

Creativity for Everyone: Integrating Encouragement of 21st Century Skills in Russian Schools

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Abstract. This study is part of the OECD Center for Educational Research and Innovation's project Teaching, Assessing and Learning Creative and Critical Thinking Skills in Education and uses action research methods. It seeks to elaborate a teaching format to develop 21st century skills within the framework of a particular school subject, making participation in such classes available for as many teachers and students as possible. The study puts forward an approach to designing contextual problems that students are offered to solve collaboratively in the classroom. Key components of such assignments are described, which allow for fostering creativity within specific school subject domains. The results from testing the validity of such assignments are presented. Accessibility of subject-specific teaching practices enhancing 21st century skills is assessed by analyzing the outcomes of focus groups consisting of teachers and students who participated in the assignment validity assessment.

Keywords: creativity, 21st century skills, collaborative problem solving, contextual problems, assignment design, schooling practices.

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Discussions on 21st century skills development within educational processes started before the beginning of the XXI century and are still ongoing. They are supported by international organizations which have an influence on educational policy in different countries such as the World Bank, the Organization for Economic Cooperation and Development etc. There are discussions taking place at numerous international conferences, summits, and strategic sessions with business representatives etc.: what these skills are; how they should be developed. These debates have finally begun to focus on the school education regarding the issue of 21st century skills implementation into general education schools and the importance of student's access to the pedagogical approaches developing these skills. Encouragement of 21st century skills development and its further implementation are a challenging task in Russia. Some stand-alone innovative pedagogical practices of the 1980–1990s did not become a panacea for domestic education [Safronov, Sidorova, 2016]. The implementation of the Federal State Educational Standard in General Education in 2009–2012 was an important step towards changing school reality, however, it can hardly be expected that the learning process, which has taken such a long time to develop, will change at once. The suggested innovations, regarding not only the educational process itself but also technical and organizational issues, are often met with some resistance in general education schools: from non-traditional placement of desks during the lesson to identifying subject domains instead of particular school-subjects; from using technology as a learning tool to the lesson conducted outside the school building. We do not deny the existence of a significant number of innovative teaching practices, which in some cases can even be extended to the level of a specific region [Akhmadgaliyeva, 2014], but the difficulties connected with the implementation of teaching practices developing metasubjective skills are hard to ignore. The study presented in this paper attempts to solve this ongoing problem.

Methodology

The study was conducted by the team from the Institute for Strategy of Education Development of the Russian Academy of Education (ISRO RAO) and HSE with the support of the Sberbank's *Contribution to the Future* Charity Foundation in 2016–2017 in the framework of the international study *Teaching, assessing and learning creative and critical thinking skills in education* conducted by the Center for Educational Research and Innovation of the Organization for Economic Cooperation and Development (OECD). The methodology of so-called *action research* was used—an investigation of school and its everyday life that has both scientific and practical goals. The study included collaborative planning, observation and analysis of experimental actions made by the developers and teachers of the schools that participated in the study. Constant feedback enabled flexible and timely correction of assignment design and its adaptation to the capabilities of the students.

The action research method is based on the works of K. Levin, describing the results of the research which had taken place at industrial enterprises in the United States [Zhukov, 2015]. The application of this method in relation to education is usually associated with the work of P. Freire in Brazil, where with the help of the action research method not only original teaching methods, but also liberation of education were developed, for example, anti-racism. There are several types of action research distinguished in modern social science: knowledge generating, practical and emancipatory [Newton, Burgess, 2008]. By its nature, action research in education often serves as a platform for strengthening the dominant discourse in educational policy. The study also aimed at improving teaching practices, contributing to teachers' introduction to new teaching standards.

The action research method should be distinguished from the problem solving method. The methodology is based not only on the involvement of all research participants in the problem solving process. It is believed that the validity of the action research appears when the entire research process is thoroughly observed; theoretical input is presented to the participants; data is collected; and reflection is conducted.

Action research at the school level suggests the following initial steps [Kenneth S. Volk, 2009]:

1. Identifying the problem that needs to be solved.
2. Outlining specific issues and figure out the steps towards their solution.
3. Determining the method of collecting feedback to define the impact of efforts made.

