In the United States, collaborative approaches to education research are quite rare in the existing research and development infrastructure, therefore, researchers in this group consider themselves responsible for methods of working with schools, families, and communities. R. Penuel William, Riedy Robbin et al. [4] have explored four approaches to collaboration: community-based design research, design-based implementation research, the science of improvement in network communities and strategic partnerships for research in education. The authors have identified a set of principles related to collaboration between educational institutions and the real economy. The authors recommend applying

these principles to research proposals and projects because there is evidence that these approaches can promote agency and equity in education.

In a world characterized by overstretch and constant renewal, education has the potential to educate citizens oriented towards sustainable development. Higher education institutions certainly play an important role in this by contributing to the promotion of a sustainable society, a holistic understanding of how to incorporate sustainable development initiatives. Given the critical role of higher education institutions in society, the number of students, faculty, and staff they welcome every day and ensuring that sustainability is taught and practiced on campuses — all of this becomes fundamental. An example of cooperation and strategic partnership is the ERASMUS+ EUSTEPs project aimed at improving the teaching and practice of sustainable development in universities [5].

The new European research funding program for partnership development in education, Horizon Europe 2020-27, has as one of its main strategic ideas to invest in projects related to digital media in combination with tools and resources from other fields to develop innovative methods of knowledge production and transfer. The initial big idea of this project is to demonstrate how serious digital games can be used as one of the most operational research methodological tools within any kind of knowledge. The targets of this project include universities and corporations that partner with different institutions to transfer knowledge and share expertise among themselves [6].

Professional training makes it easier for teachers to navigate with the understanding of how to position students and use active and authoritative methods and techniques during training. E.B. Dyer, M. Jarry-Shore, et al. [7] analyzed teachers' discourse during professional development focused on agency and authority and found that they often expressed ideas related to student initiative and authority. The authors have shown that practice-oriented training, use of prompts to action, adaptive facilitation practices, normalization of critical approaches, and positioning frameworks are important for deep engagement with ideas related to student initiative and authority.

In recent years in the regions of the country, more and more attention is paid to practice-oriented forms of training specialists in the construction industry. Such forms allow students to get the necessary experience and knowledge, which they apply in real life. Thus, the development of practice-oriented forms of training specialists in the construction industry in Russia is an urgent task that requires improvement of training methods and quality of training. It is important to involve both public and private organizations in this process to ensure high competitiveness of domestic specialists in the construction industry in the global market.

There are a number of educational institutions in Russia, which are already successfully implementing practice-oriented methods of training in the field of construction. For example, one of such institutions is Moscow State University of Civil Engineering, where students are given the opportunity to receive high quality education, combining theoretical knowledge with practical experience.

Another example of an educational institution where practice-oriented teaching methods in the field of construction are successfully applied is Saint Petersburg State University of Architecture and Civil Engineering, where students can undergo practical training in large construction companies, as well as to work at real facilities [3].

In addition, Russia has a number of professional organizations and associations that also contribute to the development of practice-oriented forms of training of specialists in the construction industry. For example, the Russian Builders Association holds seminars, conferences, and other events where the issues of improving the quality of education and professional training of specialists in the construction industry are discussed.

It is important to note that in Russia in recent years there has been an increased interest in infrastructure development and construction of new facilities, which also contributes to the growing demand for highly qualified specialists in this field. In this regard, it is necessary to continue improving the methods of education and the quality of training in the construction industry.

The development of practice-oriented forms of training of specialists in the construction industry is an important task for the Russian regions. It is necessary to improve training methods and continue the introduction of new technologies, to establish cooperation between educational institutions and representatives of the construction industry. Only in this way it is possible to ensure high quality of the training of specialists and compliance of their professional skills with modern requirements of the labor market. In addition, it is important to pay attention to the development and support of innovative projects that can significantly improve the efficiency of education and training of specialists in the construction industry.

One form of practice-oriented training is an internship, which is a paid position in a company where students can gain practical work experience on a construction site or in an office. This allows students to see in practice how interaction within a company is going, how management decisions are made and how they affect various aspects of the business.

