Analysis of the impact of the introduced restrictions caused by the new COVID-19 infection in the field of education on the results of the unified state exam in various constituent entities of the Russian Federation

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Abstract. Since the end of 2019, all countries of the world have faced a rapidly increasing level of disease caused by the new coronavirus infection COVID-19, which in turn has led to the introduction of a number of restrictions in various areas of life. Educational institutions in many countries were forced to transfer students to a remote mode of work, for which both sides were not ready. The difficulty of a quick transition to a distance learning mode was primarily associated with a number of technical limitations, since not every educational institution had the proper material and technical support, just like not every student had the opportunity to use electronic resources. The resulting situation temporarily made it impossible to carry out the educational process. As technical and other problems were solved, educational organizations sought to bridge the gap in the quality of distance and face-to-face training. This article provides statistical data on the results of the unified state exam in mathematics in various regions of Russia and analyzes the results of the exam.

Distance learning is a rather multifaceted aspect that cannot be unequivocally classified as a positive or negative phenomenon. Like any complex measure, it has both positive and negative aspects.

The clear advantages of distance learning include:

- The ability to conduct training regardless of the epidemiological situation in any subject of the Russian Federation or another country in the world [1]. Distance learning allows you to organize various forms of classes, including project activities, which contribute to the development of leadership qualities and skills within team communication with elements of the competition model [2].
- Distance learning is inextricably linked with the use of digital platforms, which allow high-quality storage, systematization and accumulation of educational material. To refer to this or that information or materials, a student only needs to have access to the Internet [3].
- Another equally significant advantage in the implementation of the distance educational process is the ability to organize monitoring of students' progress by the administration of educational institutions. Since electronic educational platforms often have a fairly wide functionality, it is also possible to check assignments in them, which allows you to track

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the teacher's statistics in real time throughout the course. The same category of advantages includes the fact that the teacher can track the student's activities outside the classroom, that is, watch when and for how long the student turned to various sections of the course [4].

- In terms of the implementation of international educational programs of higher education, it is required to attract experienced specialists from the industry, to create an infrastructure for the exchange of knowledge. The system should promote the development of journalistic activity of students and teachers. Remote mode leads to the development of this kind of activities. Thus, it becomes possible to attract world-class faculty to work, to create international conferences. It is noteworthy that participation in these events does not require distraction from daily routine affairs with a colossal expenditure of money and time resources.

However, along with the large number of positive aspects of introducing distance learning, there are a number of disadvantages. The obvious disadvantages include the following:

- High complexity in the transformation of educational and other activities caused by a significant load on the material and technical base of the educational institution. Moreover, the increased share of digital technologies in the activities of educational organizations demanded other new competencies from persons involved in the educational process [5]. Taking into account the education sector, as rather conservative, and due to the average age of the teaching and administrative staff, we can say that not all educational institutions have coped with the sharp digital transformation [6].
- Another, no less important disadvantage of the distance educational process is the complexity, and sometimes the impossibility of organizing distance events for people in different time zones. There are frequent cases in various international and network educational projects when classes for students were held with a difference of 5 hours or more. Obviously, this factor quite strongly affects both the degree of assimilation of the material and the degree of student involvement.
- Another difficulty of the distance form of work of an educational organization is the lack of regulatory and legal documentation for holding graduation qualification events for students in the framework of the State Final Attestation. The mechanism for identifying the student's personality and the legitimacy of this procedure is not fully understood. In this regard, most of such events in the Russian Federation were held in person, in compliance with all sanitary and epidemiological standards.
- Significantly increased complexity of the student's control during classes. Distance learning is not so critical for individuals with a fairly high degree of self-organization. While for students with low academic responsibility, the introduction of distance learning can be a relaxing factor [7, 8].

Thus, distance learning forms have both a number of positive and negative sides [1]. For a more objective assessment of the distance educational process, a number of studies are required with the distribution of weights by various factors. Another method of assessment is the statistical method, on the basis of which it is possible to form a method for forecasting and correcting the further development of educational activities.

