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## Labor potential of engineering personnel in the russian oil and gas region: problems of development in the system of secondary professional education

Трудовой потенциал инженерных кадров российского нефтегазового региона: проблемы развития в системе среднего профессионального образования

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### Abstract

The article studies urgent issues of development of the labor potential of engineering personnel and the role of secondary vocational education system. The consideration of the theoretical foundations of the «development of labor potential» concept became the basis for the formation of the author's vision of it as an irreversible and purposeful change in the consciousness and actions of workers, resulting in a new quality. The study of the peculiarities of the development of the labor potential of engineering personnel on the example of the Tyumen Region has shown that the system of secondary vocational education in the Region is aimed at creating conditions for reducing the existing gap between the knowledge received by students under educational programs and the knowledge required by business and the market. The revealed problems have served as a basis for formation of offers on the environment creation directed on the formation of conditions of development of labour potential of engineering personnel in the system of the intermediate vocational education of the Tyumen Region.

**Palabras clave:** Labor potential, development, problem, education, engineering personnel, secondary vocational education.

### Аннотация

В статье изучаются актуальные вопросы развития трудового потенциала инженерных кадров и роли системы среднего профессионального образования. Рассмотрение теоретических основ понятия «развитие трудового потенциала» стал основой формирования авторского видения его как необратимого и целенаправленного изменения в сознании и действиях работников в результате которых возникает новое их качество. Изучение особенностей развития трудового потенциала инженерных кадров на примере Тюменской области показал, что система среднего профессионального образования области направлена на создание условий сокращения существующего разрыва между знаниями, получаемыми студентами в рамках образовательных программ, и знаниями, необходимыми бизнесу и рынку. Выявленные проблемы послужили основой формирования предложений по созданию среды, направленной на формирование условий развития трудового потенциала инженерных кадров в системе среднего профессионального образования Тюменской области.

**Ключевые слова:** трудовой потенциал, развитие, проблема, образование, инженерные кадры, среднее профессиональное образование.

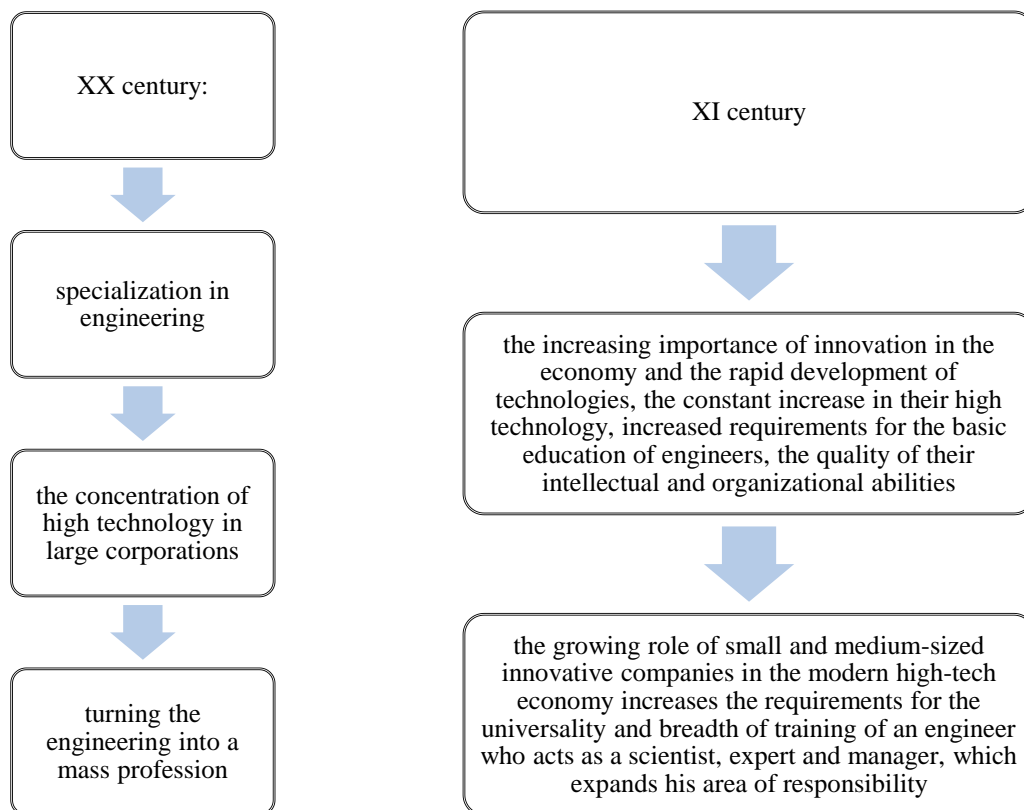
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**Introduction**

