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Monitoring study of the quality of work with gifted schoolchildren in the Russian Federation regions

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Abstract. The article presents the results of research into the quality of work with talented schoolchildren in the Russian Federation subjects. It shows that it is the regional and municipal levels that should be most actively involved in the identification and development of such children. The author suggests his methodology of calculating the integral index of the quality of work with gifted schoolchildren in the regional educational systems. The article shows that Russia's territories differ considerably according to this indicator. The highest value of the index is registered in the Volga Federal District (average rating is 0.499) and the Central (0.480) Federal District. The constituent entities of the North Caucasian (0.303) and Far Eastern (0.358) federal districts have the lowest average rating.

The regions were divided into five groups by the index of quality of work with gifted schoolchildren. The Vologda Oblast joined the group in which the level of quality of work with gifted schoolchildren was above average; the Oblast ranked 22nd in the country and 5th in the Northwestern Federal District. The Oblast has the greatest progress by the set of indicators "Olympiad movement" (6th place among Russian regions). According to some indicators, the Oblast's results were below the threshold indicators.

The dynamics of the integral index of the quality of work with gifted students for 2012–2013 was analysed by the cross grouping of the regions according to the level and rate of growth (decline) of the integral index. The Vologda Oblast was included in the group of regions with low growth rates of the integral index (94%), which creates the risk of decrease in the quality of work with gifted students.

The article states the main reasons for the integral index decline; it also suggests certain measures for the improvement of the quality of work with gifted schoolchildren.

Key words: Education, gifted schoolchildren, integral index, dynamics of development of education, school Olympiads.

Nowadays the issue of the system of work with gifted children at the state level is in focus due to the changes in the country's socio-economic development. The most important condition of its innovation development is the intellectualization of human capital [13]. In this regard, one of the priority tasks of the Russian education policy is to create conditions for development of gifted children and youth. The relevance of this direction is emphasized in such documents of the federal level as "The Concept of Long-Term Socio-Economic Development of the Russian Federation for the Period up to 2020" (approved by the Russian Government Decree of November 17, 2008 no. 1662-r), a national educational initiative "Our New School", "The Concept of the National System for Identifying and Developing Young Talents".

The necessity to work out the national system of search and development of talented children and youth was discussed at the joint session of the Presidium of the State Council, the Council for Culture and Art and the Council for Science and Education, held April 22, 2010. Special attention was paid to regional and municipal parts of the system. Regional authorities should develop mechanisms to identify gifted children, systems of monitoring, stimulating and encouraging their creative development as well as supporting teachers who have achieved significant success in training gifted children and youth [5]. In this context, it is important to assess approaches to work with intellectually gifted children at the regional level, which is the purpose of the present study. This target is specified in the following tasks:

– identification of indicators that determine the effectiveness of work with gifted students;

– determination of a current level and analysis of the work quality dynamics;

– research into the dependence between indicators that determine the level of work with gifted students;

– forecast of development trends in the work with gifted children.

In 2013 the Institute of Socio-Economic Development of Territories of the Russian Academy of Sciences (ISEDT RAS) carried out the monitoring study of the education development in Russia [4]. The set of indicators included some indicators, characterizing the level of talented youth support. However, currently there are no studies, specifically devoted to quality of work with gifted children at the regional educational systems. This article is the first attempt to elaborate a systematic approach to the evaluation of such work in the RF subjects. In accordance with the definition of giftedness, proposed by the authors of domestic "Working Concept of Giftedness" (V.D. Shadrikov, D.B. Bogoyavlenskaya and others), we consider talent as a system human feature, developing in the process of his/her activity and determining the possibility of achieving outstanding results in society's valuable activities [3]. A gifted child is a child who outstands among others due to bright, obvious, sometimes striking achievements (or has internal prerequisites for such achievements) in any activity.

The algorithm to conduct a monitoring research includes the following stages:

– identification of indicators and development of research tools;

– processing of data, obtained in the research course;

– analysis of the received data, formulation of the proposals to improve the quality of work with gifted students on its basis.