Distance education has undoubtedly influenced the quality of mastering the educational program of students regardless of their level of education (schoolchildren, students) [9]. For the purpose of the analysis, the results of the Unified State Exam in Mathematics in various regions of the Russian Federation were taken:

- the city of federal significance—Saint-Petersburg (population 5.38 million) [10];
- the region of Kabardino-Balkaria (population 0.87 million) [10].

The above two constituent entities of the Russian Federation have different population sizes, and the average per capita expenditures of the region for the organization and provision of various institutions of the educational industry also differ. An important difference is the average income of a resident and the share of GDP that is formed by this subject [10].

The average per capita income in Saint-Petersburg is 2.4 times higher than the same in Kabardino-Balkaria, and the gross regional product per capita in Saint-Petersburg is 4.62 times higher than the same indicator in Kabardino-Balkaria. At the same time, the regional costs for the use and implementation of digital technologies differ 400 times in favor of Saint-Petersburg [10].

Kabardino-Balkaria

As can be seen from the table (table 1), in the subject under consideration, over 90% of students pass mathematics. In 2020, there is a significant decline in exam passing, which is primarily caused by the demographic crisis of the early 2000s in the region.

Table 1. The number of participants in the mathematics examination in Kabardino-Balkaria (for the last 3 years) [11]

Subject	2019		2020		2021	
	number of people	% from the total number of people	number of people	% from the total number of people	number of people	% from the total number of people
mathematics	8072	99.9	4363	93.3	7792	97.2

A difficult situation with coronavirus infection in the Russian Federation arose in the spring of 2020, it is this period of the year that is traditionally associated with the active phase of preparing students for the upcoming exams. Results distribution is shown in table (table 2).

Table 2. Dynamics of the results of the examination for the last 3 years in Kabardino-Balkaria in subject mathematics [11]

Criterias	Kabardino-balkaria		
	2019	2020	2021
Got low results	79	729	205
Average % of completion	58.5	42.6	50.2
Got high results	40	10	25
Got 100%	1	0	0

Undoubtedly, a significant increase in low scores for the exam (almost 10 times) is associated with insufficient digitalization of the region and the rather low speed of the subject's response to digital transformation. In view of the above, some of the students temporarily lost the opportunity to prepare for exams. The relatively low level of well-being of citizens living in this region aggravated the current situation. Due to the lack of modern telecommunication facilities for some students and the inability to use commercial educational services during the active phase of preparation for exams, the level of preparation for exams has significantly decreased.

Table 3. The main results of the examination in subjects in Kabardino-balkaria (mathematics) [11]

Result	0–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100
Number of participants	83	87	473	1371	1889	1850	1224	615	190	10

A detailed distribution of student results is presented in the table (table 3).

The total number of those taking the exam in 2021. amounted to 7792 people. The results of table (table 3) can be shown in more detail in the diagram (figure 1).

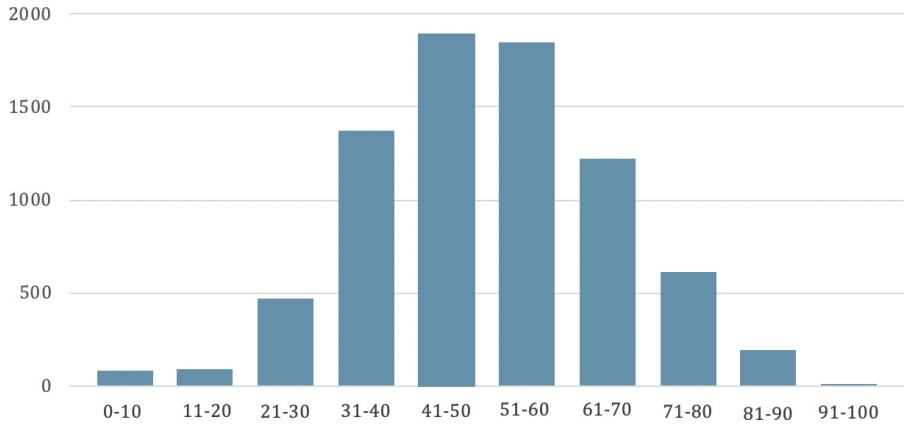

Figure 1. Distribution of the test scores of final state exam participants in the subject in 2021 in Kabardino-Balkaria

It can be seen from the above table (table 3) that the median value of the average exam result is concentrated in the range from 31 to 70 points, which is a relatively low result.

