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**ROLE OF YOUTH'S ORIENTATIONS TO TECHNICAL
EDUCATION IN SUSTAINABLE DEVELOPMENT OF RUSSIAN
INDUSTRY**

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Abstract

The article deals with actual issues related to youth's orientations to technical education and the quality of students' training at technical universities. On the one hand, the state provides tuition-free education to school leavers in order to increase the number of young designers, engineers, technologists capable of providing innovative development of industrial enterprises in the country. On the other hand, there is a low level of youth's orientations to technical education. Meanwhile, youth's orientations to technical education can be considered as a factor of the sustainable development of Russian industry. In addition, employers note a low level of young professionals' readiness for professional self-development in the conditions of constant modernization of present-day production. The major research objective is to analyze the youth's orientations to technical education and to assess the quality of technical education in Yekaterinburg. The investigation has revealed that employers do not show activity in the assistance for finding employment for those who intend to realize their knowledge and skills while working in their specialty. The study has shown that the number of those graduates of higher education institutions who work in related specialties or the number of those who are not related to the profession acquired is increasing. The survey has fixed that the majority of them are not satisfied with the level of young engineers' professional competence. It should be concluded that this situation complicates the sustainable development of Russian industrial enterprises due to the constant inflow of young workers' with low-level competence.

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Keywords: Youth's orientations, students, technical education, sustainable development, Russian industry.



1. Introduction

The analysis youth's orientations to technical education as a factor of the Russian industry sustainable development seem to be a very important aim of sociological analyses, as it may allow the future development of Russian industry to be predicted.

In the modern world the competitive struggle between different countries has intensified in the field of creation and effective use of modern technologies that provide an opportunity to conquer new markets, to successfully solve the tasks of ensuring an independent foreign policy, and to enhance the population quality of life. To meet these challenges in Russia, it is necessary to create conditions for the sustainable innovation development of various industrial sectors. One of the key conditions is the technical training of young engineers.

In the 90s of the XX century Russia has been in the process of establishing a market economy. Under these conditions, the role of the state in support and in development of Russian industry has shrunk. The majority of enterprises, unable to withstand competition, have been closed, which led to a decrease in the youth's orientations to technical education. Low prestige of technical education, low salaries of engineers and issues dealing with their employment led to the fact that a lot of universities could not recruit undergraduate applicants to get education in technical fields.

Meanwhile, modern enterprises need also young specialists capable of realizing theoretical knowledge of designing, operating various machines and mechanisms in their professional activities. In such case engineers should be ready to constantly update their knowledge and skills (Brewer, 2010, p. 9).

A country that cannot ensure sustainable innovative development of high technologies, it is in a situation where it is very difficult for it to maintain an independent domestic as well as a foreign policy. Awareness of this situation by the Federal government has led to the fact that over the past ten years the state has begun to make efforts not only to support Russian production, but also to support universities that train engineers for various enterprises of large and medium-sized businesses. In order to ensure sustainable development of industry, the number of state-funded places for skill development has significantly increased. Children' supplementary education centres have appeared in large cities, which make it possible to identify as early as in adolescence propensities to design new mechanisms, primarily different kind of robots, to work in the future on modern technology. The universities that train future engineers create small enterprises where students can show their ability to design new machines, mechanisms, to create their experimental models, offering the industry to replicate its innovative designs.

In the context of strengthening western countries' sanctions, the need to create an effective system of the formation and development of youth's orientations to get technical education is very important. Meanwhile, in contemporary Russia there is a lack of system of coordinated actions of schools, universities and industrial enterprises in search for and selection of young people with propensities to design, operate new technical equipment etc. The increase in the number of state-funded places, on the one hand, strengthens the orientation of a part of school leavers to technical education. On the other hand, the proportion of those who study for a higher education diploma increases. Today there is a contradiction between the country's need for training highly qualified engineers and the lack of facilities and resources for it at a lot of universities. This situation reduces youth's orientations to technical education as well as universities' graduates' orientations to work within specialty.