To single out the indicators of the quality of work with gifted students we have analyzed regulatory documents that determine the strategic development of this direction at the federal and regional level. As a result, 9 indicators have been chosen. The data have been taken from public sources, such as "The Complex Program of Education Modernization (CPEM) "Our New School";

the official information portal of the Unified State Examination; the official site of the All-Russia Student Olympiad; the Olympiad schools ranking of the Russian Rectors Union [7, 8, 9, 16].

The dynamics of quality of work with gifted students for 2012–2013 has been assessed. The given years have been chosen, as the Program "Our New School" began to be implemented in 2010, and the set of indicators was changed in the first two years of monitoring.

The selected indicators have been grouped into three thematic blocks. The list and characteristics of the included indicators are presented in *Table 1*. The share has been calculated from the total number of pupils in the region.

1. *Olympiads*. Subject school Olympiads are considered as one of the most effective methods to identify gifted and talented young people. The Chairman of the Russian Council of Student Olympiads, academician V.A. Sadovnichii marks their high significance as a tool of strengthening intel-lectual competitiveness of Russia [6].

This block singles out the indicators that determine the effectiveness of student participation in the All-Russian Student Olympiad and contests, held by the Rectors Union. The differences of these Olympiads have ideological and instrumental character. The All-Russian Student Olympiad includes 4 stages and characterizes both the contest popularity (the share of pupils of 5–11 forms, taking part in a school stage of the All-Russian Olympiad) and the level of work with the most talented pupils (the total number of winners is about 1500 people a year). The data of municipal and regional stages of the contest are not reflected in the indicators, as the share of winners is prescribed in of the Regulation on the Olympiad (not more than 25% of the participants number) and is about the same for all regions. The Olympiads under the Rectors Union, in fact, replace the system of entrance examinations in the most prestigious universities and serve as a search tool for well-prepared students for further education (the total number of winners and prizewinners is about 22.5 thousand people a year).

Table 1. Indicators to measure the quality of work with gifted students in the RF regions

No.	Indicator	Unit of measure
	Olimpiads	
1.	Share of final stage winners of the All-Russian Student Olympiad	%
2.	Share of winners and prizewinners of Olympiads, held under the auspices of the Russian Council of Student Olympiads	%
3.	Share of pupils of 5–11 forms, taking part in a school stage of the All-Russian Olympiad (in number of pupils of 5–11 forms)	%
	Educational activity results	
4.	Share of school leavers, received a certificate of secondary (complete) education and gold and silver medals	%
5.	Share of Unified State Examination participants, received 100 points in particular subjects	%
	Support of talented students	
6.	Share of school leavers, who have had profound study in some subjects (of the total number of school leavers)	%
7.	Share of pupils who have conditions for creative activities	%
8.	Share of funds, specifically allocated for the support of gifted children and talented youth from the regional budget	Rubles per person
9.	Share of pupils, enrolled in educational institutions that receive assistance under the programs of support of gifted children and talented youth at the regional level	%

2. The effective educational activity is characterized by such indicators as the share of honors students and the share of students, who received 100 points in the Unified State Examination in particular subjects.

3. The indicators of regional systems of the gifted students support are the following: infrastructure indicators (a share of school leavers, who have profound study in some subjects and a share of pupils who have conditions for creative activities) and financial ones (specific amount of funds, allocated for the support of gifted children from the regional budget and a share of children who receive assistance under the programs of support of gifted children and talented youth at the regional level).

Two methods were used to process statistical data in order to increase the results reliability. First, it is a multidimensional comparative analysis, based on the Euclidean distances method, which determines not only the absolute values of the indicator, but the degree of their proximity to each other [2, p. 143]. The integral index of the quality of work with gifted students in the RF regions was calculated by the following algorithm.

Stage 1. Each indicator has a maximum element, taken as a unity. Then all the elements of the corresponding column (a_{ij}) are divided by the maximal element of the reference region ($\max a_y$). The result is a matrix of standardized coefficients (x_{ij}) from 0 to 1. Moreover, the critical value (a_{ij}), an average value of the indicator, is calculated for each indicator.