The second form of practice-oriented training is project work. Project works can be different in their subject matter, but the main goal is to gain practical experience. This allows students to practically apply the theoretical knowledge gained during the training process. In addition, project work can be carried out in the framework of cooperation with the real

sector of the economy, which allows students to gain experience of working in real conditions.

The third form of practice-oriented training is training in professional training centers. Vocational training centers provide an opportunity to gain practical skills and knowledge in specialized areas of construction. They allow students to see how people work on a construction site, how different types of work are performed, and to familiarize themselves with different types of equipment and tools. One of the examples of professional training centers is the Training Center of Construction Technologies in Moscow. This center offers training in various areas, such as installation of heating, ventilation and air conditioning systems, water supply and sewerage systems, power supply systems and many others.

The fourth form of practice-oriented training is participation in simulation exercises, which allow students to practice in real situations, but without risk to health and life. This can be useful for gaining skills in working with various types of complex equipment, as well as for practicing interaction between different departments and workers on a construction site.

The fifth form of practice-oriented training is participation in competitions and contests. This can be useful for the development of students' teamwork skills, creativity, and search for innovative solutions. In addition, participation in such events can be a good opportunity for students to show their skills and knowledge in front of potential employers [8].

Practice-oriented forms of training specialists in the construction industry are necessary for the formation of highly qualified specialists who can work effectively in real conditions. These forms of training allow students to gain the necessary experience and knowledge that will be applied by them in practice. Each form of training has its own advantages and can be effective depending on the specific needs and goals of the student. Combining different forms of training can be the most effective way to maximize practical training.

It should be noted that the importance of practice-oriented training in the construction industry is constantly growing. Due to the rapidly developing construction technologies and innovations in the industry, it is necessary to provide training of specialists who can adapt to new conditions and apply complex, high-precision technologies [9, 10].

Practice-oriented forms of training of specialists in the construction industry are useful not only for students but also for employers. Employers who hire graduates with practical experience can be sure that the new employee will quickly adapt to the work and will be able to start it without additional training. This will significantly save employers' time and resources, which in turn will lead to increased productivity and economic efficiency.

In addition, practice-oriented forms of training are particularly useful for students who already work in the industry. These students can apply their new knowledge and skills directly in their workplace, which leads them to professional development and career advancement.

Finally, it is important to note that practice-oriented forms of training specialists in the construction industry have the added benefit of increased safety in the workplace. Specialists who have such practical skills and knowledge have a better understanding of the hazards in the workplace and act on their own to prevent accidents.

Thus, practice-oriented forms of training specialists in the construction industry play a key role for the regions in providing quality training. They allow students to acquire practical skills and knowledge, which they are sure to apply in practice.

However, despite all efforts, there are a number of problems related to the training of specialists in the construction industry in the Russian regions, including insufficient funding of educational institutions, lack of educational and methodological literature, the need for modernization of educational programs, etc.

In general, the development of practice-oriented forms of training specialists in the construction industry is a necessary step for Russian regions to provide highly qualified specialists for the industry. Along the way, it is necessary to improve existing training methods, introduce new technologies and innovations, cooperate with large companies, and actively develop professional standards.

Results and Discussion

To develop practice-oriented forms of training specialists in the construction industry, it is necessary to conduct scientific research, create special programs and projects that contribute to the development of human resources. It is also important to organize seminars and conferences where current problems are discussed and opportunities for joint development of educational programs are considered.

In addition, it is important to pay attention to the quality of education and professional development of already working specialists in the construction industry. In this area it can be useful to introduce innovative technologies in the training process, for example, the use of virtual reality and other modern teaching methods.

Despite a number of existing problems, such as lack of qualified personnel, inefficient use of innovative technologies and lack of communication between educational institutions and the business community, the Russian construction industry continues to develop and attract new specialists.