2. Problem Statement

Over two hundred years an increasing interest in the problem of youth's orientations to higher education has been observed in professional publications of various scientific disciplines. Quite frequently this subject is investigated in the field of sociology, with the majority of publication being of an applied nature. Meanwhile, the issue dealing with the youth's orientations formation has been already appeared at the initial stage of the Industrial Revolution at the end of the XVIII century (Tomory, 2016). It should be noted that the emergence of higher education in the 1850s in Russia engaged in the training of young specialists is an important step towards the Russian industry development. In the USSR to ensure the country's transition to the industrial development track, the training of engineers has dramatically increased. The total number of students in tertiary education in the country increased from 127 thousand people in 1915 to 2.1 million by 1957; the number of universities increased from 105 to 767 within the same period. The number of students in the institutions of secondary vocational education grew from 54 thousand to 2.12 million, and the number of institutions providing such education increased from 450 to 3642 (Movsovic, 1959). At the same time they were in demand at industrial enterprises, which were being built in different regions of the country (Pietsch, 1983.). Then and there an issue dealing with the interrelationship of young professionals' theoretical knowledge and practical skills has been emerged. To overcome this contradiction in the early 60s of the last century, an attempt was made to restructure the educational process in the USSR (Matthews, 1982). However, two years later, it has been found that the quality of mastering theoretical knowledge decreased sharply. It was necessary to return to the traditional system of higher education. Modern Russian industry needs also young skilled engineers.

The solution of this issue requires a change in the system of general education. It should be noted that this issue is relevant not only for Russia but also for the majority of largest Economies. In Canada, a significant number of schoolchildren face difficulties in implementing their professional choices. They need information about what kind of work they have in accordance with their individual propensities (Witko, Bernes, Magnusson, & Bardick, 2005). In some countries, such as Serbia, school leavers, engaged in certain labour activity, first of all, attempt to reveal their predisposition to it, and then to get the required professional education (Mojčić, 2012).

In this regard, the urgent task is to create a system of interaction between secondary schools, employers and universities to make an informed choice of young people to technical education (Hasanefendic, Heitor, & Horta, 2016). In this case, there is an increase in the share of technical universities graduates, who, having realized the orientation to getting necessary theoretical knowledge and practical skills, will be able to immediately engage in innovative activities in the workplace (Krnjaja, 2014).

An urgent problem for many countries is to improve the quality of students' technical training on the basis of cooperation between universities and industrial enterprises. Researchers note a decrease in the current investment of employers in the modernization of the majority of American universities (Guimón, 2013). It should be noted that this situation leads to difficulties in introducing a new content of technical education. It is associated with the introduction of an integrated approach to the engineers' training. This approach is known as the term "STEM", including such education sectors as natural sciences, technology, engineering and mathematics (Bybeer, 2010, p. 24). Basham and Marino (2013) emphasizes that in countries where such an education system is being introduced; faculty members develop students' skills

such as "system thinking, manifestation of creativity, optimism, cooperation, communication and ethical aspects" (Basham, & Marino, 2013 p. 10). Thus, engineering degree becomes a part of the STEM, which demands new requirements to future engineers (Hasanefendic et al., 2016).

In order to ensure compliance technical education with the requirements of modern industry a special approach to its organization, called the CDIO (Conceiving — Designing — Implementing — Operating, innovative educational framework), is being developed (Gaidi, 2003, p. 431). In modern conditions it is possible to provide specialist training who are capable of engineering creativity, such creativity emerges from the students' desire to design the latest developments or create what in society is so far it seems to be inconceivable (Karataş, Bodner, & Unal, 2016). In the future the need for such engineers will increase at that (Fuchs, 2012, p. 112). Kumar, Ochieng, and Oyango (2004) points out engineers need the ability to analyze existing issues and to seek better ways to solve them (Kumar, Ochieng, & Oyango, 2004).

It should be noted that the task of training engineers focused on creative activity on the basis of knowledge acquired at the university is very important for modern Russia. Engineers' training should ensure sustainable development of domestic industry.

Although youth's orientations to higher education has already been studied rather extensively; however, this phenomenon requires further study. To the best of our knowledge, the youth's orientations to technical education are still to be revealed. Therefore, the purpose of the present work was to analyse this problem in detail.

3. Research Questions

The Analysis of modern researches has made it possible to formulate the main research questions.

Do Russian young people while in the process of technical training plan to work in their specialties at industrial enterprises?

What are the motives for obtaining higher technical education by Russian youth?

What factors affect obtaining higher technical education by the Russian youth?

4. Purpose of the Study

The purpose of the study is to analyse the youth' orientations to technical education and to reveal the issues of its organization in modern Russia

5. Research Methods

The data were obtained using a factor analysis method. The research methodology combines qualitative and quantitative methods. Methods of collecting primary data were the questionnaire and in-depth interview.

3148 engineering students (the first-the fourth year students) were questioned at the age of 18 years and older on the basis of the quota sampling in 2015-2017 in the city of Yekaterinburg.