The issue of developing the labor potential of engineering personnel and the role of engineering education in the modernization of the Russian economy is caused by large-scale changes in the Russian economy, which is based on the system program of economic development of a new technological generation (digital economy). Engineering education in Russia simultaneously faces ever-increasing requirements (Figure 1), but at the same time the

use at many enterprises of inefficient and outdated technologies and formats of production organization, outdated equipment, low level of labor productivity and other factors are obstacles to its reform and modernization (Zhuravleva E.A., 2013; Mayer V.V., Kolesnik E.A., 2018; Shatalova N.I., 2018; Vaganova O.I., Smirnova Z.V., Sirotky S.D., Popkova A.A., Kolesnik E.A., 2019).



**Figure 1.** Requirements for engineering education in Russia» \*

\*collected by the authors according to the sources (Mayer V.V., Kolesnik E.A., 2018; Shatalova N.I., 2018)

At the same time, while performing the significant task of training qualified workers, employees and specialists of the middle ranking, the intermediate vocational education (hereinafter - IVE) is aimed at improving the intellectual potential of the young generation, its cultural and professional development in all major areas of socially useful activities. The development of labor potential is based on the needs of society and the state, as well as meeting the needs of the individual to deepen and expand

education (Osipova L.B., Kolesnik E.A., Goreva O.M., 2018). An indispensable element in the formation of labor potential is its quality improvement and achieving compliance with the requirements set by business and the market.

In this regard, the issue of labor potential development and competence formation in accordance with increasing requirements is becoming more and more relevant.

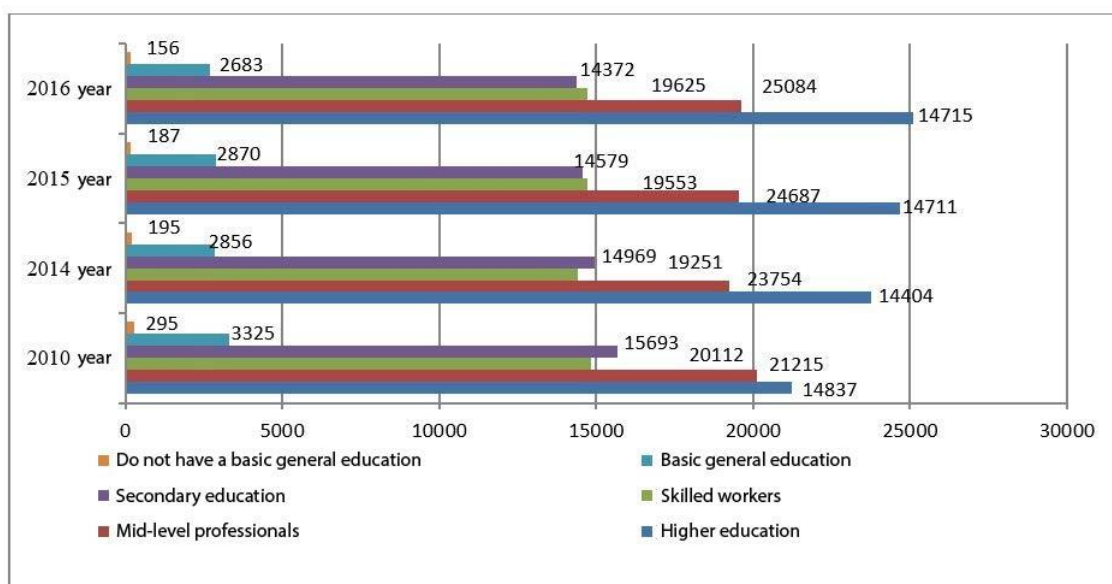
Back in 2011, at parliamentary hearings on the "Development of engineering education and its role in the technological modernization of Russia", topic D. Medvedev said that about 200,000 engineers receive diplomas annually in our country. But the modern economy chronically lacks representatives of this profession.