The next steps are the following: the interventional effect itself according to a predetermined plan, observation, and discussions of the process with participants; data collecting in a predetermined way; analysis and reflection. Next, there is an assessment of the cycle and, in many cases, a new cycle with a revised goal is planned, taking into account the revision made during the reflection.

This methodology is suitable both for solving local applied tasks of a separate school administration and for conducting research to find answers to global questions that can be only received in close cooperation with schools [Pavlova, Pitt, 2001]. Perhaps the teachers and administrators who participated in the study were looking for answers to their own questions. In recognizing the main problem to be the absence of schooling practices developing metasubjective skills in general education schools, the authors focused on the following goals:

- to design an assignment, which would include the development of 21st century skills on the material of a specific school subject;
- to make such activity available to most teachers;

- to make participation in such an activity accessible to most children.

The first goal is due to the fact that the subject-centered curriculum of the national school determines an assignment design and schooling process during the lesson, leaving little time and opportunity for the purposeful development of metasubjective skills. The development of 21st century skills based on a specific subject domain is already a challenge for Russian schools.

The second goal was defined after we took into account the less than successful experience of innovative pedagogical approaches towards teaching practices in general education schools in 1980s-90s, which focused on a new type of a teacher him- or herself.

The third goal is due to the understanding of the main risk that innovations face: it is the risk of remaining locally applied or acquiring an elite character. Therefore, the new type of assignment design should be applicable not only in specialized classes or schools that have student selection procedure.

Returning to the peculiarities of the action research methodology, the researchers' approaches to the study have to be noted [Bezrukova, 2014]. It may be more subjective than it is common for the social sciences. The level of professional training of researchers is also important: how trained they are in the field they want to improve. From this point of view, it is rather important that most authors have some experience in innovative pedagogy, and could interact with teachers more effectively, relying on their professional experience.

Conceptual Framework of the Study

There were 11 countries apart from Russia which were involved at the OECD Center for Educational Research and Innovation's project this study is a part of. The research focus is the development of 21st century skills. This article is dedicated to the creativity development. The OECD researchers proposed *The Five Creative Dispositions Model*, which allows for characterizing the student according to the following criteria [Lucas, Claxton, Spencer, 2013]:

- inquisitiveness (to identify, to raise, to explore and to critically evaluate interesting issues in any creative domain);
- persistence (to persevere through challenges, to show confidence in the face of uncertainty and to take risks in choosing a problem solving strategy);
- imagination (to come up with imaginative solutions, to test and to improve them, to make connections between non-compatible objects, to use intuition);
- collaboration (to share the results of their intellectual activities, to support others and to receive support from them, to cooperate);

- discipline (to develop a creative product using available knowledge and skills and developing new ones necessary for its creation, to reflect critically, to make decisions about improving the product) [Lucas, Claxton, Spencer, 2013].

The conceptual framework of this study corresponds to modern definitions of creativity. Initially, the study of creativity was focused on the analysis of mental operations used in the creative process. The beginning of the scientific research on creativity as a psychological phenomenon is usually referenced to the 1950s and is associated with the works of J. Guilford [Guilford, 1950]. According to Guilford's Structure of Intellect theory there is a difference between the two types of mental operations: convergent and divergent thinking. Convergent thinking narrows all options to one solution. Although, there are varieties of these solutions, their amount is always limited. Divergent thinking is the ability to generate multiple solutions. Guilford describes this type of thinking as "the kind that goes off in different directions". It allows for exploring many possible solutions and may lead to unexpected conclusions and results. Creative decisions usually come at the state of relaxation and not at the moment when attention deliberately focuses on problem solving.

Various tests have been developed to measure creativity identified with divergent thinking. E. P. Torrens, developing the ideas of J. Guilford, used the following criteria to identify the creative person:

- fluency (the ability to come up with many diverse ideas quickly);
- flexibility (the ability to generate ideas, to develop new solutions, to change one's mind during the problem solving process, to abandon the suggested idea, to take the views of others into account);
- originality (the ability to suggest unexpected solutions);
- elaboration (the ability to embellish ideas relating to the activity) [Tunik, 2013; Torrance, Goff, 1989].

