




ЦИФРОВАЯ ОБРАЗОВАТЕЛЬНАЯ СРЕДА DIGITAL EDUCATIONAL ENVIRONMENT

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Information-motivational environment: quality improvement and self-organization development in the conditions of education informatization

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Abstract. *Problem and goal.* The information technologies influence features and the educational environment on the school education quality are considered. The results of studies of the Unified State Exam, State Russian Exam, Russian Verification Work, international studies (PISA) in national regions (on the example of the Republic of Buryatia) in the conditions of education informatization were studied. The information infrastructure was explored, which includes information resources, information systems of various classes, as a motivation system and students' self-organization, especially during distance learning. *Methodology.* The data of these studies were grouped and combined, and then analyzed for problems of the general education quality in the conditions of the information environment using. The data sample was made for 2011–2020, according to such criteria as popular subjects, the general trend in the general education of students, the rating of countries in reading, mathematical and natural science literacy. *Results.* The information-motivational environment is singled out and its levels (macro, meso, micro) are determined. The technical interaction principle of the subject with the hierarchy of levels in the information-motivational environment is revealed. *Conclusion.* The information and motivation interaction contributes to the improvement of self-organization and the quality of education. The development of the information and motivational environment and its management can become a necessary technology for the development of a digital-centric person, a criterion for the quality of educational results, a set of measures aimed at creating conditions for obtaining high-quality general education in state and municipal educational organizations in the national regions of the Russian Federation.

Keywords: information technologies, information environment, motivational environment, information technologies, communication technologies, education informatization

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Информационно-мотивационная среда: повышение качества и развитие самоорганизации в условиях информатизации образования

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Аннотация. *Проблема и цель.* Рассматриваются особенности влияния информационных технологий и образовательной среды на качество школьного образования. Изучались результаты исследований ЕГЭ, ОГЭ, ВПР, международных исследований (PISA) в национальных регионах (на примере Республики Бурятия) в условиях информатизации образования. Исследовалась информационная инфраструктура, включающая в себя информационные ресурсы, информационные системы различных классов, как система мотивации и самоорганизации школьников, особенно в период дистанционного обучения. *Методология.* Данные указанных исследований были сгруппированы и объединены, а затем проанализированы на предмет проблем качества общего образования в условиях применения информационной среды. Выборка данных производилась за 2011–2020 гг. по таким критериям, как востребованные предметы, общая тенденция в общеобразовательной подготовке школьников, рейтинг стран по читательской, математической и естественнонаучной грамотности. *Результаты.* Выделена информационно-мотивационная среда и определены ее уровни (макро-, мезо-, микро-). Установлен принцип технического взаимодействия субъекта с иерархией уровней в условиях информационно-мотивационной среды. *Заключение.* Взаимодействие информации и мотивации способствует повышению самоорганизации и качества образования. Развитие информационно-мотивационной среды и управление ею может стать необходимой технологией развития цифротцентричного человека, критерием качества образовательных результатов, комплекса мер, направленных на создание условий для получения качественного общего образования в государственных и муниципальных общеобразовательных организациях в национальных регионах РФ.

Ключевые слова: информационные технологии, информационно-мотивационная среда, информационно-коммуникационные технологии, информатизация образования

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Problem and goal. The education system is one of the main objects of the information technologies introduction in order to improve the education quality. The informational environment development leads to new educational trajectories construction. At the same time, the intense and heterogeneous information flow is not filtered by schoolchildren. The need to fill the information environment has become more acute as a result of distance learning and informatization development [1].

In the conditions of using the information environment, there was a change in the way of thinking of the whole generation from creative to unified thinking. However, the stronger the cognitive motivation of students, the more complex tasks they are able to solve.¹

The information technologies introduction into the educational process can have a significant impact on an individual motivational resources. Information and communication technology inclusion (ICT) tools allows students to feel “in the flow” of high technologies, thus fueling their interest in learning [2]. At the same time, according to O.Yu. Zaslavskaya, the informatization of education becomes “a priority direction for the development of all educational organizations” [3].

According to V.I. Dobrenkov [4], the education quality and graduates’ general education degree, starting from secondary school, have noticeably decreased. A.E. Bakhmutsky says that the education quality has become a priority for the nova days school.²

Dozens of countries that actively use ICT in their educational process form the top of the countries ranking in terms of ICT development. The index based on eleven indicators, summarized in a single criterion that reflects development and information technologies application level [5].

