SOCIO-HUMANITARIAN RESEARCH

DOI: 10.15838/sa.2022.4.36.8
UDC 37 | LBC 74

INVOLVING YOUNG PEOPLE IN RESEARCH

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The solution of the country's important tasks is related to the stimulation of creative activity and involvement of young people in the scientific sphere. There are a number of problems in this area, which are due to the non-systematic nature of the decisions made, the uneven development of technologies for working with young people to attract them to the scientific field in the territorial context, and other aspects. This may have a negative impact on the outflow of highly qualified specialists, the possibility of innovative development of territories. The paper aims to study youth involvement in science and innovation activities, to determine the incentives that influence this process. To achieve the goal, we studied theoretical and methodological aspects, including approaches to interpreting the concept of "young scientist"; investigated the attitude towards scientists and trust in the results of their scientific activity; analyzed statistical data on the situation of young scientists in Russian science; identified directions to stimulate the involvement of young people in research. The analysis was carried out using data in dynamics and in the territorial context (both in the country as a whole and among the regions of the Northwestern Federal District). The information base was statistical data (from Rosstat, VologdaStat) on the number of researchers depending on age, availability of academic degrees, by field of science, by type of organization, data from the unified interagency information and statistical system. We have analyzed young scientists' views on the prestige of scientific activity for them and for society. Among the positive aspects, we can note an increase in the share of the population who

speaks approvingly about the role of science in public life; a trend in the trust of scientific information is indicated; the prevalence of the position on the prestige of the scientist's profession is revealed. Negative aspects were also identified: low real awareness of activities in the scientific sphere, in some cases, declaration of interest in scientific research. There is a low activity of the business community in the implementation of scientific achievements in practice, insufficient consideration of the researchers' position by the authorities.

Territory, region, research activities, innovation activities, young people.

ACKNOWLEDGEMENT

The article was prepared under Government Assignment № FMGZ-2022-0002 "Methods and mechanisms for socio-economic development of Russian regions under conditions of digitalization and the Fourth Industrial Revolution".

Introduction

The period of 2022–2031 has been declared the Decade of Science and Technology in Russia by Presidential Decree 231, dated April 25, 2022. Among the Decree's goals is the involvement of young people in the scientific sphere, and the involvement of researchers and developers in solving tasks important for the country. Stimulating the creative activity of young people is becoming a prerequisite for the innovative development of the country. The latter is associated with the improvement of innovation and research activities, ensuring that specialists meet the requirements of innovative economy (Lyskova, 2011).

Achievement of the above implies a systematic approach with regard to encouraging young people to participate in science, technology and innovation activities. This is reflected in the need to develop and adopt systemic solutions to attract young people into the scientific sphere both in the country as a whole and in the regions and within organizations. However, although such an approach may be possible, it is difficult to put it into practice. This manifests itself in the spontaneity and unreasonableness of the decisions made from a scientific point of view, in the unevenness and heterogeneity of the development of technologies of work with young people to attract them to the scientific sphere in the territorial context and in other aspects.

In characterizing youth work technologies, it is necessary to take into account the form and content aspects. The first is manifested in the consideration of proper technologies, presented from the perspective of a set of sequential, algorithmized steps to organize the cognitive process. There are technologies that pay attention not only to the sequence of processes, but also to their instrumental support, the order of using different types of means (personal, methodological) to achieve the goals. For example, N.V. Smirnova[1], in addition to presenting the characteristics of technology as such, points to the educational type of technology and emphasizes the connection between the steps taken and the organization of the cognitive process. In the same way, A.B. Vorontsov and E.V. Chudinova[2] emphasize the subordination of the means used to achieve pedagogical goals.

Technologicality does not only imply a sequence of processes, but also the tools that support them. In the case of technologies for the involvement of young people in science, the focus is on tools of a material and non-material nature. Among the former, for example, a system of competitions, scholarships, grants, etc. is considered, which influence the financial

[1] Smirnova N.V. (1997). Philosophy and Education: Problems of the Philosophical Culture of the Teacher. Moscow: Sotsium.

[2] Vorontsov A.B., Chudinova E.V. (2004). Learning Activities: Introduction to the Educational System of D.B. Elkonin – V.V. Davydov. Moscow.

support of young people. In addition, there are name scholarships, cash awards, as well as allowances for the intensity of work performed (Vlasov et al., 2009, pp. 99–100). Among the second are institutional aspects related to exchange programms, provision of market-oriented services by consulting agencies. At the same time, it is necessary to take into account the creation of an environment for the formation and use of leadership abilities of young people, the realization of young people as public and political figures (Technologies of Work..., 2015, pp. 216–217).

The institutional foundations for organizing youth work were laid as early as the 1980s, when the All-Union Coordinating Council for Scientific and Technical Creativity of Youth was established and the institutional framework for organizing and implementing scientific and innovative activities was developed. However, already in the 1990s (up to 1997) there was a deterioration in the system of R&D management, associated with its exclusion from curricula. By 2005, the activity in some areas was renewed, for example the All-Russian Competition for Research Papers. In addition, honorable distinctions were awarded (Lyskova, 2011).

The above-mentioned directions can positively influence the involvement of young people in research work, the formation and use of the creative potential of this population group. The participation of employees in R&D is related to their motivation, the way the involvement is organized (Lyskova, 2011). Among the motives that hinder the participation of young people in these activities, scientists highlight the low level of material and technical support, problems with material interest, organization of research work, etc.[3] Similar conclusions were obtained from the research work conducted by the Centre for Sociological Research of the Ministry of Education of the Russian Federation[4].

One of the possible consequences of the above-mentioned problems is the migration of young workers and talented professionals to other countries. Domestic researchers[5] estimate that the number of such workers doubled in 2016 compared to 2013. Such a negative trend may have a negative impact on opportunities for innovative development of territories and their competitiveness. At the same time, we are talking about economic losses due to the outflow of highly qualified specialists. According to the analysis of some researchers (Maslennikov et al., 2018), they reached 27 trillion rubles over the period of 2000–2017. Scientific papers analyze not only the migration of highly qualified specialists, but also the parameters that determine it. Attention is paid to such aspects as favorable conditions for employment (Kartseva et al, 2021), career opportunities (Fielding, 1992), university reputation (Ciriaci, 2014), employability in the place where the training took place (Hickman, 2009), availability of units in the organization that facilitate commercialization of the results obtained during intellectual activities, successful experience of cooperation of enterprises with scientific and educational institutions (Zucker et al., 2002; D'Este, Patel, 2005; Turk-Bicakci, Brint, 2005), etc.

In the light of the above-mentioned aspects, the aim of our work is to investigate the involvement of young people in science and innovation activities and to identify the incentives that influence this process.

In order to achieve the goal, the following tasks need to be solved:

- study of the theoretical and methodological aspects of the research, including approaches to the interpretation of the notion of "young scientist";
- study of attitudes to scientists and trust in the results of their scientific work;
- analysis of statistical data characterising the status of young scientists in Russian science;
- research on ways to stimulate the involvement of young people in science.