Stage 2. The composite rating for each block is calculated by the Euclidean distance formula:

$$I_i = \sqrt{\frac{\sum_{j=1}^{n} x_{ij}^2}{n}}.$$

Stage 3. The integral rating is calculated by the geometric mean formula:

$$I = \sqrt[3]{I_1 \cdot I_2 \cdot I_3},$$

where I_1 is a composite rating, revealing the level of the Olympic movement development;

I_2 is a composite rating of educational acti-vity effectiveness;

I_3 is a composite rating of the system of the gifted students support.

Due to the fact that some of the variables have a different scale of values and their meanings differ much from each other, z-transformation was used to standardize the indicators. It takes into account different dispersions of the indicators.

The integral index is calculated by the following algorithm:

Stage 1. The standardized indicators are calculated by the formula

$$x_{ij} = \frac{a_{ij} - \overline{a_i}}{\sigma_i},$$

where a_{ij} is a value of the indicator *"i"* in the region *"j"*;

$\overline{a_i}$ is an average value of the indicator *"i"*,

σ_i is a root-mean-square deviation of the indicator *"i"*, calculated by the formula.

Negative values of the index indicate its location below the average of the entire sample, and positive – the location above.

Stage 2. The composite index of each block is calculated as an arithmetic average of its constituent indicators. The integral rating of the quality of work with gifted students is calculated as an arithmetic average of each block indices.

The relative regions position in the ranking is almost the same for both methods of data processing. The Pearson correlation coefficient, close to 1 (r=0.974), indicates very close relationship of the calculated integral indicates. We will use the first calculated rating, taking values from 0 to 1, as this ranking is more convenient to calculate the dynamics of the indicators and to research the deviation from the maximum and critical values.

The calculations have estimated the quality of work with gifted students in the RF subjects and indicated the integral index dynamics for 2012–2013. The Volga (the average rating equals to 0.499) and Central (0.480) federal districts demonstrated best results in 2013. The North Caucasian (0.303) and the Far Eastern federal districts (0.358) have the lowest average ratings *(tab. 2)*. The regions ranking by the index of quality of work with gifted students has allowed to divide the regions into 5 groups:

1. *Regions with a high level of the quality of work with gifted students (the integral rating is more than 0.54) – 11 RF subjects*. It is territories that have high values by almost all indicators due to sound educational policy of regional authorities. Most these regions also have high level of education sphere development. The city of Moscow (0.698), the Chuvash Republic (0.636) and the Republic of Mordovia (0.622) have the highest rating of the quality of work with gifted students.

2. *The regions with an above average level (the rating is from 0.471 to 0.54) – 15 RF subjects*. They have favorable conditions for the gifted students development and good potential for further work in this direction.

3. *The regions with an average level (the rating is from 0.41 to 0.47) – 26 RF subjects*. They are characterized by high values of selected indicators. Further development of these regions requires management actions to maintain strong side and improve weak side.

4. *The regions with a below average level (the rating is from 0.35 to 0.409) – 20 RF subjects*. These territories have values below critical by most indicators due to rather passive approach of the regional education system to create conditions for talents development.

5. *The regions with a low level (the rating is less than 0.35) – 11 RF subjects*. This group indicates a very low interest of regional authorities to the work with gifted pupils. The urgent measures are required to improve the situation.

The Vologda Oblast belongs to the group of regions with the above average level of the quality of work with gifted students, ranking 22nd in the country and 5th in the Northwestern Federal District. The achieved indicators lag behind such leading regions of the Northwestern Federal District as Novgorod (18%), Kaliningrad (12%) Leningrad (7%) oblasts and the city of Saint Petersburg (11%).

The results of the Vologda Oblast by single indicators is non-uniform *(tab. 3)*.

The following parameters reveal the most progress:

– a share of children who receive assistance under the programs of support of gifted children and talented youth at the regional level (2nd place, 79% of the leader index);

– a share of pupils of 5–11 forms, taking part in a school stage of the All-Russian Olympiad (7th place, 93% of the leader index);

– a share of the final stage winners of the All-Russian Student Olympiad (9th place, 53% of the leader index).