Another index that makes it possible to draw parallels between the level of ICT development and education quality level is the education level index. This index is a ranking of countries based on two criteria: the adult literacy rate and primary secondary and tertiary education completing students ratio. Countries that top the first index (ICT) are also in the top ten of the second index (quality of education). Russia ranks 45th and 39th respectively. According to international studies, 75–80% of students successfully complete primary school, and 25–30% successfully complete high school.³ This indicates the information environment imperfection that affects general education quality, firstly, indicators of meta-subject results. Secondly, about students’ inability to build step-by-step work in the information environment, their lack of motivation to acquire the skills of organizing, creating, discussing, analyzing the solution of tasks in the conditions of informatization. It also indicates the need to create a technology to improve the quality level of meta-subject results, the formation of an organized infor-

¹ Smirnov SD. *Pedagogy and psychology of higher education: from activity to personality: manual for students of higher educational institutions*. Moscow: Akademiia Publ.; 2007. (In Russ.)

² Bakhmutsky AE, Kondrakova IE, Pisareva SA. *Assessment of the activities of a modern school: textbook*. Moscow: APK i PPRO Publ.; 2009. (In Russ.)

³ Bolotov VA, Efremova NF. *Systems for assessing the quality of education: textbook for students of higher educational institutions receiving education in pedagogical areas and specialties*. Moscow: Logos Publ.; 2007. (In Russ.)

mation environment that can actively influence the process of self-organization of the individual through motivation, informatization, and also encourages students to develop self-development skills.

Methodology. Consider the results of a comparative analysis of the average Unified State Exam (USE) score for the period from 2009 to 2020 (on the example of the Republic of Buryatia), results in reading, mathematical and natural science literacy in the period from 2000–2018. The decision about possibility of conducting the USE experiment was approved by the Decree of the Republic of Buryatia in June 14, 2002 No. 170⁴. According to the Ministry of Education and Science of the Russian Federation order No. 74 dated September 23, 2004 “On the Participation of the Constituent Entities of the Russian Federation in the Experiment on the Introduction of a Unified State Exam in 2005,” a list of municipalities of the Republic of Buryatia was approved to participate in the experiment⁵. In 2010, the Unified State Exam was already held in 12 general education subjects: mathematics, Russian language, history, biology, literature, chemistry, physics, computer science and information and communication technologies (ICT), geography, social studies, English, German. In 2011, the list was replenished with one more discipline – French. In the main period, 6,733 people passed two mandatory exams and got results; three exams – 2472 people, four exams – 2251 people, five exams – 74 people, six exams – 63 people, seven exams – 1 person, 8 exams – 1 person. To talk about disciplines that are relevant for graduates in 2011, then the largest number chose social science – 3236 people, which accounted for 45.4% of the total number of those who passed.

In 2011, in the municipalities of the Republic of Belarus, there was an improvement in the mathematics result by 7.05% compared to 2010, in history – by 5.1%, in chemistry – by 4.66%, in literature – by 0.94%, in social studies – by 0.17%, in German – by 19.7%. Opposite results – in physics and computer science. From 2009 to 2012 the following subjects were in demand among school-children: social science, history, biology, physics; less in demand – geography, literature, computer science. A similar trend was observed in Russia as a whole.

In September 2016, the right to retake two compulsory subjects (basic mathematics, Russian language) was granted, where 128 students took part [6]. In 2017, the average test score was 47.02, in 2018 – 44.7 [7]. In 2018, the negative trend continues in the general education of graduates in mathematics (profile level). The results of the Russian Verification Work in the Republic of Buryatia in Russian language and mathematics the 5th grade students showed 31.9 and 36.9% of knowledge quality, the 6th grade students – 27.9 and 32% [8].

In 2018, more than 8,000 Russian students took part at PISA international studies in four main areas: reading literacy, mathematical literacy, science litera-

⁴ Decree of the Government of the Republic of Buryatia dated June 14, 2002 No. 170 “On Measures to Improve the Quality of Education of School Graduates and the Organization of Admission to Vocational Education Institutions”. (In Russ.) Available from: <https://base.garant.ru/29502716> (accessed: 27.03.2022).