Since the time when J. Guilford and E. P. Torrens created their approaches towards creativity, the research on creativity has expanded significantly. Now it includes not only the type of thinking, but also personal qualities, such as self-confidence and openness to new ideas and experience, as well as motivational and environmental components [Lubart et al., 2009]. A. Cropley summarized skills teachers should promote in their students to foster creativity in the classroom [Cropley, 2011]:

- Possession of a fund of general knowledge
- Knowledge of one or more special fields
- An active imagination
- Ability to recognize, discover, or invent problems

- Skill at seeing connections, overlaps, similarities, and logical implications (convergent thinking)
- Skill at making remote associations, bisociating, accepting primary process material, forming new gestalts, etc. (divergent thinking)
- Ability to think up many ways to solve problems
- A preference for accommodating rather than assimilating
- Ability and willingness to evaluate their own work
- Ability to communicate their results to other people.

Thus, the relevance of the framework adopted as the research program is supported by other studies. It describes the creativity as a social and forward-looking phenomenon, manifested in communication with other people and requiring persistence and discipline.

What kind of schooling practices aimed at developing this kind of quality will help to fully promote it, will not be too dependent on teachers' and students' personal characteristics, and can be implemented in an average school? There are some approaches to motivate students to produce new ideas, to create collaborative project, to communicate and to self-reflect in modern pedagogy, taking into account the subject domain context. These are educational projects and studies based on the collaborative problem solving approach. This approach is evaluated in the international comparative study PISA-2015 [OECD, 2017].

Assignment Design

We analyzed *The Five Creative Dispositions Model* to prove that it does not contradict the normative framework of the modern Russian school. We also compared the metasubjective educational results 5th-9th-grade-students have to achieve with those indicated by the OECD team (Table 1).

Thus, modern Russian secondary school regulations include the formation of a creative person among the priority learning outcomes. The education process based on domain specific learning aims to achieve this goal. In this study, we consider encouraging creativity in mathematics classes.

What opportunities does a school subject like mathematics provide? It is not supposed to change the content of mathematical courses to develop creativity, but review the assignments and organization of education process. According to mathematicians and methodologists, the solving of mathematical problems is both the goal and the instrument of teaching mathematics. Therefore, we emphasize the significance of developing such types of assignments, which encourage creativity development.

Scientific study of literature and analysis of teaching experience is the key to understanding the assignment design principles that expand opportunities for developing creativity within domain specific learning. For example, it is possible to achieve the goal with the help

Table 1. The comparison between The Five Creative Dispositions Model characteristics and Federal State Educational Standard of Basic General Education regarding metasubject educational results of 5th-9th-grade-students.

The Five Creative Dispositions Model	Metasubject educational results of general education program acquisition (Federal State Educational Standard of Basic General Education)
<p>– inquisitiveness (to identify, to raise, to explore and to critically evaluate interesting issues in any creative domain);</p>	<p>– the ability to determine independently the goals of their schooling process, to set and formulate for themselves new tasks in learning and cognitive activity, to develop the reasons and interests of their cognitive activity; – the ability to define concepts, to generalize, to make connections, to classify, to choose independently the approaches and criteria for classification, to determine cause-effect relationships, to develop logical reasoning (inductive, deductive and by analogy) and to draw conclusions</p>
<p>– persistence (to persevere through challenges, to show confidence in the face of uncertainty and to take risks in choosing problem solving strategy);</p>	<p>– the ability to choose independently the strategy for achieving goals, including alternative ones, to choose consciously the most effective ways to solve educational and cognitive tasks; – the ability to correlate their actions with the goals, to self-monitor the process of achieving the goals, to choose strategy within the specific requirements, to review the strategy in accordance with the changing situation</p>
<p>– imagination (to come up with imaginative solutions, to test and to improve them, to make connections between non-compatible objects, to use intuition)</p>	<p>– the ability to create, apply and transform signs and symbols, models and schemes for solving educational and cognitive tasks</p>
<p>– collaboration (to share the results of their intellectual activities, to support others and to receive support from them, to cooperate)</p>	<p>– the ability to organize educational cooperation and joint activities with the teacher and peers; to work both individually and in a group; to find a joint decision and resolve conflicts based on the harmonization of views and consideration of interests; to formulate, discuss and defend your opinion</p>
<p>– discipline (to develop a creative product, using available knowledge and skills and developing new ones necessary for its creation, to reflect critically, to make decisions about improving the product)</p>	<p>– the ability to assess the assignment as well as his or her capabilities to solve it; – to have self-control, self-assessment, decision-making skills and to make informed choice in educational and cognitive activity.</p>

of contextual problems describing some issues that need solving; assignments with redundant or insufficient data; problems with many solutions, when the best solution has to be chosen.