[3] Romanchuk R. How to attract university youth to science. Available at: https://pandia.ru/text/78/459/63074.php

[4] Dezhina I.G. (2003). Youth in science: Problems and prospects of rejuvenation of scientific personnel. Sociological Journal, 1, 71–87.

[5] Zvezdina P. The Russian Academy of Sciences announced that the brain drain has doubled in three years. Available at: https://www.rbc.ru/society/29/03/2018/5abcc9f 59a7947e576977387

Theoretical and methodological aspects of the research

Let us review the interpretations of the concept "young scientist" found in the scientific environment and normative-legal sources. First of all, let us note the approaches to the definition of "young scientist" and specify it taking into account the aspects revealing the content of the definition of "scientist". An analysis of the sources shows that there is no unambiguity about its interpretation[6].

The first position (demographic approach) takes into account the age boundaries of young people as a key characteristic for the identification of this population group, which is determined by the features of socio-historical development, aspects related to culture and socialization.

The constructionist approach is closely related in content to the previous one; it takes into account not only age but also professional length of service. For example, T.K. Rostovskaya understands young professionals as graduates of educational institutions in the first three years of employment after graduation (Rostovskaya, 2014). A similar position is presented in the works of Yu.A. Zubok, V.I. Chuprov[7]. This sets the boundaries that are taken into account in the analysis of this category. An important role in the context of the constructionist approach is given not so much to objective conditions influencing the prevalence of youth problems as to people's attitude toward a particular phenomenon as a problem of concern (Best, 2003). A similar position is also taken by other researchers (e.g. Lemert, 1951; Becker, 1963), who focus primarily on understanding the meanings used in interpreting a phenomenon, on the predetermination of the phenomenon by societal reactions, on the response to the problem (Ibarra, Adorian, 2019). Another peculiarity of this approach is related to the consideration of social problems not from a static point of view, but in the context of a transforming society[8].

The constructionist approach plays an important role in the study of youth problems. Within its framework, for example, E. Omelchenko notes that young people are seen from a unified perspective as a group that needs to be controlled and regulated[9]. On the other hand, researchers (Yarskaya, Lovtsova, 2010) have recorded a shift from viewing youth as an object of policy to seeing it as a subject of change that realizes its potential.

The structural-functional approach characterizes youth in terms of their role in social development, and their position is determined by the state of the social system itself and the place of other social groups in it. The culturological approach provides characteristics along with social position to distinguish youth from other social groups and view them as subjects of the formation of a "unique cultural system", given the spread of norms and values among youth[10].

Similar approaches are taken with regard to young scientists. For example, a demographic approach focusing on the age boundaries of the group is widespread. The key attribute influencing the latter is the presence or absence of an academic degree of candidate of sciences. Thus, a young researcher is defined as an employee of an educational or research organization who is under 30 years old without a degree, under 35 years old with a candidate degree or under 40 years old with a degree of doctor of sciences[11]. In this formulation, along with age limits and the presence/absence of a degree, attention is paid to several other aspects: firstly, it is a reference to the young

[6] Kochetkov A.V. (2010). Theory of legal regulation of state youth policy in Russia: Doctor of Sciences (Law) dissertation abstract. Saint Petersburg: Law Institute.

[7] Zubok A., Chuprov V.I. (2008). Youth. Sociology of Youth. Moscow: Academia.

[8] Yasaveev I.G. Sociology of Social Problems. Available at: https://smolsoc.ru/index.php/2010-09-06-10-21-32 (accessed October 18, 2022).

[9] Omelchenko E.L. (2012). How to teach to love the Motherland? Discursive practices of patriotic education of youth. In: Omelchenko E., Pilkington H. Where Does the Motherland Begin: Youth in the Labyrinths of Patriotism. Ulyanovsk: Ulyanovsk State University.

[10] Rudenkin D.V. Youth as a sociological category: Basic conceptual approaches. Available at: http://teoria-practica.ru/rus/files/arhiv_zhurnala/2019/9/sociology/rudenkin.pdf

[11] A draft on defining the concept of "young scientist" was introduced to the State Duma. Available at: https://ria.ru/20200211/1564549458.html

scientists' activities on a professional basis, and secondly, the existence of an employment relationship with a scientific organisation. It is the latter that creates the preconditions for the professional nature of young scientists' activities.

Belarusian scientists raise the issues related not only to professional development, but also to professional self-determination and professional identity in their studies. We should note the research work carried out by the Centre for Monitoring the Migration of Scientific and Scientific-Pedagogical Staff of the Institute of Sociology of the NAS of Belarus, which focuses not only on identification as such, but also on its different types. It takes into account how young scientists relate to their immediate, close environment in the scientific sphere, as well as to the scientific organization and the scientific community as a whole[12].

Domestic research draws attention to different aspects of young scientists' activities that relate to young people's attitudes toward careers and migration trajectories[13]. Some authors (e.g. Rakitina et al., 2009; Mikhalkina et al., 2019) focus not only on career strategies and the factors that predetermine them, but also on the value-motivational aspects that determine the choice of career directions, as well as on knowledge transfer channels; on the assessment of the educational environment and determining its impact on the success of young scientists' career.

Similar studies are conducted at the all-Russian level (all-Russian sociological study of Russian intellectual youth environment[14]). They analyze the positions of young scientists both at several federal universities (sociological study of postgraduate students from five federal universities[15]) (Mikhalkina et al., 2019) and at the level of an individual university (study of postgraduate students and young scientists at Siberian Federal University) (Bakhova, 2018).

The results of the aforementioned works indicate that the scientific activity is prestigious for young scientists in more than 60% of cases (for 42.3% it is prestigious, for 24.6% it is very prestigious). Some young researchers who express patriotic intentions and live in the provinces are much more likely than others to focus their career choices on public benefit[16]. The inclination to bring public benefit through the implementation of youth actions, the presence of family traditions, including those related to professional self-determination and the implementation of certain career trajectories, the presence of interest in this type of activity, the vision of its development prospects (Bakhova, 2021). Alongside this, among the incentives influencing the involvement of young people in the scientific sphere are the opportunities for professional development, the realization of oneself in an intellectual and creative direction, the achievement of a competitive level of wages (Bekova et al., 2017; Sokolov et al., 2015).