It should be noted that the Vologda Oblast is one of the leaders by the effectiveness of participation in the final stages of the All-Russian Student Olympiad for the past 10 years [13] and by the scale of participation in the school stage. The study revealed a significant ($\alpha = 0.05$) positive statistical relationship between these two indicators (Pearson correlation coefficient $r = 0.237$). This indicates that the greater the number of students involved in the Olympiad activity, the higher the number of winners at the final stage, i.e. it proves the transition of quantitative indicators into qualitative ones.

Table 2. Integral index of quality of work with gifted students in the RF regions in 2013

Region	Rating	Region	Rating
Central Federal District	**0.480**	Republic of Tyva	0.258
Moscow	0.698	**Northwestern Federal District**	**0.449**
Belgorod Oblast	0.546	Novgorod Oblast	0.577
Tambov Oblast	0.543	Kaliningrad Oblast	0.540
Bryansk Oblast	0.521	Saint-Petersburg	0.536
Moscow Oblast	0.508	Leningrad Oblast	0.512
Voronezh Oblast	0.497	Vologda Oblast	0.475
Lipetsk Oblast	0.497	Murmansk Oblast	0.474
Vladimir Oblast	0.479	Komi Republic	0.392
Tula Oblast	0.474	Republic of Karelia	0.392
Ivanovo Oblast	0.468	Pskov Oblast	0.355
Orel Oblast	0.451	Nenets Autonomous Okrug	0.354
Kaluga Oblast	0.446	Arkhangelsk Oblast	0.336
Kostroma Oblast	0.439	**Ural Federal district**	**0.429**
Kursk Oblast	0.429	Khanty-Mansi Autonomous Okrug – Yugra	0.475
Smolensk Oblast	0.426	Tyumen Oblast	0.465
Tver Oblast	0.413	Yamalo-Nenets Autonomous Okrug	0.430
Yaroslavl Oblast	0.411	Sverdlovsk Oblast	0.423
Ryazan Oblast	0.389	Chelyabinsk Oblast	0.417
Volga Federal District	**0.499**	Kurgan Oblast	0.366
Chuvash Republic	0.636	**Southern Federal District**	**0.403**
Republic of Mordovia	0.622	Krasnodar Krai	0.461
Kirov Oblast	0.559	Rostov Oblast	0.428
Samara Oblast	0.552	Volgograd Oblast	0.422
Republic of Tatarstan	0.546	Republic of Kalmykia	0.392
Mari El Republic	0.541	Astrakhan Oblast	0.357
Penza Oblast	0.506	Republic of Adygea	0.355
Ulyanovsk Oblast	0.463	**North-Caucasian Federal District**	**0.303**
Nizhny Novgorod Oblast	0.456	Republic of North Ossetia-Alania	0.463
Republic of Bashkortostan	0.455	Stavropol Krai	0.459
Orenburg Oblast	0.447	Karachay-Cherkess Republic	0.373
Saratov Oblast	0.438	Kabardino-Balkar Republic	0.329
Udmurt Republic	0.382	Republic of Dagestan	0.239
Perm Oblast	0.379	Republic of Ingushetia	0.166
Siberian Federal District	**0.407**	Chechen Republic	0.095
Tomsk Oblast	0.484	**Far Eastern Federal District**	**0.358**
Kemerovo Oblast	0.476	Khabarovsk	0.427
Krasnoyarsk Oblast	0.473	Jewish Autonomous Oblast	0.395
Novosibirsk Oblast	0.465	Magadan Oblast	0.386
Republic of Khakassia	0.456	Republic of Sakha (Yakutia)	0.366
Altai Krai	0.431	Kamchatka Krai	0.362
Omsk Oblast	0.420	Amur Oblast	0.360
Zabaikalsky Krai	0.380	Chukotka Autonomous Okrug	0.332
Republic of Buryatia	0.366	Sakhalin Oblast	0.306
Republic of Altai	0.348	Primorsky Krai	0.284
Irkutsk Oblast	0.330		

Source: author's calculations.