⁵ Order of the Ministry of Education and Science of the Russian Federation of September 23, 2004 “On the Participation of the Constituent Entities of the Russian Federation in the Experiment on the Introduction of a Unified State Exam in 2005”. (In Russ.) Available from: <https://base.garant.ru/6151520> (accessed: 30.03.2022).

cy, and computer literacy [9]. The sample included 15-year-old students of basic and secondary schools, as well as students and students of educational institutions of secondary vocational education. So, consider the results of countries in reading, math and science literacy in the period from 2000–2018 (Figures 1–4).

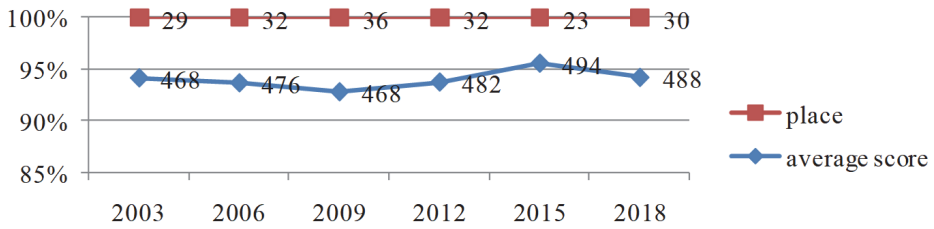


Figure 1. PISA, mathematical literacy, 2003–2018, Russia

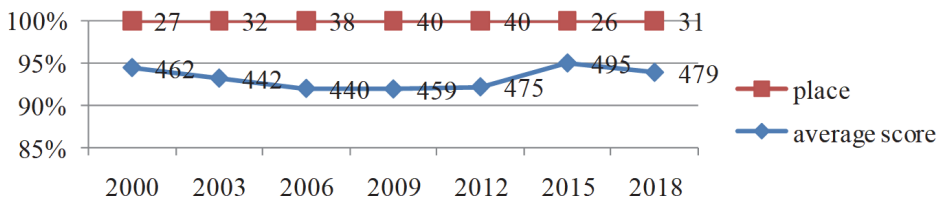


Figure 2. PISA, readers literacy, 2003–2018, Russia

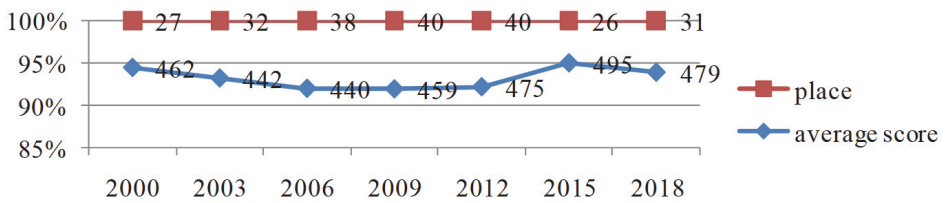


Figure 3. PISA, natural science literacy, 2003–2018, Russia

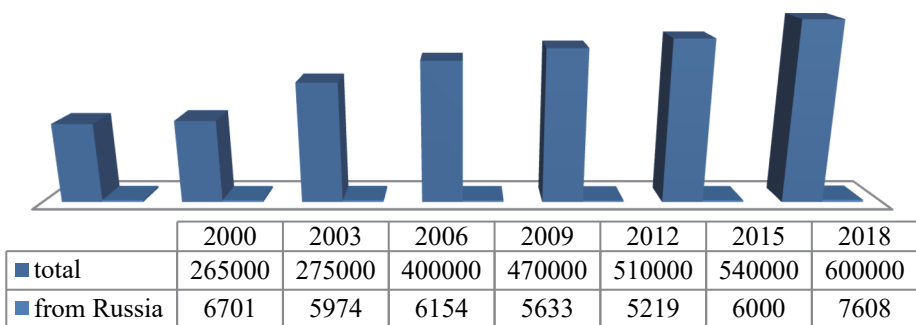


Figure 4. PISA, participants quantity changing dynamic, 2000–2018

To evaluate the Russian Federation in the ranking of other countries, consider in the quantitative ratio of participants (students of 15 years old) and countries, with an additional sample for the Russian Federation (Figure 4).