There is a question if it is possible based on the content of the topic to develop and to implement such types of teaching activities into educational process. Is it methodologically correct to develop assignments with several possible solutions? At first glance, it contradicts the traditional approach to teaching mathematics: usually the student has to find the one correct answer when solving mathematical problems. The analysis of educational material on Mathematics and teaching experience shows the opportunity to develop assignment-promoting creativity almost in every topic.

The clear reference to the type of mathematical activity needed to get the solution simplifies the assignment for the student, and the requirement to choose the solution by him- or herself makes the assignment more difficult. When studying a number of topics, it is necessary to repeat the same actions (operations) to get the skill. It can be assumed that such work is boring for students; they don't have any desire to choose the best solution during the problem-solving process. In this case, it is reasonable to use assignments where the same mathematical operations will be covered by interesting assignment design, while the problem-solving strategy developed by the students will require their repetition.

Below is an example of an assignment for 9th- grade students developed by our team.

At the family meeting, dad asked his daughter Alena to help solve an important problem. The family is going to buy an affordable car during the next three years. However, the available amount of money (300,000 rubles) is not enough to purchase the selected car. 55,000 rubles more are required. In order to save money, dad suggests putting all the money they have (300,000 rubles) into a bank at a certain interest. Mom comes up with another idea: to buy company shares in a well-established small business in order to receive dividends.

The parents have the following information about a small company.

- The cost of producing x thousand units per year can be represented by the dependence $y = 0,05x^2 + x + 1$ (costs are calculated in millions of rubles).
- Products are supposed to be sold at a price of 3,000 rubles per unit.
- The company's profit (in millions of rubles per year) is calculated as the difference between the money received from the sale of products and the production costs.

- The capacity of a small company allows for producing no more than 20,100 units of production per year.
- The company has made an output plan for the next three years. It is assumed not to change the basic parameters of the production process, the scheme to calculate the income and payments on shares.
- When buying company shares in the amount from 200,000 to 300,000 rubles, shareholders are expected to receive annually up to 0,1% of the company's profit.

Determine which strategy for a successful investment should be approved at the family meeting in order to save the required amount of money within three years.

The assignment is accompanied by additional materials presented in various forms. There are some of these materials.

Bank *The Last Chance*. Deposits for individuals—2016.

Bank *The Last Chance* offers several profitable investments for individuals in 2016, their annual interest rate is up to 10.58%.

The Bank *The Last Chance* has deposit programs which are insured by the state in accordance with the Law "On Deposit Insurance".

1. Deposit *The Right Answer*—growth rate according to the period.

The minimum deposit is 100,000 rubles (it is impossible to open a deposit in another currency), for the period of up to 380 days.

As you will see in the table, the growth rate depends on the time period (there are four of them) and ranges from 8.0% to 12.0% per year (the average growth rate during the whole period is 9.75%).

Additional deposits or partial withdrawals are not permitted.

Minimum amount, RUB	From 1 to 95 days	From 96 to 190 days	From 191 to 285 days	From 286 to 380 days
100 000	8.00%	9.00%	10.00%	12.00%

2. Deposit *Maximum Income*—maximum annual growth rate

This deposit allows the maximum annual growth rate in comparison with the bank's other offers; however, the total contribution to receive it is a substantial amount of money.

The minimum deposit is 1,000 RUB, or 100 EUR or USD. The time of the deposit is up to the client and varies from 91 to 1,095 days.

In the case of early withdrawal in the period from 180 days the interest is paid at a fixed rate equal to 60% (see table below).