One of the factors having a discouraging effect on the involvement of young people in science is the disruptive reforms of the postgraduate institution in Russia, which have been in place since 2015. We need to return to the traditional target

[12] Voroshen' O.G. Peculiarities of formation of professional identity of young scientists in the academic sector of science. Available at: file:///C:/Users/yka/Downloads/osobennosti-formirovaniya-professionalnoy-identichnosti-molodyh-uchenyh-akademicheskogo-sektora-nauki.pdf

[13] All-Russian sociological survey of Russian intellectual youth aimed at studying career expectations and aspirations of students and graduates of Russian universities. Available at: https://lomonosov-msu.ru/archive/Lomonosov_2018/Research_2018_Presentation.pdf

[14] All-Russian Sociological Survey of Russian Intellectual Youth. The sample is 5,231 respondents, including men and women from 17 to 35 years old including students, graduate students, or graduates of leading Russian universities, i.e., the Russian intellectual youth environment. All federal districts of the Russian Federation. Period of conducting: December 2017 – June 2018; All-Russian sociological study of the Russian intellectual youth environment, aimed at studying career expectations and aspirations of students and graduates of Russian universities. Available at: https://lomonosov-msu.ru/archive/Lomonosov_2018/Research_2018_Presentation.pdf

[15] A sociological survey of 1,429 graduate students from five federal universities. Respondents of different ages participated in the survey, but young people aged 23–27 formed the largest group.

[16] All-Russian sociological survey of Russian intellectual youth aimed at studying career expectations and aspirations of students and graduates of Russian universities. Available at: https://lomonosov-msu.ru/archive/Lomonosov_2018/Research_2018_Presentation.pdf

function of the Russian postgraduate education, i.e. to the training of scientific-pedagogical and research personnel of higher qualification with a degree of candidate of sciences, to overcome these negative consequences, (Markin, Voronov, 2016). Such transformation would be in line with the implementation of the classical model of postgraduate education, which creates an environment for effective reproduction of scientific personnel (Kelsina, 2017).

In scientific research on the indicated problems, attention is paid not only to the issues that determine professional self-determination, but also to the aspects related to the criteria of scientists' performance qualification, primarily to education, as well as the experience in team leadership, interaction with employees in the organization (experience in scientific team leadership, experience in interaction with the organization team, work experience in foreign universities). The level of qualification has a direct impact on the results of scientific activity, so the publication of materials, including monographs and textbooks (list of publications in the last 5 years; availability of publications in journals with an impact factor; availability of published textbooks and monographs), patents, etc. are of great importance. Similar aspects regarding qualifications are also found in other papers[17].

The competitiveness of researchers is examined in terms of their publication and patent activity and their participation in professional communities. In turn, professional self-determination depends on interest in the achievements of modern science, attitudes toward scientists and trust in the results of their work. These aspects will be presented below.

We used the official statistical data (information of Rosstat, VologdaStat) on the number of researchers by age, by academic degree, by field of science, by type of organization; data of the Unified Interdepartmental Information and Statistical System (EMISS) as the information base. We carried out the analysis using the data in dynamics and in the territorial context (both in the country as a whole and among the regions of the Northwestern Federal District). In addition, the article takes into account the results of a mass all-Russian population survey, which was carried out according to the traditional scheme of all-Russian telephone surveys using CATI technology (three call centers operated). Respondents were selected by randomly selecting telephone numbers from a common database of mobile and landline telephone numbers registered in the Russian Federation. The sample size was 1,600 respondents (statistical error for random selection does not exceed 3.6%). The sample population was representative of Russia's adult population in terms of gender, age, education, type of place of residence (type of settlement) and geography of residence (federal districts). Data collection was monitored by listening to audio recordings of interviews for at least 10% of the survey sample and analyzing the original sample for consistency with the planned sampling indicators. In addition, the directions and tools for supporting young scientists were analyzed using the roadmap for improving measures to support young researchers, which links the objectives of the National Project "Science and Universities", the state program "Scientific and Technological Development of the Russian Federation", and the draft action plan to implement the Strategy for Scientific and Technological Development of the Russian Federation.

Attitudes toward scientists and trust in the results of scientific activity

In Russia, the number of young scientists is projected to increase by 70% and the number of undergraduates by 60% by 2030[18]. The above targets can be achieved through the implementation of national projects, including those related to support for universities and their balanced development (Baler, 2021). At the same time, public attitudes toward the improvement of the scientific field should be taken into account, as they determine, firstly, the extent to which certain changes will be supported, and secondly, the extent to which certain groups of the population

[17] Quantitative methods for assessing the qualifications of researchers. Available at: https://kapital-rus.ru/articles/article/kolichestvennye_metody_ocenki_kvalifikacii_issledova telej

[18] Education Navigator. The number of young scientists in Russia is projected to grow by 2030. Available at: https://scientificrussia.ru/ articles/v-rossii-k-2030-godu-prognoziruetsa-rost-cisla-molodyhucenyh

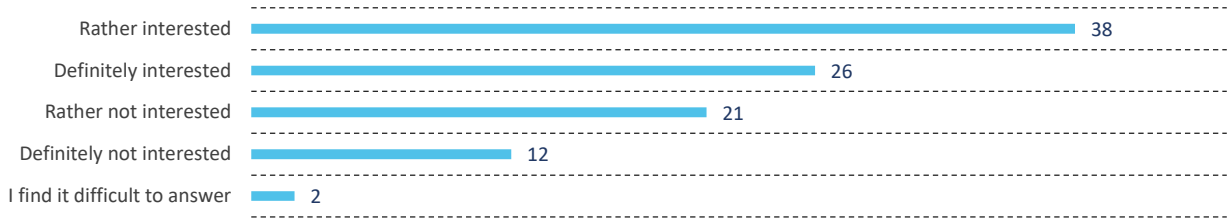

Figure 1. Distribution of responses to the question "Please tell me, are you interested in the achievements of modern science?", % of the number of respondents

Source: Science of Russia in 10 figures. Available at: https://issek.hse.ru/news/442044357.html

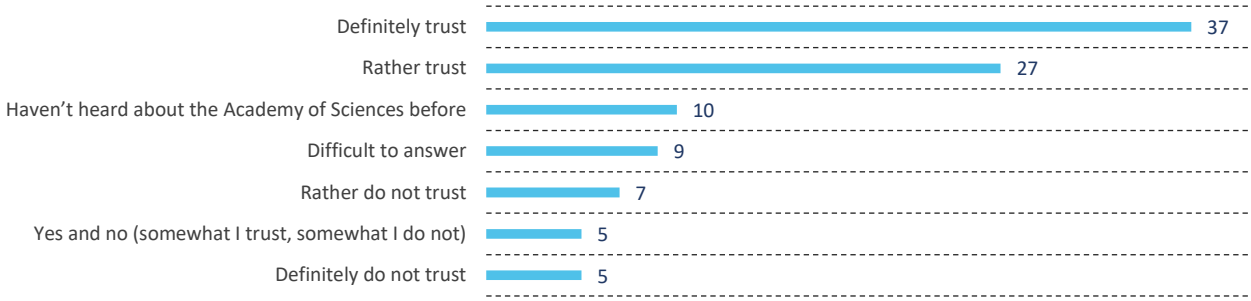

Figure 2. Distribution of answers to the question "Tell me, do you trust or distrust the Russian Academy of Sciences as an organization?", % of the number of respondents

Source: Science of Russia in 10 figures. Available at: https://issek.hse.ru/news/442044357.html

may be potentially inclined toward scientific activities. According to a sociological survey conducted by the Institute for Statistical Studies and Economics of Knowledge at the Higher School of Economics (ISSEK HSE), the number of people who consider the role of science in public life to be positive is increasing (67% in 1996, 86% in 2019)[19]. The population is aware of the achievements of modern science in 64% of cases *(Fig. 1)*. Nevertheless, almost a third do not express any interest in this area, and the number of people who are not aware of scientific news has increased between 2014 and 2019 (one in four in 2014, and one in three in 2019).