Saint-Petersburg

Table 4 shows that the percentage of exam participants over the past three years is concentrated in the 50% range. of the total number of exam participants. This turnout of graduates is primarily associated with the presence in the region of specialties in higher educational institutions that do not require the subject of “Mathematics” for admission.

Table 4. Number of participants of the Unified State Exam in the academic subject in Saint-Peterburg (for the last 3 years) [12]

2019		2020		2021	
number of people	% from the total number of people	number of people	% from the total number of people	number of people	% from the total number of people
16404	52.19%	16700	49.97%	18265	50.21%

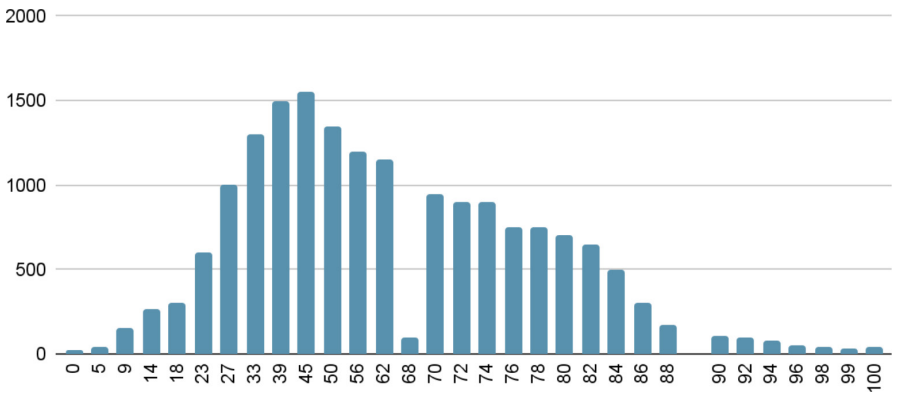

Figure 2. Distribution of the test scores of final state exam participants in the subject in 2021 in Saint-Petersburg

The diagram (figure 2) below shows that the median mean is concentrated in the range from 33 points to 56 [12].

The table below shows that the percentage of participants who did not score the minimum score in 2020 increased significantly compared to 2019, where no coronavirus restrictions were introduced.

The increase in the number of applicants who did not pass the minimum threshold is due to the same reasons as in another considered subject of the Russian Federation.

However, in view of the rather high level of digitalization in this region, the higher standard of living of the population, this increase is not so critical, in comparison with other considered subject.

In both regions under consideration, the results of 2021. They have improved for the better, this is due to the adaptation of the regional authorities to the changed conditions of the organization of the educational process. However, the results of 2021.

Still below the 2019 results (table 5). It is impossible not to mention the fact that in both regions colossal work was carried out to adapt educational institutions to distance learning.

Table 5. Dynamics of the final state exam results for the last 3 years in Saint Petersburg [12]

Criterias	Saint-Petersburg		
	2019	2020	2021
Did not get minimum results	4.70%	7.60%	7.71%
Average test result	58.89	56.16	56.24
Got from 81 to 99 points	10.80%	8.58%	10.54%
Got 100 points, people	86	23	25

Exam participant 2021 We spent a long time on distance learning in both the 10th and 11th grades, but thanks to the measures taken by the self-government bodies, we managed to stabilize this situation and neutralize the negative impact of distance learning.

Conclusion

From the data presented above, it can be seen that the new coronavirus infection significantly influenced the results of the Unified State Exam in Mathematics. A similar situation is ob-

served not only in the subject "Mathematics", but also in all other subjects from the list of available for delivery. The Unified State Exam is an objective measure of comparing the quality of the educational process and the results of its development in different regions of the country, in view of the fact that these materials are developed by leading educational and methodological specialists at the Federal and regional levels. From the materials presented above, it can be seen that the mobility and flexibility of local government authorities, as well as the level of financial and personnel well-being of the region as a whole, have a significant impact on the result of passing the exam, as well as the digitalization of the population in the given subject.

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