	The time of the deposit (days)						
	91–180	181–364	365	366–547	548–730	731–1094	1095
from 1,000	7.80/ 7.85%	8.70/ 8.86%	8.70/ 9.06%	8.60/ 8.95%	7.30/ 7.69%	7.10/ 7.61%	6.80/ 7.52%
from 200 000	8.00/ 8.05%	8.80/ 8.96%	8.80/ 9.16%	8.70/ 9.06%	7.40/ 7.80%	7.20/ 7.72%	6.90/ 7.64%
from 550 000	8.10/ 8.15%	8.90/ 9.06%	8.90/ 9.27%	8.80/ 9.16%	7.90/ 8.36%	7.70/ 8.30%	7.40/ 8.26%
from 850 000	8.20/ 8.26%	9.20/ 9.38%	9.20/ 9.60%	9.10/ 9.49%	8.10/ 8.58%	7.90/ 8.53%	7.60/ 8.51%
from 500 000	8.30/ 8.36%	10.10/ 10.31%	10.10/ 10.58%	9.70/ 10.14%	8.30/ 8.81%	8.10/ 8.76%	7.80/ 8.76%

To compare the deposit conditions, we recommend you to search for the “Top Banks on Deposits in 2016” on the Internet and choose the better offer.

The assignment has some significant features:

- it lacks data, so students need to look for additional information (for example, to choose a bank that offers more profitability of deposit) from different sources;
- it is necessary to make a decision regarding the suitable sources of information;
- it is possible that the correct answers of students may not coincide, because of different types of reference materials, different sources of information and different decisions made at each assignment stage (choosing a reliable bank, choosing a deposit, choosing interest rate).

It is important to note that such an assignment not only helps to revise the previously studied material (quadratic functions and the calculation of percentages), but also encourages students to develop non-standard approaches to the solution. Thus, this contextual problem contributes to the development of The Five Creative Dispositions Model while fulfilling the subject didactics.

Together with the schoolteachers, an assignment option for the 8th grade was designed. It does not contain the part with profitability of an enterprise’s shares calculations, since quadratic functions are studied most often in the 9th grade. The assignment aims at choosing the bank and deposit(s) and corresponds with the 8th-grade-curriculum. Moreover, it is an opportunity to discuss the reliability of banks in the remaining time.

At the beginning of the lesson, some teachers asked students to write the percentage formulas in order to actualize the knowledge

needed for the assignment (finding the percent number, number by its percent or percentage), since this material was studied two years earlier. On the one hand, the actualization of the material is necessary to calculate capitalization in the problem-solving process; on the other hand, it enables the teacher to assess the students' capability to use subject domain knowledge, if necessary.

The assignment allows for varying certain parts in order to increase students' involvement and to get closer to everyday life situations. For example, it is possible to add currency deposits to make the assignment design more complicated and to increase the amount of possible behavioral strategies. The currency deposits have a smaller interest rate, but students can try to get the required amount of money faster because of the difference in exchange rates. This also increases the range of mathematical calculations. The assignment also allows for adding "attractive" deposits with a higher interest rate (named *Excellent chance* or *Stability* or such). At the end of the assignment, when all students have chosen certain banks and deposits, the teacher announces that all banks offering deposits above a certain interest rate are closed by the decision of the Central Bank. Such a remark may be the reason for a more meaningful discussion about the reliability of banks regarding the everyday life situation, when one's bank license may be revoked due to its unreliability. Different options in assignment design stimulate both discipline, imagination and coherence of team members while developing a deposit strategy in accordance with The Five Creative Dispositions Model, as well as the development of students' general financial literacy and an increase the subject domain activity because of additional mathematical calculations.

The approach to assignment design has to be underlined:

- the story itself is not related to any specific topic in Mathematics;
- the assignment doesn't require students to perform the specific actions they have studied (to do identical transformations, to solve an equation, to plot a function etc.);
- there is no solution method students have to follow.

While developing a strategy, the student has to deviate from the standard and previously studied problem solving procedures, since he or she is under conditions of uncertainty about the theoretical material of the Mathematics required to solve the particular problem.