That is why the intermediate vocational education plays a special role in the education system established in Russia. On the one hand, it provides training for competitive middle-ranking specialists with the skills of an employee of a certain profile and the possibility of obtaining a higher professional training, and on the other hand, the professional development of the future specialist's personality in the process of acquiring

knowledge and competencies in accordance with the choice of specialty, individual abilities, social demand and the government's need for qualified specialists.

In connection with the above, the purpose of the study is to identify problems in the development of the labor potential of engineering personnel in the center of the Russian oil and gas region (Tyumen region), which have an impact on the formation of the economy of the new technological generation in the region.

According to statistical data, the share of highly qualified workers and middle-ranking specialists in the structure of the labour market is about 45% on average. Figure 2 shows the number of the Russian labor force by education level.



**Figure 2.** Number of Russian labor force by education level, thousand people\*

\*according to the data from the Federal Statistics Service of the Russian Federation (Labor and employment in Russia, 2017)

The share of employed skilled workers and middle-ranking specialists in the total number of those employed by level of education also tends to gradually increase, amounting to 45.1% in 2016, 45% in 2015 and 44.9% in 2014. In comparison with the employment of specialists with higher education, their share in the study period does not exceed 32%. In the structure of the employed qualified workers and middle-ranking contracted workers make 45,4 %, workers without any contract - 40,4 %.

The data presented confirm the importance of qualified specialists for the economic

development of the country, although the Russian Federation annually lacks highly qualified and middle-ranking workers in various sectors of the economy. The problem is the rapid ageing of this skilled workforce, which affects the attractiveness of regions and industries for investment. Thus, the development of labor potential and the formation of qualified specialists becomes particularly important.

### Literature Review

The analysis indicates a significant theoretical and practical elaboration in the development of

the labor potential of workers for various areas of the national economy. Various aspects of the development of labor potential are studied in the works of foreign (G. Becker (Becker G., 1992), J. Mintzer (Minzer, J., 1962), T. Schultz (Schulz T. (1960), M. Blaug (Blaug M., 1994), J. Hentze (Hentze J., 1997), etc.) and domestic researchers (Kibanov A. Ya. (Kibanov A. Ya., 2006), Genkin B.M. (Genkin B. M., 2006), Shatalova N.I. (Shatalova N.I., 2003), Bukhalkov M. I. (Bukhalkov M.I., 2005), etc.)

In general, they define development as an irreversible, directed, natural change of matter and consciousness, which results in a new quality of the object. It is this concept that unites various aspects of human development from birth with the accumulation of necessary elementary knowledge about the world and its formation with the acquisition of theoretical and practical knowledge, skills and abilities and the worldview formation.

A.A. Zinoviev singles out another aspect of the development. He notes that the development of the object is a disclosure of its intrinsic ancestral potentials; he also notes that the development is autonomous due to its intrinsic patterns. According to his vision, the development is nothing more than an effective system in place to promote the discovery of human capabilities. Those capabilities and aptitudes that are inherent in nature (Zinoviev A.A., 2002). At the same time, according to the author's vision, the development is not limited to natural abilities, they only correct the content of human activity. In this regard, the development is the acquisition, in the process of formation of the personality, of the necessary competences, which are the basis for the development and improvement by the employees of their potentials depending on internal needs and external factors.

N.I. Shatalova considers the development of labor potential of personality as "a process that characterizes it and which consists of a system of transformation of opportunities into reality" (Shatalova N.I., 2003). Having its limits, labor potential is conditioned by the abilities and inclinations of a person (mental, physical, mental), his or her qualities (moral, intellectual) and other personal characteristics that give rise to the inclination and ability of a person to grow professionally and develop creatively.