78 heads of workshops, heads departments of industrial enterprises of the Sverdlovsk region were questioned to determine former university graduates' general cultural and professional competences.

Depths interviews with experts (10) are applied on purpose to identify main issues of the topic. Heads of departments of industrial enterprises in Yekaterinburg, Moscow, St. Petersburg were defined as informants.

A biographical method was used in interviewing 17 young graduates who had got technical education 2-3 years ago at different universities of the country.

6. Findings

The study has revealed a number of problems in the organization of technical education and different students' orientations to it.

Our research has shown that the students' orientations to technical education begin to form unconsciously in childhood, when interest in games with cars, work with designers is shown. The informants (employers) note: *"Now the children are immersed themselves in modern technology, they understand that a person begins to develop attending school. Now we meet a lot of young specialists who were interested in technology attending school"* (man, head of the plant head of division, 45 years old).

The study has fixed that 8% of the respondents had an interest in technology in the preschool age. 13% of the respondents indicated they had the desire to study different technical instruments at the age of seven-ten years. They attempted to figure out household appliances organization, computer organization etc.

Our research has revealed that 58% of the respondents had their orientation to technical education before submitting documents to the university. 42% of the students note that their choice was determined by the desire to get a profession that they are interested in, although there is no clear idea of its content. 33% of the respondents, when analyzing their orientations to technical education, came to the conclusion that they would be able to successfully master the requirements to their future work.

The study has shown a gender-specific in the youth's orientations to technical education. 65.0% of men tend to think about technical education while studying at school. This is due to the fact that they appreciate games with cars, work on the computer, etc.

The study has revealed a number of factors affecting the choice of technical education by future engineers. Interest in engineering was found to be a key factor in the respondents' orientations to technical education (84.0%).

Another important factor, which affected respondents' choice of technical education in our study, was the reference group, in particular students' families. Recommendations received from parents and acquaintances also influence the choice of technical education, with 47.0 % of respondents mentioning it.

For a half (51%) of the respondents, the occupational prestige was shown to be a significant factor. High prestige has such areas of training as IT technology, automation engineering, information systems, construction industry and energy production. Applicants who choose these specialties consider that they will not have problems with employment in the future, and they will have good material well-being. Meanwhile, when choosing a specialty, only 12% of the respondents are interested in its demand on the labour market. For them the main goal is to enter a higher educational institution and to get a job in any specialty. Young people who have such an attitude are unlikely to become good professionals, ensuring the sustainable development of Russian industry.

Our research has determined that low USE (Uniform state exam) score occupies a special position among factors in the choice of technical education by the respondents. Applicants with low USE scores, on average 160-180, choose such specialties as "technical machines and technologies", "metallurgy", "chemical technologies". This fact indicates that they were bad at math, at physics and at chemistry at school. It should be noted that 54% of the respondents being a second year students have come to the conclusion that they have the ability to study subjects related to the acquired specialty. About 40.0% of the respondents note that their interest in getting technical education significantly reduces: *"At our faculty a large percentage of students are sent down from university, they do not have the necessary training at school. They do not know what they will have to do at the university"* (man, 23 years old, master student).

In addition, our study has revealed that industrial establishments, faculty members and school teachers do not seem to be important factors that affect respondents' choice in getting technical education. About 10% of the respondents note their influence on the formation of students' orientations to technical education. This fact indicates that top-managers of industrial enterprises opt out of shaping the orientations of schoolchildren as one of the key ways to train future engineers who are capable of ensuring the sustainable development of the Russian economy. As a result, a significant number of applicants who attempt to get technical education have no a clear version about their readiness of getting knowledge to become professionals. 23% of the respondents made informed choices about a technical specialty before entering the university. In addition, 46% of the respondents considered alternative specialties such as managers, economists etc. It indicates a low choice validity of the future profession by applicants.

Our research has determined that in the process of studying, students change their ideas about the content of the goals of the education they get. Hence, if 83% of the 2nd year students hope that education will allow them to have high earnings in the future, then in the fourth year only 74.0% of the students hope that it works for them. The idea of career progression varies from 72% to 67%, and the orientation toward acquiring practical skills increases from 49% to 69%. Getting specific knowledge on the specialty by senior students leads to the fact that the value of the acquired profession rises from 48% to 58%. Meanwhile, this value is the 6 in rating position of students' technical education goals.