This type of assignment refers to contextual mathematical problems¹. However, not every contextual problem requires the student to be cre-

¹ In the methodology on mathematics, the contextual problem is the problem describing everyday life situations, when the student must him- or herself choose the strategy to solve it. At the same time, the student may be famil-

ative by finding the solution. Requirements of the Federal State Educational Standard of the basic general education force almost all the authors to use applied assignments on Mathematics while presenting topics and sections in textbooks. There are common *stereotypical* applied assignments in textbooks and teacher's manuals to illustrate the use of Mathematics in solving everyday life problems. The potential of these assignments to encourage creative thinking is a controversial issue.

While conducting the research, 24 assignments on mathematics and natural sciences (ecology, biology, physics, and geography) were developed for elementary and secondary school.

The principles of contextual problem design aimed at promoting students' creativity are presented below. They were used within our study and proved to be successful. During the study, colleagues from the OECD developed their own criteria for an assignment to be classified as promoting creativity, and they are quite similar to ours.

- The problem described in the assignment should be quite *uncertain, unclear*: if the assignment refers to mathematics, if there is a certain mathematics topic suitable for solving the problem, etc. A student faces a situation when there is no *prescribed problem-solving strategy*.
- The problem described in the assignment should *require knowledge from different mathematical topics to solve it*. So, for example, the assignment refers students to the study of functions, to write numbers in a standard form, to review involutions, percentage formula and percentage math problems.
- It is obligatory for contextual problem design to be based on the prescriptions of the Federal State Educational Standard and curriculum framework for schools. The teaching experience and experimental verification of educational materials allow for claiming that the current mathematics curriculum provides wide opportunities for contextual problem implementation. The assignment presented above proves the connection between the specific school-subject domain (the earlier acquired knowledge and skills) and metasubject skills (a search for information, an approach to presentation of the information, data analysis, synthesis of knowledge founded in different sources), which is also documented in educational standards. The design of the assignment presented above meets the requirements of the "The graduate will learn" section and the "The graduate has an opportunity to learn" section of the curriculum framework. These knowledge and skills are

iar with the situation described in the assignment based on personal experience, literary sources, etc.

significant in a problem solving process *with nonstandard, unusual design*.

- The contextual problem design demonstrates to the students that there is *not enough (or it is redundant) data* in order to solve the problem. Thus, there is an opportunity to promote creativity while analyzing the initial data (discipline and inquisitiveness), searching for the information (persistence), making decisions (imagination, collaboration). The same assignment design principles encourage critical thinking development during the process of analyzing the initial data and selecting the most relevant information, choosing reliable sources of information, and understanding decision making.
- The contextual problem design deliberately *limits the opportunities for problem solving* because of *the given context*. This requirement partially facilitates the contextual problem development, because it puts the student in a new situation compared to what he or she may know from personal experience, studying information sources. However, the restrictions may be a pretext for additional questions that do not arise in a classic assignment.
- The developed contextual problem assumes various *correct solutions to the problem* in contrast to the only possible solution in classical assignments on Mathematics. In this case, the student is required to explain his or her decision making strategy, which contributes to the critical thinking development.
- The contextual problem design involves *different ways of presenting information* (text, table, diagram, drawing, chart, etc.), using the Internet or other sources to get the missing information. This assignment design principle contributes to the development of almost all the qualities that promote creativity. Along with the generation of new solutions, it is important to be able to evaluate their viability, productivity and efficiency.
- So, these are the characteristics of contextual problems contributing to the creativity development. The principles of assignment design presented above are found in Russian methodology [Feigenberg, 2010].

Lesson Requirements

The development of the creative abilities of students can be encouraged not only by specific assignment design, but also by the learning climate in the classroom. The Five Creative Dispositions Model supposes to promote collaboration, which can be achieved through teamwork. The methodology on mathematics describes the teaching experience within both homogeneous and heterogeneous learning groups. The teamwork is usually used as the didactic method to review the material during the skill formation process: it should help to provide conditions for gaining new knowledge during the systematization process. Within the traditional approach teamwork is usual-

ly used as extracurricular project activities for students. The contextual problem solving supposes students to work in groups during the lesson and to feel free to communicate without the teacher's direct instructional guidance. The teaching experience allows us to recommend a group size of 4–5 students. This amount allows participants to share their views (to listen and to hear each other) regarding the problem solving process; to share activities based on personal characteristics and the experience of the participants; to jointly develop the problem solving strategy.