Table 3. Comparison of the Vologda Oblast indicators in 2013 with the limit and maximum indicators for the Russian Federation

Indicators	Actual value (2013)	Position among RF regions	Limit level		Maximum level		
			Value	Deviation, in %	Value	Region	Deviation, in %
The share of winners of the final stage of All-Russian Student Olympiad, people per 100 thousand students	20.89	9	9.33	124	39.36	Moscow	-47
The share of winners and runners-up of the Olympiads held under the auspices of the Russian Council of Student Olympiads, people per 100 thousand students	147	22	111	41	750	Moscow	-80
The share of students of 5–11 grades, who took part in a school stage of the All-Russian Olympiad (in the total number of students of 5–11 grades), %	47.9	7	39.4	22	51.4	Nenets AO	-7
The share of graduates who obtained high school diplomas and were awarded gold and silver medals, %	6.02	59	7.64	-21	13.54	Republic of Mordovia	-56
The share of USE participants, who got 100 points for USE in particular subjects, people per 100 thousand students	63	38	63	0	234	Bryansk Oblast	-73
The share of high school graduates, who attended classes with advanced or specialized study of some subjects (in the total number of high school graduates), %	26	79	54	-52	99	Novgorod Oblast	-74
The share of students, who have opportunities to be engaged in creative activities %	34	56	40	- 15	83	Leningrad Oblast	-59
The share of funds allocated from the regional budget for the support of gifted children, rubles per person	5	64	106	-95	1034	Chukotka AO	-99.5
The students, who study in educational institutions, which receive support in the framework of programs for support of gifted children and talented youth at the regional level, %	45.35	2	2.96	1432	57.77	Republic of North Ossetia-Alania	-21
Source: author's calculations.							

The performance results of the Vologda Oblast were below the limit (national average) by some indicators:

– he share of graduates who obtained high school diplomas and were awarded gold and silver medals (by 21% lower than the threshold level);

– the share of high school graduates, who attended classes with advanced or specialized study of some subjects (by 52% lower than the threshold level);

– the share of students, who have opportunities to be engaged in creative activities (by 15% lower than the threshold level);

– the share of funds allocated from the regional budget for the support of gifted children (by 15% lower than the threshold level).

To analyze the dynamics of the integral index of quality of work with gifted students for 2012–2013 the cross grouping of regions by the level and rate of growth (decline) of the index was carried out, by the results of which the territories were combined into five groups *(tab. 4)*. The highest growth rates are observed in the Jewish Autonomous Oblast (139%), Kamchatka Krai (129%) and the Republic of North Ossetia-Alania (124%), and the lowest – in the Kirov Oblast (87%). Over the last two years 53 subjects of the Russian Federation improved their positions, 25 subjects experienced deterioration of their positions. It should be noted that the group of regions with extremely high growth rates of the index is significantly larger than the group with extremely low growth rates (18 territories against four). 11 RF subjects demonstrated high and extremely high values and growth rates of the indicators of the quality of work with gifted students; this fact opens up good opportunities for intellectualization of human capital in these territories.

The Vologda Oblast was included in the group of regions with low growth rates of the integral index (94%), which poses the risk of deterioration of the quality of work with gifted students. Partly this can be explained by rather high rates and indicators of development achieved in 2010–2012 in the whole sphere of general education and also in the sphere of support of talented students (during this time, the integral index has increased in 3 times). In 2013 the pace of development somewhat slowed down.

It should be noted that the dynamics of the region's indicators is highly heterogeneous. Positive dynamics is observed in the following indicators: productivity of performance at the final stage of the All-Russian Olympiad (106%); the share of medalists (105%); the share of students who study in specialized classes (130%); the share of students, who have opportunities to be engaged in creative activities (114%). However, the abandonment of the programs for support of gifted students, did not allowed the Vologda Oblast to surpass in 2013 the indicator of 2012. In 2013 the index of the number of students, who received support in the framework of regional programs for support of talented children, amounted to 79% of the 2012 level, and the index of the volume of financial resources allocated for their support was 6%, respectively. In September 2012 by Order of the Vologda Oblast Governor under the Department of Education a working group was created for the purpose of developing a model of the system for identification and development of gifted children in the region, the author of the article is the member of this group. The draft model developed by the group for 2013–2017 pays special attention to the following areas:

– organization and expansion of intellectual contest events for children;

Table 4. Matrix for comparing the RF regions by the rate and level of the quality of work with gifted students

Level	Rate				
	Extremely high (over 108%)	High (from 104 to 108%)	Moderate (from 98 to 103%)	Low (from 92 to 97%)	Extremely low (less than 94%)
High (over 0.54)	Republic of Mordovia (112)	Republic of Tatarstan (105) Novgorod Oblast (105) Belgorod Oblast (104)	Kaliningrad Oblast (103) Mari El Republic (100) Samara Oblast (99) Moscow (99) Tambov Oblast (98)	Chuvash Republic (97)	Kirov Oblast (87)
Above average (from 0.471 to 0.54)	Tula Oblast (119) Kemerovo Oblast (118)	Moscow Oblast (107) Tomsk Oblast (105) Murmansk Oblast (105) Penza Oblast (105) Bryansk Oblast (104)	Saint Petersburg (103) Krasnoyarsk Krai (103) Vladimir Oblast (102) Leningrad Oblast (102) Khanty-Mansi AO (100) Voronezh Oblast (100)	Lipetsk Oblast (97) Vologda Oblast (94)	
Average (from 0.41 to 0.47)	Republic of North Ossetia-Alania (124) Kostroma Oblast (110) Tyumen Oblast (110) Ivanovo Oblast (112) Yamalo-Nenets AO (109)	Khabarovsk Krai (108) Krasnodar Krai (108) Omsk Oblast (107) Tver Oblast (106) Saratov Oblast (105) Novosibirsk Oblast (105) Sverdlovsk Oblast (105)	Orlov Oblast (103) Republic of Kalmykia (103) Volglgrad Oblast (103) Republic of Bashkortostan (102) Smolensk Oblast (101) Nizhny Novgorod Oblast (101) Kursk Oblast (101) Chelyabinsk Oblast (100) Yaroslavl Oblast (99) Kaluga Oblast (99) Ulyanovsk Oblast (99) Altai Krai (98)	Republic of Khakassia (96) Stavropol Krai (92)	
Below average (from 0.35 to 0.409)	Jewish Autonomous Oblast (138) Kamchatka Krai (129) Karachay–Cherkess Republic (114) Komi Republic (114) Magadan Oblast (113) Astrakhan Oblast (113)	Zabaykalsky Krai (108) Republic of Buryatia (105)	Rostov Oblast (103) Orenburg Oblast (103) Udmurt Republic (103) Perm Krai (99) Republic of Adygea (98) Republic of Karelia (98) Kurgan Oblast (98)	Ryazan Oblast (96) Republic of Sakha (96) Pskov Oblast (94)	Amur Oblast (89) Nenets AO (88)
Low (less than 0.35)	Tyva Republic (120) Republic of Dagestan (116) Chukotka AO (112) Sakhalin Oblast (110)	Primorsky Krai (105) Republic Алтай (105)	Irkutsk Oblast (100) Kabardino-Balkar Republic (100)	Republic of Ingushetia (95) Arkhangelsk Oblast (93)	Chechen Republic (90)

Source: author's calculations.

– motivational support of the work with gifted children;

– expansion of the network of educational institutions specializing in the work with intellectually gifted children;

– development and improvement of the scientific-methodological base, introduction of modern educational technologies in the work with intellectually gifted students.

Implementation of a systematic approach to finding talented students and working with them should allow the Vologda Oblast to strengthen its leading positions in traditionally strong sectors and to overcome negative trends in individual indicators. The use of the results of monitoring research in the organization of work with gifted students helps to assess trends in the development of this direction and make timely corrections for improving the quality of work with gifted students.

Further research on this topic is planned to be focused on the following points:

• adjustment of calculation methods (adjustment of a system of indicators with regard to relevant directions of educational policy, determination of weight coefficients of individual indicators);

• assessment of the dynamics of indicators for a longer time period, and forecast of the development of regional educational systems.

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