The research has revealed that by the end of studies at the bachelor's degree 62% of the students have not developed the practical skills required in their specialty by employers; 48% of the respondents are not able to communicate with representatives of foreign firms and organizations. The survey has shown that one of the reasons for this situation is the poor organization of practices: *"I myself was looking for an enterprise to practice. Actually, how is the practice sought? My friends helped me to find the enterprise. How is the practice organized for friends? The Head signs the necessary papers, and put a stamp"* (woman, 24 years old, technologist). The lack of permanent interactions between universities and industrial enterprises leads to the fact that practice is often formal, that reducing the students' orientations to work in the acquired specialty in the future. Employers should be primarily interested in such interactions, if they are striving to ensure the sustainable development of the Russian economy. In-depth interviews with young graduates receiving a technical education (N=19) have revealed the difficulties universities' graduates face when seeking to find a job in their specialty

Our research has determined that a part of students are dissatisfied with the low quality of education. They note that a part of the professors do not have the necessary knowledge of modern technology: *"There is a subject of" Technology and innovation "... I thought that there would be a young professor, and the*

professor was an old man with old views, cited old data that was used 10 years ago ... The professor must understand new technologies ... He explained the principle of the open-hearth furnaces, which nowhere else is used. What for? The question remained unanswered. "(man, 21 years old, student of the 4 years).

Our study has shown that students' dissatisfaction with the acquired knowledge and skills is the main reason for the universities' graduates reluctance to work on their specialty. Meanwhile, 26.0% of the undergrads are ready to work on their specialty. 52.0% of the students will work on their specialty, if they find the desired employment and remuneration terms. 22.0% of the respondents express a wish to work on another specialty. As researchers mention, "This situation reduces the upgradeability of Russia to ensure high rates of modernization with the help of universities' graduates. The reason for this is the lack of career guidance work with senior school students who do not have the opportunity to reveal the existence of a predisposition to a certain profession before finishing school and to make a motivated choice of their future work in accordance with their abilities" (Grunt, Merenkov, & Antonova, 2017).

Our research has revealed that only 21% of the respondents believe that they are in demand in the labor market. This opinion is caused by the fact that universities are not looking for a future job for their graduates. 35% of the respondents say that some professors periodically tell them about those enterprises where there are vacant work places for young professionals. 17% of the respondents note that they get such information from the heads of teams at the enterprises. 7% of the respondents mention that they get relevant information from representatives of different plants and factories when recruiting young specialists. The research has found that in modern Russia there is a lack of an effective system of interaction between higher education institutions and employers. Therefore, universities' graduates can find an occupational work if they display an active attitude, kindly speaking to relatives and acquaintances. Anyone who attempts to find a job being a senior student, combining work with study, successfully solves this problem: *"I believe that after graduating from the university a lot does not depends on a person. Much depends on the fact that you have already worked somewhere. Without experience, even with any degree, you do not need anyone ... You can be a knowledgeable person, etc., but all potential employers always look at your credentials. (woman, 25 years old, designer).* The survey of employers has revealed their opinion about the reasons for this situation: *"The quality of education is low ... It's worse than it was 20 years ago ... We have to retrain graduates". (man, R&D and Procurement director, 45 years old).* The issue of the young specialists' quality training is the most important for ensuring the sustainable development of Russian industry.

7. Conclusion

The survey has established that today there is a paradoxical situation in Russia, when there is a lack of connection between youth's orientations to technical education and the education he/she has got.

It has been found that youth's orientations to technical education in modern Russia have a pronounced gender-specific nature. Thus, about 70.0% of the respondents engaged in technical education are men.

A significant number of young people who attempt to get technical education have no a clear vision about their readiness of getting knowledge to become professionals.

We have found that both objective (gender, the reference group, occupational prestige, low USE (Uniform state exam) score) and subjective factors (human interest in engineering, personal engineering' experience) affect the youth's orientations to technical education.

The research has revealed that the majority of the Russian universities' graduates are guided when choosing of the future place of work not by the requirements of potential employers, but by representations about where it is profitable for them to realize their material needs. In such case they are ready to work in a related specialty or even in those which do not correspond to the available knowledge in case of high wage packet. This leads to the fact that Russian industry does not have those professionals who are ready to work both on existing equipment and the new ones, developing modern methods of organizing production by engaging in innovative activities. In this case, the country's need to ensure the sustainable development of both traditional manufactures and the new ones that determine scientific and technological progress in the world is not being realized.

Our study has unequivocally confirmed that there is a need to create an effective system of interaction between universities and employers, so that in the process of studying future specialists acquire competencies required by the innovative economy, based on the order of those enterprises they are going to work at.

The survey has elucidated that the business community and employers should become a customer and a participant in the educational activities at the universities

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