Another aspect to pay attention to is the population's trust in scientific information, trust in the RAS as a scientific organization. According to the results of a study[20] conducted by employees of the Institute of Psychology of the RAS and Zircon Research group, three quarters of respondents tend to trust scientific information about world issues. Against this background, there are slightly fewer Russians who trust in the RAS as a scientific institution – 64%, including 37% who have unconditional trust *(Fig. 2)*.

Despite the high level of trust in scientific institutions and awareness of information about scientific life, actual awareness is lower than declared, and such interest is in some cases declared. Data from a sociological survey by ISSEK HSE show an increase in the number of people who do not follow news about science (from 25% in 2014 to 31% in 2019). In about 40% of cases, the population is not informed about the most significant scientific achievements[21]. Another important aspect was

[19] Science of Russia in 10 figures. Available at: https://issek.hse.ru/news/442044357.html

[20] The mass All-Russian population survey was conducted in the traditional scheme of All-Russian telephone surveys using CATI technology (three call centers worked) from April 11 to 19. The respondents were selected by randomly selecting telephone numbers from the general database of mobile and landline telephone numbers registered in the Russian Federation. The volume of the final sample was 1,600 respondents according to the plan (the statistical error for random selection does not exceed 3.6%). The sample represents the adult population of Russia according to the parameters of gender, age, education, type of place of residence (type of settlement) and geography of residence (federal districts). Data collection was monitored by listening to audio recordings of interviews in the volume of at least 10% of the sample population of the survey and analyzing the initial array for compliance with the planned sample indicators.

[21] How society treats scientists and the Russian Academy of Sciences: Results of the survey. Available at: https://scientificrussia.ru/articles/rezultaty-oprosa-otnosheniya-obshchestva-k-uchyonym-ran (accessed: July 13, 2022).

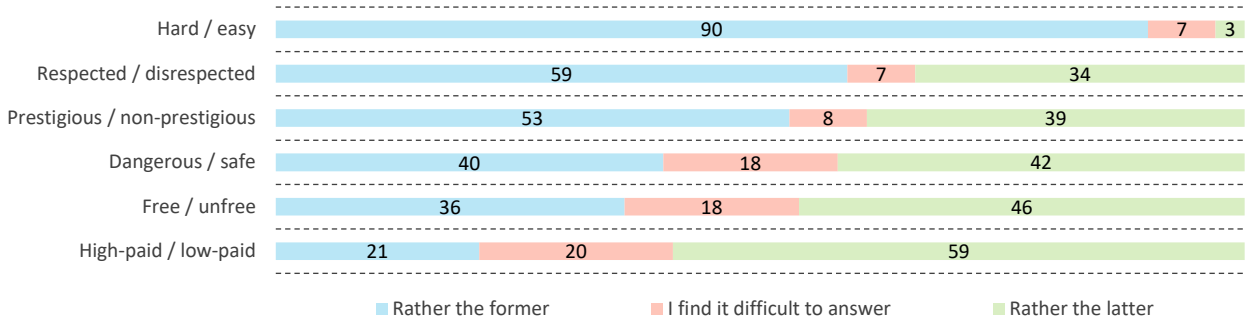

Figure 3. Distribution of responses to the question "Do you think the profession of a scientist today in Russia...?", % of the number of respondents

Source: Science of Russia in 10 figures. Available at: https://issek.hse.ru/news/442044357.html

that 60% of the respondents drew attention to the failure of the authorities to fully take into account the position of scientists, and in 67% of cases a low level of implementation of scientific achievements in practice was noted[22].

A more detailed characterization of the public perception of scientists was carried out using "polar" statements, the analysis of which suggests that in 90% of cases the profession of scientist is considered difficult, in more than half – respected and prestigious, but low-paid *(Fig. 3)*.

The prevalence in the public environment of a position on the prestige of the profession of scientist is accompanied by an inclination to employ children in the scientific field in a third of cases, and in another 27% such a decision would be rather welcomed. A positive trend is the almost doubling in 2019 compared to 2003 of the number of Russians positively characterizing science as a professional choice for their children (for example, in the United States this was common in 80% of cases).

Nevertheless, along with the trends outlined, negative trends are also noteworthy: analysis of statistical data over the past twenty years shows a 1.2-fold decrease in the number of researchers, and taking into account technicians and support staff, a 1.3-fold decrease (Dozortsev, Starokozheva, 2021). Another negative trend is the 20% decrease in the number of young scientists under 29 years of age. The largest group of scientists in 2019 are 30-39 year olds, while in 2010 they were under 29 years of age[23].

This raises the scientific challenge of encouraging young people to become involved in science and innovation. It cannot be solved without understanding who a young scientist is, what approaches to his / her identification exist and what parameters are used for these purposes. The improvement of the status of young scientists in the country depends on the definition and legal consolidation of the status of this group. In turn, the consolidation of the status creates the preconditions for the allocation of their rights and obligations, as well as guarantees, which can affect the implementation of developed support measures and lead to an improvement in the situation of young scientists. Such a position is held by Senator L. Skakovskaya[24] and her view is shared by Deputy Minister of Science and Higher Education E. Druzhinina, who sees "changes as a source of streamlining the system of government support for young scientists and increasing its efficiency"[25]. This could help young scientists play a greater role in socio-economic development and in shaping and realizing their potential as a driver of civilizational change and national development[26].

[22] Ibidem.

[23] The number of young scientists in Russia has fallen by almost 20% in 10 years. Available at: https://nauka.tass.ru/nauka/11016963

[24] Scientists in Russia will prolong their youth. Available at: https://www.pnp.ru/social/uchenym-v-rossii-prodlyat-molodost.html

[25] The Ministry of Education and Science explained why it is important to fix the term "young scientist". Available at: https://rg.ru/2021/04/14/v-minobrnauki-rasskazali-pochemu-vazhno-zakrepit-termin-molodoj-uchenyj.html

[26] Ivanov D.V. Young scientists as the driving force of Russian society. Available at: https://rosmu.ru/activity/opinions/155.html (accessed: August 2, 2021).

Young researchers in Russian science: analysis of statistical data

The total number of researchers in the country is at a level comparable to the indicators of advanced foreign countries and amounts to more than 346 thousand people. Speaking of the dynamics of the number of scientists, it is worth noting that their number reduced by 6%, or more than 22 thousand people, over the past 10 years *(Tab. 1)*.