In the monitoring of 2018, Russian students took 31st place in terms of reading literacy, which corresponds to the conditional rating indicator of 48, where students from Russia gave way to students from Latvia (30th place), Croatia (29th place), Switzerland (28th place) out of 79 participating countries; in mathematical literacy – 30th place, behind Australia (29th place), Portugal (28th place), New Zealand (27th place); in science literacy – 33rd place, behind Hungary (32nd place), Lithuania (31st place), Spain (30th place).

The results confirm the need for continuous improvement of the requirements for methods of control, assessment of education quality, self-organization technology application and students motivation, influencing the education quality improvement.

Results and discussion. Based on these data, it is possible to establish a link between the use of ICT and education quality. This fact is reflected in the draft document “Key Directions for the Development of Russian Education to Achieve the Goals and Objectives of Sustainable Development in the Education System” until 2035. In accordance with this document, a list of drivers is formulated – factors that influence the education system development: external, derivative, systemic, prospective and internal. Key concepts for us, such as digitalization and motivation, refer to external and system drivers, respectively.

The information role is of great importance, therefore, some scientists equate the concept of “educational environment” and “information educational environment.” As Yu.S. Manuilov notes, the environment is now understood as the psychophysical or information-communicative conditions of school life.⁶ According to V.A. Yasvin's environment is “a system of influences and conditions for the formation of a personality according to a given pattern, as well as opportunities for its development contained in the social and spatial-subject environment” [10]. The studies of G.A. Kovaleva and Yu.G. Abramova focus more at school space atmosphere, L.A. Bodenko – on pedagogical conditions. Educational environment at V.A. Slastenin and G.I. Chizhakova “represents a set of existing external conditions, influences, opportunities that contribute to the education of the individual.”⁷ At the same time, A. Asmolov focuses on three characteristics that a school needs: motivation, opportunities, and individualization. In his opinion, if the information and educational environment is not filled with motivation, then there will be a simple enrichment of the student with information. In case when the information educational environment becomes motivational, it contributes to successful participants interaction in educational process, and hence the education quality improvement. At the same time, we considered it to be possible combining the concepts of “information environment” and “motivational environment,” since in this case

⁶ Manuilov YuS, Sheik GG. *Experience of mastering the medium approach in education: teaching manual*. Moscow, Nizhny Novgorod; 2008. (In Russ.)

⁷ Slastenin VA, Chizhakova GI. *Introduction to pedagogical axiology: textbook for students of educational institutions*. Moscow: Akademiia Publ.; 2003. (In Russ.)

the main goal of the educational organization is achieved – improving the quality of education [11].

Thus, the information-motivational environment (or IMS) should be understood as a specially organized information environment, which, based on its pedagogical capabilities and technologies, as well as with the active interaction of the subjects of the educational process (students, parents, teacher), actively influences the process of self-organization of the individual through motivation and informatization, encourages students self-organization and has a positive effect upon general education quality. The information motivational environment structure can be considered from the informatization point of view, and from the motivation point of view. From these positions, the information motivational environment has the following characteristics: the learning individuality; psychological comfort; openness: external and internal (the ability to influence from outside and inside the environment).

Environment (information-educational) from the point of view of the subjects of the environment, represents a hierarchy of three levels: macro level or macro environment (information educational environment in general), meso level or meso environment (information educational environment of a study group or class), micro level or micro environment (personal environment of the student). Since the information-motivational environment affects the relationship between the subjects of the educational process, which affects the quality of general education, the IMS is also represented by the above levels, but with the filling of these levels with a motivational component that positively affects self-organization (Figure 5).