The authors analyzed different points of view on the essence of this concept and formulated their own vision. Which is to consider the development of labour potential as an

irreversible and targeted change in the mindset and actions of workers, resulting in a new quality. Thus, the modern Russian science considers the development of labor potential from the point of view of its qualitative elements (Kolesnik E. A., Stepanov V. G., 2019; Mayer V.V., Kolesnik E. A., 2018), where the education system has higher requirements. Its importance in the formation and development of competencies capable of meeting the requirements for the quality of labor potential in the knowledge economy is growing. In today's business environment, the level of the development and mobility of the labor potential of employees is given considerable attention and certain requirements.

### Materials and Methods

From the methodological point of view, the consideration of the role of the IVE system in the development of the labor potential of engineering personnel is conditioned by the presence in the scientific discourse of various approaches to the definition of labor potential development, mechanisms of its formation and measurement criteria, etc. There are updates regarding the point of view of the object of research data and other differences.

For the complex study of this question the authors used the following basic methods of scientific cognition:

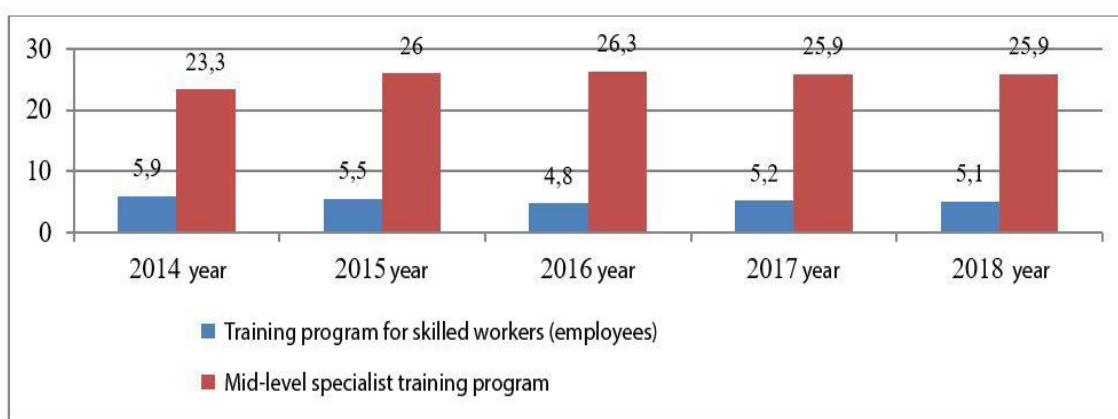
- the analysis, which allowed separating the object under study from its components, properties and features; the synthesis became the basis for obtaining new knowledge by combining the obtained data into a single system;
- the statistical analysis became the basis for obtaining and substantiation of the judgment on the dynamics of changes in the development of the labor potential of the engineering personnel in the IVE system;
- the content analysis (analysis of documents, media publications, Internet portals, websites, literary sources on the research problem, including foreign ones) made it possible to carry out a subsequent substantial interpretation of the regularities revealed;
- the survey provided initial sociological information. The research of the peculiarities of development of labor potential of middle-ranking engineering personnel and qualified workers (employees) was conducted by means of a questionnaire survey on the

example of one of the regions of the Russian Federation - Tyumen Region. 120 respondents from the middle-ranking management of the real sector of the region's economy took part in the research process.

### Results of the Research

The IVE system in the Tyumen Region is represented by 18 professional educational organisations. The purpose of their educational activities is to ensure sustainable and successful economic development of the region. According

to statistics, in 2018 there were 24,196 students in the intermediate vocational education, or 1.06 per cent of the total number of students in the Russian Federation. It is worth noting a gradual decrease in the number of students, which decreased by 12.8% compared to 2017. There has been a gradual increase in the number of students enrolled in training programs for skilled workers (employees) - compared to 2016, the growth was 7%. At the same time, the number of students in middle-ranking programs is decreasing; in 2017, compared to 2016, the decrease was 1.4% (Figure 3).