Looking at the distribution of researchers by field of science, we can note the following. Their greatest number is concentrated in the field of technical sciences (60% of the total number of researchers) and natural sciences (23%). However, during the analyzed period the number of specialists in social sciences and humanities increased by 40 and 9% respectively, while in all other areas there was a decrease: technical – by 7%, natural sciences – by 10%, medical – by 12%, agricultural – by 25%. It should be noted that the identified reduction in the number of researchers is sustainable.

Table 1. Number of researchers by field of science in the Russian Federation, people

Year	Number of researchers, total	Including by field of science					
		natural	technical	medical	agricultural	agricultural	humanities
Researchers							
2010	368915	89375	224641	16516	12734	14347	11302
2015	379411	86722	231809	15819	11296	20874	12891
2016	370379	85979	225038	16137	11066	19831	12328
2017	359793	79980	224111	14942	10343	18126	12291
2018	347854	78661	214233	14327	9575	19046	12012
2019	348221	79270	213942	14416	9459	19466	11668
2020	346497	80966	208994	14584	9551	20076	12326
including those with scientific degree							
2010	105114	45915	25880	11520	6546	7918	7335
2015	111533	45958	26789	10707	6143	13308	8628
2016	111533	45958	26789	10707	6143	13308	8628
2017	103327	43206	25016	9754	5567	11537	8247
2018	100330	42106	24075	9312	5183	11832	7822
2019	99912	41862	23600	9184	5139	12380	7747
2020	99122	41716	22734	9173	5133	12527	7839
including:							
Doctors of Sciences							
2010	26789	12251	4620	4045	1542	2057	2274
2015	28046	12233	4928	3899	1551	2951	2484
2016	27430	12083	4648	3768	1487	2990	2454
2017	26076	11503	4435	3621	1384	2726	2407
2018	25288	11302	4259	3365	1243	2862	2257
2019	24844	10992	4130	3326	1214	2933	2249
2020	24473	10757	3974	3339	1197	2959	2247
Candidates of Sciences							
2010	78325	33664	21260	7475	5004	5861	5061
2015	83487	33725	21861	6808	4592	10357	6144
2016	80958	33087	21153	6755	4483	9611	5869
2017	77251	31703	20581	6133	4183	8811	5840
2018	75042	30804	19816	5947	3940	8970	5565
2019	75068	30870	19470	5858	3925	9447	5498
2020	74649	30959	18760	5834	3936	9568	5592
Source (hereafter): Rosstat data. Available at: https://rosstat.gov.ru							

Table 2. Number of researchers by age group in the Russian Federation, people

Indicator	2010			2015			2016			2017			2018			2019			2020		
	researchers	including		researchers	including		researchers	including		researchers	including		researchers	including		researchers	including		researchers	including	
		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences		doctors of sciences	candidates of sciences
Total	368915	26789	78325	379411	28046	83487	370379	27430	80958	359793	26076	77251	347854	25288	75042	348221	24844	75068	346497	24473	74649
including at he age of (full years):																					
up to 29 (included)	71194	52	4354	76813	11	4408	71492	13	3864	66376	32	3153	60634	40	2507	58537	12	2129	56607	39	1746
30–39	9910	632	15229	85972	730	21207	88782	629	21204	91429	566	20772	92109	518	20459	95527	518	20565	96826	519	20295
40–49	54113	2394	12157	50171	2606	14703	50193	2547	14899	51149	2473	14906	52801	2474	15466	55939	2484	16536	60072	2472	17410
50–59	88362	7211	18805	69552	6286	15727	65196	5927	14506	59893	5160	13238	54832	4763	12310	52004	4318	11993	48840	4076	11667
60–69	60997	7743	16001	63943	9280	16420	60915	8991	15443	57414	8484	14351	54077	8145	13693	54909	8390	13740	51716	7887	13081
70 and older	34339	8757	11779	32960	9133	11022	33801	9323	11042	33532	9361	10831	33401	9348	10607	31305	9122	10105	32436	9480	10450

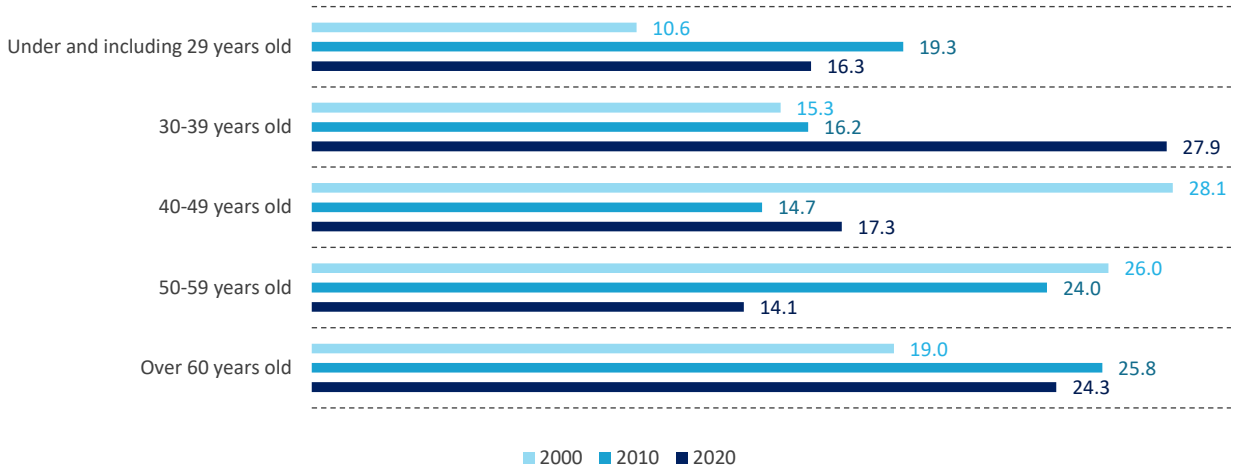

Figure 4. Dynamics of the number of researchers by age group in Russia, %

On the whole, the share of researchers with a degree has not changed over the 10 years and it makes up 28.6%. However, there are trends in the structure of the distribution of degrees by field of science that correlate with the above trend. Thus, there are fewer researchers with a candidate or doctoral degree in those areas where the number of scientists reduced in general. Against this background, there has been an increase in the number of degree holders in the social sciences (by 58%) and humanities (by 7%).