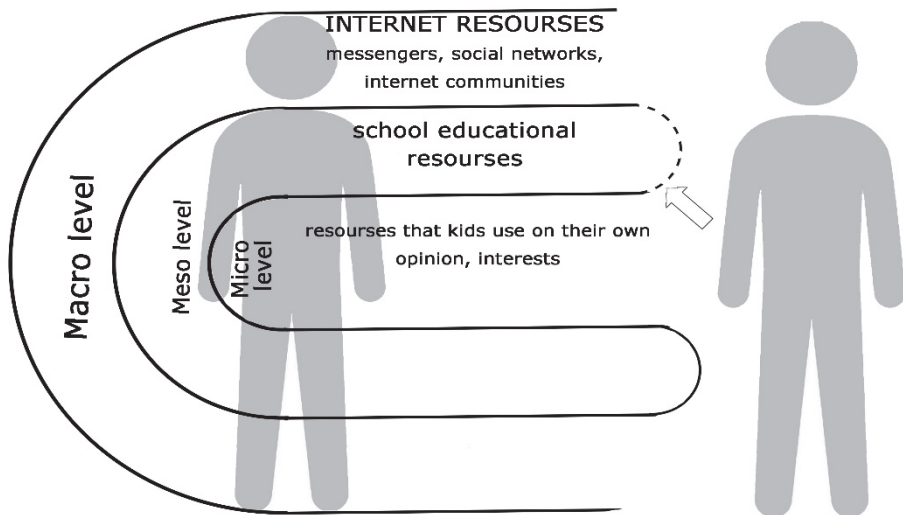


Figure 5. Subject technical interaction with levels hierarchy in terms of information-motivational environment

The scheme clearly demonstrates the current isolation of the meso level from the macro and micro levels. The meso level, being a part of the entire system

of information resources, is nevertheless in isolation and turns into an environment that the child turns to only when necessary. The subject (student) spends most of his time outside the educational process at the micro and macro levels, opposing them to the meso level. In the absence of self-organization and motivation technology at the meso level, the subject (student) avoids this level as much as possible, and receives a great amount of information at other levels without filtering. If there is a technology that can eliminate the isolation of the meso level and fill it with a motivational component, the subject (student) will no longer oppose and avoid the meso level.

Let's consider several examples of the information motivational environment application in the educational process. For example, providing an individual approach in terms of IMS, which implies the possibility of completely switching attention from one student to another, interacting with him individually, in which a child can open up emotionally. Thus, this technology involves the use of an individual approach and emotional dynamics fixation. At the same time, the information motivational environment is a space that allows diagnosing the emotional background on a regular basis. In dynamics, combining that with educational results, allows us to make conclusions about the answers reliability and their impact on the educational process. This electronic form of the survey is a simple scale of emotional states expressed in graphical form. At the same time, the student chooses the state that best corresponds to his emotional state at the time of making the decision. An assessment of the emotional state occurs before the start of lessons by sending an “emoji” to the teacher via instant messengers, which makes it possible to assess the dynamics of emotional states and track the reasons for their changes.

The next example is the educational process subjects interaction in the context of the use of IMS. This is such a format of interaction with the student and parents, which allows the student to feel their importance and significance in the educational process. At the same time interaction contributes to blurring the boundaries between the levels of the information motivational environment described above. This technology involves teachers participation in all three levels of their student's activity. Thanks to this, parents can receive timely and reliable information about the educational process and actively interact with the teacher. This format of interaction contributes to the creation of a comfortable psychological and educational atmosphere at home so that the child achieves the best educational result. As a part of doing homework teacher introduces (with the consent of the parents) interactive tasks in order to improve memory, concentration, logic, associative thinking in student's environment (micro level). Doing tasks in the form of games designed to develop certain cognitive abilities before starting homework, getting progress statistics for each of the categories (logic, arithmetic calculations, spatial thinking, memory, etc.) helps students to get more involved into educational process. At the same time, a rating system is formed (at the micro level), taking into account the personal characteristics of students in the class. This gives them opportunity to assess their weaknesses and correct them as needed.

Conclusion. The information motivational environment is aimed at maintaining the above functions when children are not in an educational organization. Thus, the information and motivational environment has a new function – motiva-

tional, aimed at self-organization. The information and motivational environment is focused on improving general education quality, the emergence of motivation for change readiness, the ability to switch from one skill to another, opportunities, individualization and meta-subject knowledge and understanding, as well as expanding capabilities of individuality and developing students self-organization in the conditions of education informatization.

The information motivational environment at the same time makes it possible to capture the emotional background and internal state, as well as vary the forms of interaction with students, choosing group or individual, as necessary. This helps the teacher to become a full-fledged participant in the IMS, managing processes occurring at different levels, switching the child and parents to a certain level and integrating into the educational process those events, phenomena and resources that surround the children in everyday life, thereby having a positive impact on the education quality. The educational process subjects interaction in the context of technologies using within the framework of the IMS leads to the establishment of contact between the student, teacher and parents.

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