The classroom observations showed that teamwork provided collaboration and an exchange of views, which helped students to find their own problem solving strategy; there were also discussions and disagreements with new ideas or uncommon approaches to the problem solving process. The partnership aiming at solving the problem promotes an atmosphere of learning and cooperation. The participants had to be persistence and disciplined in order to find the best solution.

Thus, the analysis of students' activities necessary for contextual problem solving has shown that teamwork develops inquisitiveness, persistence, imagination, collaboration and discipline, which contributes to creative problem solving.

The teaching process should be organized in a certain way to encourage creativity:

- the assignment is based on an everyday life (rather than theoretical) situation, when students are supposed to solve the problem using the approach of the specific school subject, to choose knowledge required for the problem solving, to identify the missing data and to select the sources to collect it;
- the students are interested in the problem solving process;
- the teaching process consists of practical activities and therefore differs a lot from traditional lessons, which also attracts students' attention;
- teamwork is used, suggesting an independent problem solving process by students;
- the usage of additional sources of information is supposed.

The Assignment Implementation

Lessons similar to those described above were conducted by teachers at schools in three city districts of Moscow and at one school in New Moscow. The teachers conducted four lessons in each class. Table 2 shows the characteristics of the schools taking part in the study.

After assignment implementation the seven focus groups with teachers and students were conducted to determine the success of the study: if the assignment design was sufficient to promote creativity based on subject domain knowledge; if the participation at assignment activities was accessible to most teachers and children.

Table 2. **The characteristics of the schools taking part in the study.**

City districts, school type (all schools taking part at the research are state schools)	Amount of classes
Central Administrative District. Lyceum with in-depth study of mathematics and science	4 classes of elementary school: three 3rd grade-classes and 4th grade-class; 5 classes of secondary school: three 8th grade-classes and two 9th grade-classes
North-Western Administrative District. School with in-depth study of the English language	2 classes of elementary school: 3rd grade-classes; 2 classes of secondary school: 8th grade-classes
Southern Administrative District. General education school	5 classes of elementary school: two 3rd grade-classes and three 4th grade-classes; 2 classes of secondary school: 8th grade-classes
New Moscow. Gymnasium with a complex student body with low socioeconomic and cultural backgrounds	6 classes of elementary school: three 3rd grade-classes and three 4th grade-classes; 2 classes of secondary school: 9th grade-classes
Total	28 classes with an average of 25 students per class

Focus Groups with Teachers

Each focus group consisted of teachers from the same city district. The teaching experience was discussed as well as the usefulness of suggested educational activities, the level of student engagement, and the possibilities to vary the assignment design. The teachers shared their experience in changing the assignment design depending on curriculum by grade, in analyzing both the predictable and unexpected behavior of their students they faced with during educational process.

The teachers also noted the possibility to develop both metasubject and subject skills within conducted lessons. In general, the idea of developing competences within the subject domain is interesting for them, but the development of such assignments is a time-consuming process, which requires teachers to do more theoretical background. Primary school teachers emphasized that such lessons can provoke discipline problems, if students are not used to teamwork. A new lesson design leads to a transformation of the teacher's role, where they become not the only one knowing the right answer, which was sometimes uncomfortable for teachers.

The teachers noted that the teaching materials were clearly presented and well-organized. The teachers gave different assessments regarding the accessibility of instinctual materials according to their own teaching experience: if they were used to implementing practical activities during the lesson, to organize teamwork and to give students an opportunity to find a solution to the problem themselves.

As for the similar assignment implementation in the educational process, the majority of teachers stated that they are ready to use such assignments no more than once a month. During the lesson design process, teachers independently chose the appropriate time and the main goal of the lesson: someone used them for topic introduction, someone reviewed the material, and someone used them as a tool to motivate students using an interesting and unusual task. Some teachers supported the idea of interdisciplinary tasks and used them for integrated lessons.