At the same time, it should be noted that the average age of a domestic scientist decreased from 48 to 46 years old. In general, the largest number of researchers (almost 28% in 2020 against 16% in 2010) are young scientists aged 30-39 years *(Tab. 2; Fig. 4)*. In 10 years this category increased by 62%, up to 96.8 thousand people. The National Project "Science" set a target according to which by 2024 a half of the scientists in Russia should be no older than 39 years old[27]. In 2020 the number of scientists in this age group reached 44.2% *(Tab. 3)*. In 10

[27] The future of science: How Russia nurtures young scientists. Available at: https://www.gazeta.ru/science/2019/08/23_a_12593149.shtml

years the amount of Doctors of Sciences in this cohort has become 18% less, and the number of Candidates of Sciences has increased by 33%. The number of other age groups of scientists has decreased: by 20.5% in the group of under 29 years old (inclusive), by 11% in the group of 40–49 years old, by 45% in the group of 50-59 years old, by 15% in the group of 60–69 years old, by 5.5% in the group of 70 years and older.

Let us consider in more detail the distribution of researchers by age on the example of the Northwestern Federal District (NWFD). In general, the trend of growth in the category of scientists under 39 years old is characteristic of all the subjects of the Northwestern Federal District. The leader in this indicator is the Vologda Oblast (65.5%). Kaliningrad (55.5%), Novgorod (53%) and Arkhangelsk (50%) oblasts also exceed the national average.

The qualification level of researchers working in the subjects of the District is characterized by the following figures *(Tab. 4)*. The Northwestern Federal District accounts for 12% of all researchers in the country with a scientific degree. The largest number of them (80%, or 9.5 thousand people) is registered in St. Petersburg, which indicates a high concentration of human resources in some points of the country. In other constituent entities of the District the number of scientists with a degree varies from 24 (Pskov Oblast) to 498 (Komi Republic).

In contrast to the all-Russian trend, which consists in the reduction of scientific personnel of higher qualification, some regions, on the contrary, managed to increase this indicator during the 10-year period. These subjects include the Kaliningrad Oblast (growth by 2 times), the Novgorod Oblast (by 40%), the Vologda Oblast (by 39%), the Arkhangelsk Oblast (by 15%), the Komi Republic (growth by 14%), the Republic of Karelia (growth by 2%). At the same time the fall of the indicator in the Pskov Oblast was 70%. In the Vologda Oblast, the number of both young candidates and doctors of science aged up to 39 years decreased by 1.4 p.p. in 2020 in comparison to 2010 *(Tab. 5)*.

In the Vologda Oblast, the share of young researchers under the age of 29 working in research organizations decreased by 23.2 percentage points over the period 2010–2020, at the same time, the share of a group of scientists aged 30–39 years increased by 17 percentage points. There is the opposite trend in educational institutions of higher professional education: the share of young researchers under the age of 29 It increased by 11.4 percentage points, and the amount of scientists aged 30–39 years decreased by 13.5

Table 3: Share of researchers under 39 years of age in the total number of Russian researchers in the Russian Federation and the subjects of the Northwestern Federal District, %

Constituent entity	Total						
	2010	2015	2016	2017	2018	2019	2020
Russian Federation	35.5	42.9	43.3	43.9	43.9	44.2	44.3
Northwestern Federal District	34.7	42.6	43.4	44.1	44.4	44.2	44.1
Republic of Karelia	41	41.6	41	40.9	38.9	39.7	40.4
Komi Republic	47	48.8	48.5	42.1	37.1	36.7	33.5
Arkhangelsk Oblast	40.7	49.8	49.6	51.1	52.7	51	50.1
Vologda Oblast	61.8	57.6	62.9	66.4	63.6	62.6	65.5
Kaliningrad Oblast	31.4	39.6	39.7	45.5	48	45.2	55.5
Leningrad Oblast	25.6	31.4	31.8	33.1	31.9	33.5	35.3
Murmansk Oblast	29.9	37.9	37.8	37.6	37.8	37.5	37.1
Novgorod Oblast	35.4	55.9	54.3	53.1	50.3	52.7	52.6
Pskov Oblast	39.4	32.4	45	50.6	51.6	48.8	43.2
Saint Petersburg	34.6	43	43.8	44.6	45.1	44.8	44.3
Source (hereafter): EMISS data. Available at: https://www.fedstat.ru							

Table 4: Number of researchers with a scientific degree in the Russian Federation and the subjects of the Northwestern Federal District, people

Constituent entity	Total							Including with scientific degree													
								Doctor of Sciences							Candidate of Sciences						
	2010	2015	2016	2017	2018	2019	2020	2010	2015	2016	2017	2018	2019	2020	2010	2015	2016	2017	2018	2019	2020
Russian Federation	105114	111533	108388	103327	100330	99912	99122	26789	28046	27430	26076	25288	24844	24473	78325	83487	80958	77251	75042	75068	74649
Northwestern Federal District	**13538**	**13769**	**12784**	**12156**	**11508**	**11901**	**11837**	**3296**	**3274**	**3073**	**2887**	**2681**	**2766**	**2774**	**10242**	**10495**	**9711**	**9269**	**8827**	**9135**	**9063**
Republic of Karelia	314	364	364	362	347	341	321	76	87	82	85	79	84	70	238	277	282	277	268	257	251
Komi Republic	435	493	489	501	509	497	498	102	102	100	103	112	110	109	333	391	389	398	397	387	389
Arkhangelsk Oblast	151	181	188	189	168	167	174	23	32	34	32	25	23	25	128	149	154	157	143	144	149
Vologda Oblast	72	144	131	86	95	108	100	8	21	18	16	11	12	9	64	123	113	70	84	96	91
Kaliningrad Oblast	116	194	215	163	168	223	233	16	35	30	20	23	31	22	100	159	185	143	145	192	211
Leningrad Oblast	579	643	623	599	580	560	475	120	130	126	120	115	107	102	459	513	497	479	465	453	373
Murmansk Oblast	489	511	496	471	471	467	450	114	116	110	107	107	103	103	375	395	386	364	364	364	347
Novgorod Oblast	27	72	66	59	58	40	38	6	7	10	7	8	6	5	21	65	56	52	50	34	33
Pskov Oblast	70	366	60	53	51	43	24	6	51	8	8	10	10	1	64	315	52	45	41	33	23
Saint Petersburg	11285	10801	10152	9673	9061	9455	9524	2825	2693	2555	2389	2191	2280	2328	8460	8108	7597	7284	6870	7175	7196

Table 5. Dynamics of the number of researchers by academic degrees and age in the Vologda Oblast, %

Indicator	Up to and including 29 years old		30–39 years old		40–49 years old		50–59 years old		60 and older	
	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020
Total	35.2	25.1	26.6	40.4	12.2	15.5	18.3	9.6	7.6	9.4
Doctor of Sciences	0.0	0.0	12.5	11.1	12.5	11.1	25.0	44.4	50.0	33.3
Candidate of Sciences	12.5	6.6	40.6	45.1	17.2	20.9	17.2	13.2	12.5	14.3

Note: 100% for each year by line.
Sources: Science and innovation in the Vologda Oblast in 2005–2010: Vologda Statistical Collection: Vologdastat, 2011; Science and innovation in the Vologda Oblast in 2016–2020.: Vologda Statistical Collection: Vologdastat, 2021.