The most notable innovations in the educational process are the implementation of dual training and the introduction of the demonstration exam. The singularity of dual education lies in its flexibility, which allows developing the system of social partnership, reviving the institute of mentoring,

harmonizing the best practices and forms of vocational training. The introduction of a dual system of education allows to bring the level of specialist training to a higher one that satisfies the needs of employers, strengthen the connection between the educational process and real production, increase the motivation of students and popularize working professions and specialties [11].

To create practice-oriented education, it is necessary to organize the processes of training of future specialists together with industry organizations starting from school. We should not forget about advanced training, consider the challenges of the time, remember that robotics, VR technologies, 3D printing and scanning, drones in construction, etc. are already being implemented at a high rate in the country's economy, and we can also rely on the Atlas of emerging jobs.

One of the strategic priorities of education development in the Novgorod region is a comprehensive training program for the construction industry, developed in partnership between the Government of the Novgorod region, Yaroslav-the-Wise Novgorod State University and Novgorod Construction College. This program implies parallel training for students starting from 10-11 grades in the School-College-University-Enterprise paradigm.

The prerequisites for the creation of a comprehensive training program for the construction industry in the region were the following:

- the existing gap between the demands of employers, the requirements of the Federal State Educational Standards and the current norms for specialized subjects at school;
- the task set by the governor of the region to increase the enrollment of students from municipal districts of the Novgorod region;
- negative student assessment at the college entrance test after the 9th grade of general secondary school;
- the task of early vocational guidance of schoolchildren set by the government of the country.

Planning and development of the comprehensive training program for the region's construction industry took place in accordance with clause 2.2.4 On the Strategy of Socio-Economic Development of the Novgorod Region until 2026, approved by the Novgorod Regional Duma on March 27, 2019, namely:

- formation of demand from the economy for qualified personnel of working professions;
- reducing the indicators of migration outflow of graduates;
- attracting graduates from other regions of the Russian Federation to the system of secondary vocational education.

The solution to this problem is the introduction of a new form of interaction between all participants of the educational process — industry clusters of continuing professional education. This proposal is discussed in the work by G.I. Kosterin and E.F. Kravchenko [12]. The main idea is the creation of a unified educational and production environment and conditions of continuing education for the formation of professional staff that meet the requirements of the employer.

The target audiences of such a practical-educational platform should include educational institutions (schools), sectoral organization of secondary vocational education, regional specialized university and construction industry organizations. This approach implies the integration of various resources, including material and technical equipment, information and communication technologies, personnel. Network interaction of all elements of the system is aimed at training, retraining and employment of graduates.

Studies [12, 13] show that all target audiences of the project receive the following synergetic effects:

- school acts as a basic platform for early career guidance and development of scientific and creative activity of students;
- college realizes the process of professional education of its own level, establishes traditionally close ties with schools and implements the applied nature of training;
- higher education institution builds up intellectual potential, expands educational and methodical base, is responsible for professional and creative growth of students, conducts profile training of students taking into account the interests of the employer;
- enterprise plays a systematizing role in this project, that is, formation of requirements to professional training standards, modernization of the material and technical base of the educational process, career guidance of schoolchildren, support for students and young workers.

The implementation of the project of parallel education in the School-College-University-Enterprise paradigm has features of the educational process and assumes the following algorithm of the educational trajectory. Upon completion of the 9th grade, the student enters the college and in the first 2 years studies the school program of 10-11th grades (directly at school) and in parallel — professional disciplines of the college. Having received a certificate of complete secondary education, the student goes to the 3rd year of college, where they finish the training in the chosen specialty within 1-2 years. After graduating from college and receiving a diploma of secondary vocational education, the graduate without entrance examinations and passing the Unified State Exam has the right to continue their educational trajectory in a specialized university. Thus, at the entrance to the system there is an ordinary Russian school student, and at the exit from the system there is a professional, motivated, employed worker of the enterprise.

This concept will be implemented on the basis of Novgorod Construction College, the advantage of

which is that graduates of the college have the opportunity to easily enter any partner university: Yaroslav-the-Wise Novgorod State University, Russian Presidential Academy of National Economy and Public Administration, Financial University under the Government of the Russian Federation.