On the other hand, the focus groups have shown that teachers are concerned about the discrepancy between the new assignments and the tests used for the external quality control of education. Despite the fact that the assignment design corresponds to the Federal State Educational Standard, the skills they develop are not assessed during such tests. Teachers and schools find themselves in the situation of a difficult choice between the lesson design they find interesting and useful for students and the external quality control, which has great importance for the school.

None of the teachers during the focus groups reported that the tasks were difficult for the students or that the students did not cope with them and did not take part in the educational activities. On the contrary, they stressed that students with low academic performance often realized themselves in tasks aimed at developing creativity. During teamwork, they were often the most active students who clearly demonstrated their knowledge within the subject domain. Unexpected activity in students with low academic performance can be explained by the significant difference in lesson design required for contextual problem solving, which may help to overcome a teacher's perception about those students.

Thus, the focus groups with teachers allow us to conclude that the new assignments and lesson design are not challenging for both teachers and students and do not conflict with their educational experience. The main obstacle to such assignment implementation from the teachers' point of view is not their untraditional design or contradiction with the school program, but the mismatch of skills formed by contextual problems with skills tested with external evaluation.

Focus Groups with Children

We conducted four focus groups with children: two with students of two 8th-grades and two with students of one 3rd-grade. In the second case, two moderators divided the students of one class into two groups and held a conversation with them separately. Students were briefly reminded what activities they had during the study. After the students had expressed their first emotional response, they were asked to describe assignments they were interested in, assignments, which were useful for them and to specify the criteria. The children shared their experience about the difficulties they had during the prob-

lem solving process, about their classmates' behavior: whether it was expected or unexpected. They also expressed their opinions about the frequency of such assignments during the educational process.

The students showed great interest in teamwork, they believe that it is useful in learning, and even expressed a desire to acquire skills to organize such activity by themselves. Primary school students are more sensitive to small conflicts that occur during the problem solving process; secondary school students already know how to solve conflicts, but they also need the teacher's help.

Some students were also surprised by those classmates who were not usually interested in the learning process, but who had participated in teamwork. The activity of such students contributes to the group result and enhances their own motivation to study, if the group choose a strategy to support any ideas, regardless of previous academic success or failure: «I didn't think that <name of the classmate> would start to work so actively. He doesn't care, really. Maybe he was interested, maybe he was cheered up by the team. When someone had difficulties in mathematics or could not solve the problem by him- or herself, we said: «Let me help you, we can do everything together». There was a girl in our team, who had to order figures. She could not do it, it did not work. We helped her to do it, we ordered it together, and it worked out».

Students explain their own learning activity when performing contextual problems by their interest in the task, its untraditional design, their desire to learn something new as well as by the external evaluation and competition within the groups. Younger students noted that it was interesting for them having a particular role to play:

S1: [You feel yourself] like a real ... seeker.

S2: ... or a traveler.

All students noted that the developed assignments were untraditional for a school lesson. On the one hand, they seemed simple, on the other hand it was not always clear how to solve the problem, and it was quite unusual that there could be several correct answers. Such statements from students that contextualise problems—"teach to think", "develop the imagination", "teach to work in team"—prove that such assignments develop 21st century skills and can be used in everyday life situations.

Conclusions Based on the results of action research, we have shown that it is possible to design lessons aiming not only at knowledge acquisition within the subject domain, but also at 21st century skills development. The assignment implementation has shown that an ordinary teacher can at least give such a lesson developed by others taking into account the criteria of the contextual problem we have presented above. The

assignment availability for children is out of doubt. The assignment availability to teachers may vary depending on their skills in developing innovative lessons.

It seems to us that the unwillingness of teachers to conduct non-traditional lessons significantly limits the contextual problem implementation. The focus groups both with primary and secondary school students support this conclusion. It is still common practice to distinguish between education and entertainment in the Russian school system. Educational practices, which can develop creativity, even if they are used within the subject domain, are often perceived by teachers and students as entertainment, irrelevant to the traditional school system and more appropriate for extracurricular activities or additional education. This can be considered both as a barrier towards the modernization of the education system and as a specific structural characteristic of the Russian school. The popularization of the best approaches to developing 21st century skills within a specific school subject is necessary to make teachers and children believe that achieving effective knowledge acquisition is possible along with the development of imagination and curiosity in children.

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