**Figure 3.** The dynamics of changes in the number of students enrolled in IVE in the Tyumen Region under training programs for qualified workers (employees) and under training programs for middle-ranking specialists, thousand people\*

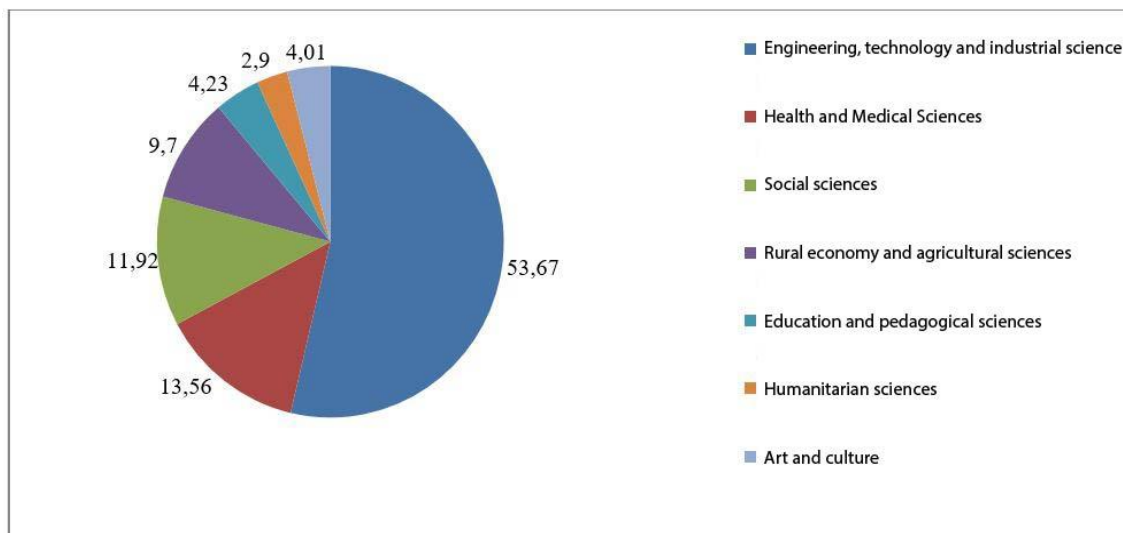
\*according to the data of the final report of the Department of Education and Science of the Tyumen Region on the results of the analysis of the state and prospects of the education system development for 2017 (Labor and employment in Russia, 2017)

Engineering specialties are the most popular among students. Thus, engineering, technology and technical sciences are in the highest number (53.67 per cent), followed by health and medical sciences (13.56 per cent) and social sciences (11.92 per cent); humanities are in the lowest demand — 2.9 per cent (Figure 4).

At the same time, the contingent of students under training programs for skilled workers and employees is 5.18 thousand people, or 16.7 per cent of the total number of trainees, and under training programs for middle-ranking specialists — 25.92 thousand people, or 83.3 per cent.

According to Tyumen Labour and Employment Department estimates, the turn-out of mid-level specialists and skilled workers (employees) from

technical secondary schools will start decreasing from the year 2019. The turn-out will be 7914 people in 2019 and 7619 people in 2020. Thus, the decrease by 295 people or 3.9% is expected during this period. Another problem is that graduates of the vocational secondary education system are not intended to work immediately after graduation. According to our survey, 71% of graduates are intended to obtain a higher education. Thus, there is a redistribution of students towards higher education, while the labor market requires skilled workers and mid-level specialists. This tendency makes it possible to satisfy the demand of employers for mid-level specialists and skilled workers (employees) by educational establishments of the vocational secondary education system.