Additional advantages of the proposed system of practice-oriented training include the following:

- training without leaving the place of residence and work process;
- saving time and money for training;
- possibility of employment at the place of residence;
- individualized schedule of the training process;
- opportunity to participate in the whole range of industry championship movements;
- training in a remote mode with the use of a personal account;
- opportunity to study simultaneously in two or more specialties;
- immersion in the industry in 10th, 11th grades;
- obtaining a state diploma of secondary vocational education with qualification.

The advantages of the "School - College - University - Enterprise" program for educational organizations are as follows:

- increasing the efficiency indicators of educational organizations;
- elimination of the shortage of teachers in general education subjects in schools and colleges;
- training in the subject of Technology on the basis of the college;
- preservation of the student contingent of 10-11th grades at school;
- strengthening the teaching of specialized subjects at school;
- increasing the employment rate of graduates;
- improving the quality and indicators of vocational guidance work.

The model of development of the School-College-University-Enterprise practice-oriented program (*Fig. 1*) involves:

1) Actualization of the strategy of diversification of educational activities.
2) Training in the professions relevant to the regional economy and demanded by employers.
3) Creation and practical use of professional standards, taking into account the demands of employers.
4) Creation of a unified educational platform and continuity of training.
5) Introduction of a system of educational, social and professional elevators for students.
6) Territorial attachment.
7) Professional elevator for students and graduates.
8) Guaranteed employment.
9) High quality of training.

Fig. 1. **Model of Development of the Practice-oriented School - College - University - Enterprise Program** / *Рис. 1.* **Модель развития практико-ориентированной программы «Школа – Колледж – ВУЗ – Предприятие»**

Source: compiled by the authors / *Источник:* составлено авторами

In general, the use of advanced technologies in the construction industry contributes to the development of innovation and increasing the efficiency of the entire real sector of the Russian economy. Thanks to continuous investments [14] and research, it is likely that in the coming years the development and implementation of even more advanced technologies in the field of construction can be carried out.

Conclusion

The Russian construction industry has a huge potential for development; however, it is necessary to provide qualified personnel capable of working with modern technologies and solving complex engineering tasks. The study of theoretical and practical approaches to the training of specialists for sectors of the economy in recent years and the formulation of expert assessment of the advantages and limitations of different approaches to training of specialists in the construction industry in Russian regions allowed us to note the main thing – practice-oriented forms of training in the construction industry are a powerful tool for the preparation of highly qualified personnel demanded by employers for the construction industry in the region, and, accordingly, improving the comfort of life of the workers.

The article presents the study of domestic and foreign experience in training specialists for construction and related sectors of the national economy. Thus, the experience of implementation of training programs in the USA, the experience of Horizon Europe 2020-27, the European research funding program for partnership development in education, have been studied. Among Russian specialized educational institutions, the cases of Moscow State University of Civil Engineering, Moscow Training Center of Construction Technologies, Saint Petersburg State University of Architecture and Civil Engineering, as well as the Russian Builders Association have been investigated.

The study of the experience of leading Russian construction universities in training students has allowed us to develop the author's vision of the architecture of the School-College-University-Enterprise practice-oriented program model and to present its advantages for further discussion. This model allows not only college graduates to freely enter specialized universities of the country, but also to be trained without leaving the place of residence and work process, to save resources during the learning process.

Undoubtedly, the effectiveness of this approach is impossible without planned, systematic activity on introduction and development of new educational approaches in the construction industry, taking into account the specifics of the industry and the requirements of the regional labor market. The implementation of practice-oriented forms of training should be carried out with the account of modern technologies and innovations, which will allow graduates to be ready to solve complex problems in professional activity.

Thus, we can conclude that practice-oriented forms of training of specialists in the construction industry play an important role in the formation of highly qualified personnel and increasing the competitiveness of the construction industry in the regions of Russia.

Authors' Contribution

The authors have made an equal contribution to the research: collection and analysis of the material; definition of goals and objectives, research methods; formulation and scientific substantiation of conclusions, registration of key research results in the form of an article.

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