Table 6. Dynamics of the number of researchers by type of organization and age in the Vologda Oblast, %

Показатель	Up to and including 29 years old		30–39 years old		40–49 years old		50–59 years old		60 and older	
	2010	2020	2010	2020	2010	2020	2010	2020	2010	2020
Total	35.2	25.1	26.6	40.4	12.2	15.5	18.3	9.6	7.6	9.4
research organizations	48.0	24.8	23.6	40.6	12.2	13.9	8.9	10.9	7.3	9.9
educational organizations of higher professional education	19.2	30.6	38.5	25.0	19.2	16.7	15.4	19.4	7.7	8.3
industrial enterprises	29.1	–	29.8	–	13.5	–	20.6	–	7.1	–
others	27.0	–	16.2	–	2.7	–	43.2	–	10.8	–

Note: 100% for each year by line.
Sources: Science and innovation in the Vologda Oblast in 2005–2010: Vologda Statistical Collection: Vologdastat, 2011; Science and innovation in the Vologda Oblast in 2016–2020.: Vologda Statistical Collection: Vologdastat, 2021.

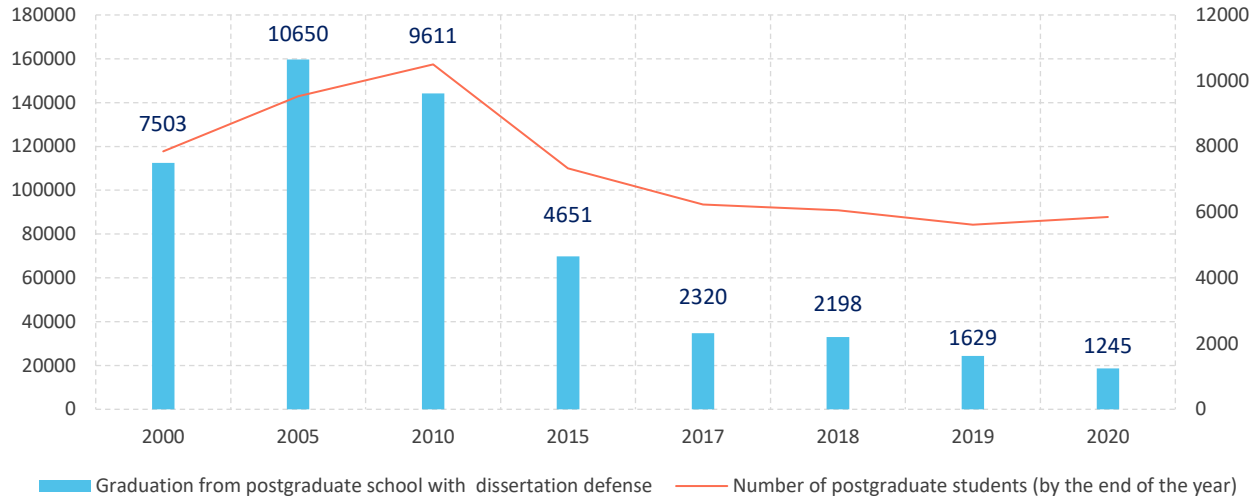

Fig. 5. Number of postgraduate students and graduation from postgraduate studies with a dissertation defense in Russia, people.

Sources: Russia in Figures – 2020: statistical coll. Moscow: Rosstat, 2020;
Russia in Figures in 2021. Available at: https://rosstat.gov.ru/folder/210/document/12993

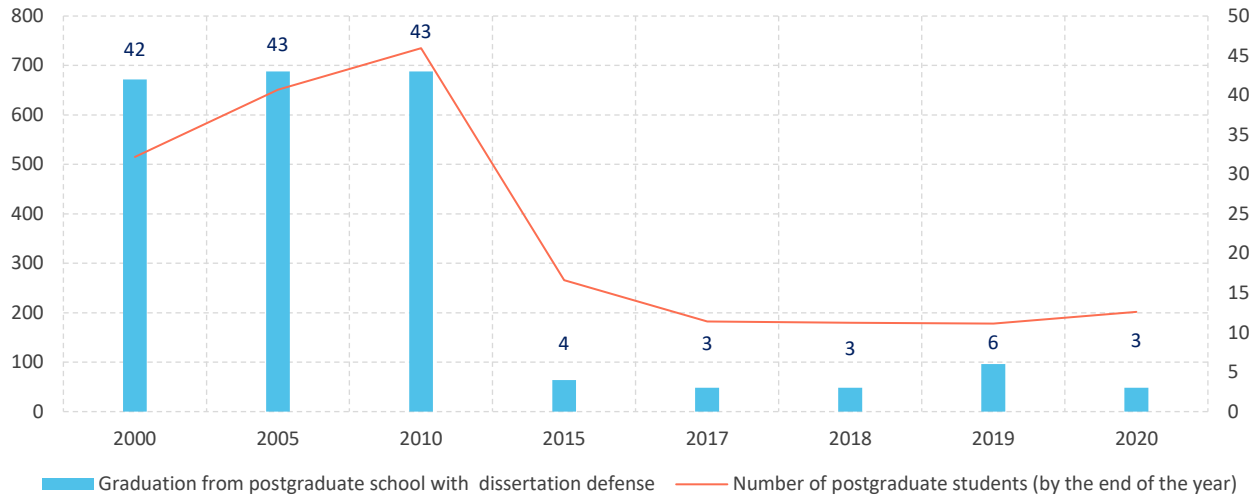

Fig. 6. Number of postgraduate students and graduation from postgraduate studies with a dissertation defense in the Vologda Oblast, people.

Source: Vologda Oblast in figures – 2020: stat. coll. Vologda: Vologdastat, 2021.

percentage points. In the whole region, the number of young scientists under the age of 39 increased by 3.7% during the period under review.

During the period of 2000–2020 the number of postgraduate students decreased by 25.5% in the country as a whole, which had a negative impact on the graduation from postgraduate school with a dissertation defense (the decrease in this indicator was 83%).

Similar changes occurred in the Vologda Oblast: the number of graduate students decreased even more markedly – by 60.8%, the number of those who graduated from postgraduate school with a defense – by 93%.

Thus, the analysis allows us to draw the following conclusions:

- there is a continuing downward trend in the number of scientific personnel in the country, including the main group – researchers;

- the greatest number of researchers is concentrated in the field of technical and natural sciences (more than 80% in total);

- the number of specialists in the social sciences and humanities has increased, and it has decreased in all other areas; the largest

decrease has occurred in the field of agricultural sciences (by 25%);

- there is an increase in the number of researchers in the 30–39 age group, which is currently the most numerous, accounting for 27% of the total number of scientists;

- the number of postgraduate students decreased by 25.5%, which had a negative impact on the graduation from postgraduate school with a dissertation defense, the reduction of this indicator is 83%;

- the share of researchers with a scientific degree has not changed and is about one-third of the total number;

- the number of researchers with a candidate or doctoral degree decreased in those areas where there was also a general reduction in the number of scientists.