**Figure 4.** Sectoral specifics of specialists training by the regional system of IVE in the Tyumen Region, 2018\*

\* according to the monitoring of the training quality in 2018 (Information and analytical materials on the results of monitoring the quality of training, 2017)

In the Tyumen Region, the system of IVE has been restructured to meet the needs of the region's labour market and promising areas of economic development. Educational organizations carry out systematic and significant modernization of vocational education programs in accordance with the requirements of professional standards of IVE. The percentage of programs modernized in accordance with the requirements of WorldSkills is 80%. Thus, the IVE system of the region is aimed at creating conditions for reducing the existing gap between the knowledge received by

students within educational programs and the knowledge required by business and the market. The IVE of the Tyumen Region system have established close cooperation with the leading enterprises and associations of the industry. In the course of the training, the theoretical training of students is consolidated in real working conditions, where they have the opportunity to acquire practical knowledge in the installation, maintenance and operation of modern equipment, as well as to get a guaranteed job after training. As a result, the employment rate of graduates in the training profile is quite good (Table 1).

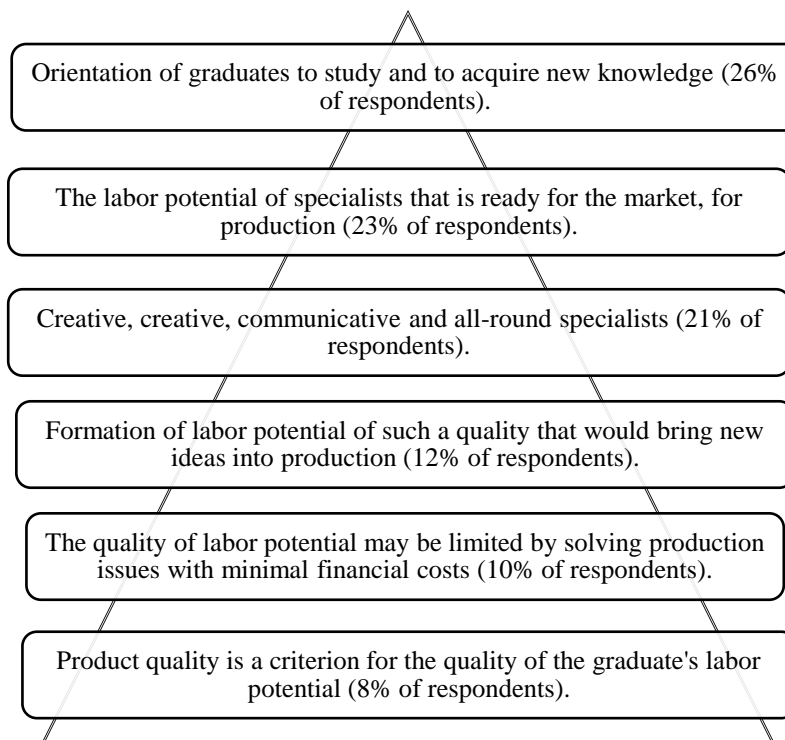
**Table 1.** The employment and unemployment rates of IVE graduates, %

Graduate employment rate	Graduates of the year 2015	Graduates of the year 2016	Graduates of the year 2017
program: training of middle-ranking specialists	83,5	77,5	71,6
program: skilled workers (employees)	81,7	75,2	70,4
Graduate unemployment rate	Graduates of the year 2015	Graduates of the year 2016	Graduates of the year 2017
program: training of middle-ranking specialists	6,4	10,8	16,1
program: skilled workers (employees)	8,4	12,8	17,5



It is also worth noting a negative trend — a gradual decrease in the employment rate of IVE graduates. In 2017, compared to 2016, the decrease was 5.9 per cent for the training programme for middle-ranking specialists and 4.8 per cent for the training programme for skilled workers (employees).

Our analysis has shown that a modern employer gives preference to other important qualities of labor potential, which a young specialist should possess, in addition to the complex of formed competences. The qualities obtained during the survey have been ranked according to their importance (Figure 5).



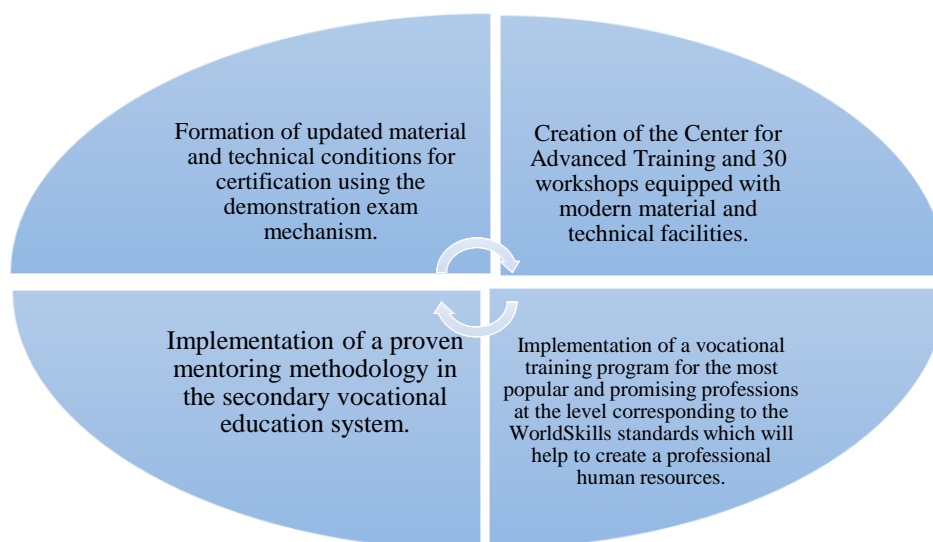
**Figure 5.** Ranking of qualitative characteristics of the labor potential of engineering personnel, according to a survey of middle-ranking managers of the real sector of the Tyumen Region economy\*  
\*according to the survey data conducted by the authors

It can be concluded that a modern employer relies on the competitiveness of graduates: today, a young specialist should not only be a bearer of knowledge, skills and abilities that are necessary for sustainable development of enterprises in the real sector of the economy, but also be able to apply knowledge in practice.

The prospective development and improvement of enterprises in the real sector of the economy of the Tyumen region provide for the fact that a future mid-level specialist, skilled worker (employee) shall have a certain set of competences. The region economy needs technicians who are able to carry out the tasks using high-tech equipment, to make its maintenance and repair; production line engineers to perform efficient maintenance of technological processes; innovative engineers to

carry out the development of new technical products and technologies at an enterprise, and their implementation into production.

The requirements of the enterprises of the region real sector of economy for the competence of the vocational secondary education system graduates are quite extensive and in practice are not always feasible. There is still an open issue of getting competencies formed in the process of training of young middle-level specialists and skilled workers (employees) closer to production capabilities and realities. The regional project “Young Professionals (Improving the Competitiveness of Vocational Education)” (Resolution of the Tyumen regional council, 2019), the main activities of which are presented in Figure 6, is intended to fill this gap.



**Figure 5.** The main activities of the regional program "Young Professionals (Improving the Competitiveness of Vocational Education)", implemented in the Tyumen region\*

\* according to the information of the Tyumen region Government on the implementation of the regional project "Young Professionals (Improving the Competitiveness of Vocational Education)" (Resolution of the Tyumen regional, 2019).

Thus, this regional project is aimed at increasing the competitiveness of vocational education in the regional labor market, which will create new opportunities for the formation and development of such competencies of specialists that will be in demand by the present-day regional economy.

Bringing the level of engineering personnel training to a single standard in Russia is designed to solve the quality problem at all educational levels. Despite contradictions and problems, specialists with engineering education are in demand in the Tyumen Region labour market.

### Conclusion

To sum up, it should be noted that a decrease in the employment rate of graduates of IVE on the labour market of the Tyumen Region is due to a decrease in the importance of the knowledge and skills acquired by students, and as a result, the value of IVE and the qualitative characteristics of the labour potential decrease. In this regard, achieving compliance of the quality of education in the IVE system with the requirements of the modern economy and labor market is one of the priority tasks that can be achieved by increasing the labor potential through raising the prestige of the working professions, the role of employers' participation in the educational process, involving IVE in the system of "turnkey" training. The prospective development of enterprises in the real sector of the Tyumen region economy

and the orientation of the region to innovative development set new requirements for the regional vocational education system. In this regard, qualitative changes are constantly taking place in the system of secondary vocational education in order to fully meet the future needs and new challenges of the socio-economic development of society.

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