Policies to encourage the involvement of young people in science

The state policy being implemented is aimed at attracting and stimulating young personnel to work in science. Thus, some existing programs and infrastructure projects are presented below *(Tab. 7)*. Along with this, an important role should be given to personal values, worldview reference points influencing the life goals of a person, the aptitude for learning when attracting young people to science (Melnichuk et al., 2019). Consideration of such aspects as the desire to learn and create new things, focus on self-realization, the desire to bring benefit with their discovery is significant (Vlasov et al., 2009).

The measures presented make a significant contribution to attracting and retaining

Table 7. Directions and tools to support young scientists in Russia

Direction of support	Tools and measures
Material incentives for the initial consolidation in science	program "Involvement of Schoolchildren in Innovative Activities" (operator: Sodeistvie Foundation); the UMNIK program (operator: Sodeistvie Foundation); grants from the President of the Russian Federation to support individuals who have demonstrated outstanding abilities (operator: Sirius Educational Center); scholarships of the President of the Russian Federation for students, postgraduate students, adjuncts, listeners and cadets of educational institutions of higher education (operator: the Ministry of Education and Science of Russia); scholarships of the President of the Russian Federation for students and postgraduate students studying in the areas of training (specialties) corresponding to the priority areas of modernization and technological development of the Russian economy (operator: the Ministry of Education and Science of the Russian Federation); scholarships of the President of the Russian Federation for young (up to 35 years old) scientists and postgraduate students who carry out promising research and development in priority areas of modernization of the Russian economy (operator: the Ministry of Education and Science of Russia).
Material support for scientific research	grants of the President of the Russian Federation for state support of scientific research of young (up to 35 years old) Russian scientists - candidates of sciences and young (up to 40 years old) Russian scientists - doctors of sciences (operator: the Ministry of Education and Science of Russia); grants of the Presidential Program of research projects for young scientists (operator: the Russian Science Foundation); grants of the Presidential Program of research projects for scientific groups headed by young scientists (operator: Russian Science Foundation); the Prize of the President of the Russian Federation in the field of science and innovation for young scientists (operator: the Russian Science Foundation).
Providing housing	provision of housing certificates to young scientists within the framework of the state program of the Russian Federation "Providing citizens of the Russian Federation with affordable and comfortable housing and communal services" ("Provision of housing to certain categories of citizens").
Organizational support	Coordinating Council for Youth Affairs in Science and Education of the Presidential Council on Science and Education; Youth Council of the All-Russian Society of Inventors and Innovators.
Source: own compilation.	

young personnel. For example, the presidential program, launched in 2017, annually supports about 500 researchers under the age of 33 on individual grants and 300–400 scientific groups led by young scientists. Total funding has reached more than 4 billion rubles annually[28].

By the end of 2022, 260 million rubles will be allocated to fund a program to provide housing for researchers. It is planned to increase the number of housing certificates for young scientists several times. It is expected that more than 300 Russian researchers will be able to obtain such certificates[29].

In addition, in 2021 a roadmap to improve measures to support young researchers was developed; the document links the objectives of the National Project "Science and Universities", the state program "Scientific and Technological Development of the Russian Federation", the draft action plan for implementation of the Strategy for Scientific and Technological Development of the Russian Federation.

The priorities also include increasing of the prestige of the profession of a scientist, expansion of measures of young scientists' material support and providing them with housing, modernization of laboratory facilities in the institutes of the Russian Academy of Sciences and universities. It is necessary to strengthen the targeted grant and scholarship support for postgraduate students and young scientists.

The Minister of Science and Higher Education Valery Fal'kov noted, "the roadmap has become a document that forms a common system for developing support for young talents and provides consolidation of the authorities, development programs, and ongoing activities. We have focused particular attention on building unified end-to-end trajectories: from the Council of Young Scientists to support measures, and in the long term, to reaching our own world-class laboratories and teams".

Conclusion

In conclusion, we should note the following.

Firstly, the absence of unambiguous positions in the scientific literature regarding the definition of "youth" was revealed; there are several approaches in science, including demographic, constructionist, and structural-functional ones. They focus on different aspects (e.g., age, social status, etc.); the following characteristics of young scientists were highlighted: age boundaries, availability of labor relations with scientific organization, professionalization of young scientists' activity.

Secondly, we analyzed the opinions of young scientists with regard to the prestige of scientific activity for them and for society. An increase in the share of the population positively characterizing the role of science in public life was revealed (67% in 1996, 86% in 2019); a trend in relation to the credibility of scientific information was outlined; the prevalence of the position on the prestige of the scientist profession was revealed (in more than half of cases the inclination to employ children in the scientific sphere is welcome). Negative aspects were also identified: low real awareness of activities in the scientific sphere, in some cases declaring interest in scientific research. We have revealed low activity on the part of the business community in relation to the implementation of scientific achievements in practice (67%), noted insufficient consideration of the position of researchers on the part of the authorities (59% of respondents drew attention to this).

Thirdly, we conducted an analysis of statistical data, which revealed both positive and negative trends with regard to the involvement of young scientists in the scientific sphere. Positive trends include the increase in the share of highly qualified scientific personnel in a number of regions (these include the Kaliningrad, Novgorod, Vologda, Arkhangelsk oblasts, the Komi and Karelia republics); the increase in the number of specialists in the social sciences and humanities (by 40 and 9%, respectively). Positive changes are also

[28] RSF. Available at: https://rscf.ru/news/interview/aleksandr-klimenko-ob-itogakh-pyati-let-molodezhnykh-konkursov-prezidentskoy-programmy (accessed July 28, 2022).

[29] Dom RF. Available at: https://xn--h1alcedd.xn--d1aqf.xn--p1ai/news/molodye-uchenye-poluchat-bolee-300-zhilishchnykh-sertifikatov-v-2022-godu (accessed: July 28, 2022).

observed in the Vologda Oblast: an increase in the share of researchers aged 30–39 years by 17 p.p. over the period of 2010–2020; an 11.4% increase in the number of young researchers under 29 years in educational institutions of higher professional education; a 3.7% increase in the number of young researchers under 39 years old during the period under review. Negative trends include a 1.2-fold reduction in the number of researchers nationwide and a 1.3-fold reduction in the number of technicians and auxiliary personnel; a 20% reduction in the number of young scientists under 29 years of age. At the same time there is a steady decrease in the number of researchers by field of science during the period under consideration: by 7% in technical sciences, by 10% in natural sciences, by 12% in medical, and by 25% in agricultural sciences. The number of doctors of sciences became 18% less in the last decade (in contrast to this there has been an increase in the number of candidates of science by 33%). In general, we should note that in those areas of science, where there is a general reduction in the number of scientists, the number of researchers with academic degrees is also decreasing. In addition, despite the all-Russian tendency to reduce the number of highly qualified scientific personnel, there is a concentration of human resources in certain parts of the country.

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