NATIONAL RESEARCH UNIVERSITY

HIGHER SCHOOL OF ECONOMICS

INSTITUTE OF EDUCATION

As a manuscript

Nadezhda Avdeenko

Creativity-fostering practices in education: defining problems of implementation

Summary of the thesis
for the purpose of obtaining academic degree
Doctor of Philosophy in Education

Academic Supervisor: Oleg Fedorov,
Doctor of Sciences (Ped.), Associate Professor

Moscow, 2024

Full name of the applicant	Avdeenko Nadezhda Aleksandrovna
Title	Creativity-fostering practices in education: defining problems of implementation
Organization	National Research University Higher School of Economics, Institute of Education
Academic supervisor	Oleg Dmitrievich Fedorov, Doctor of Sciences (Ped.), Associate Professor
Publications	Creativity for Everyone: Integrating the 21st Century Skills in Russian Schools / Avdeenko N., Denishheva L., Krasnyanskaya K., Mikhailova A., and Pinskaya M. // Voprosy Obrazovaniya / Educational Studies Moscow, no. 4 (November), 2018. P. 282-304. https://doi.org/10.17323/1814-9545-2018-4-282-304. Avdeenko N. A. Teachers' perceptions of creativity and its development at school // Education and self-development. 2021. T. 16. № 2. C. 124-138. Avdeenko N. A. Implementation of project-based learning at school: analysis of teachers' statements in the context of the system model of creativity // Monitoring of Public Opinion: Economic and Social Changes. 2023. № 3. C. 239-258.
Conferences	International Scientific and Practical Conference "Research activities of students in the modern educational space", February 8-10, 2018, Moscow. Report "Formation of 4C competencies by means of academic subjects" (jointly with A.M. Mikhailova); Creativity Conference, Southern Oregon University, August 3-6, 2018, Ashland, Oregon, USA. Report «Creativity for everyone: implementing 21-century skills in public school»; INTED-2020 (International Technology, Education and Development Conference), Valencia, Spain, March 2-4, 2020.

	Report «Teachers' Beliefs About Barriers Towards Implementation of Innovative Teaching Practices»; Scientific and practical conference with international participation "Management of functional literacy development", Kazan Federal University, Kazan, November 27-28, 2023. Report "Formation of creative thinking in the classroom using project- and problem-based tasks".

Terminology

Implementation is the process of introducing into everyday use, practices, tools, technologies that have demonstrated their effectiveness in relation to certain research goals and/or are promising for achieving these goals from the perspective of the expert community [Nilsen, 2015; Bauer&Kirchner, 2020].

Competence is a set of an individual's integrated capabilities composed of clusters of knowledge, skills, attitudes, and values that are mobilized in a particular context to meet the requirements of a given task or problem [Dobryakova et al., 2020]. It is considered to be domain-general, although it manifests on the basis of a particular domain of knowledge. It is formed on the basis of both intrapersonal characteristics and through deliberate practice.

Creativity, or creative thinking, is a competence related to the generation and development of ideas that are novel, original and relevant to the context in which they are produced [Sternberg & Lubart, 1999].

Project-based and problem-based learning tasks are tasks that share certain characteristics, such as

1) They begin with the teacher or students posing a non-standard task or problem;

2) Their result is the development of a product or solution;

3) To complete them, one needs to go through a full or partial problem solving cycle;

4) To solve them, subject knowledge and skills are required [Lerner, 1974; Kolmos, 2012; Vincent-Lancrin et al., 2019].

Research relevance

Students in schools today live in a rapidly changing world, where they have to repeatedly change their professional sphere and lifestyle, immerse themselves in new activities, advance in them, predict solutions, make mistakes and try again. Out of concern for preparing young people for self-realization in this world, the idea of reorienting the content of universal school education to models that develop universal skills of creative and critical thinking, teamwork and communication skills, has grown [WEF, 2015; Frumin et al., 2018]. This content of education meets such modern trends as reducing the need for routine labor, increasing the role of tolerance to ambiguity as a personal quality. In particular, the skill of problem solving brings Russian workers a significant return in the form of wage growth [Korshunov et al., 2023].

Creativity, or creative thinking, is an important competence that is considered necessary to develop, starting from school. The most popular definition of creativity in modern science is the ability to produce and develop ideas that are new, original and appropriate for the context in which they originated [Sternberg & Lubart, 1999]. This definition was used in the framework for evaluating creative thinking in the PISA international comparative study [Framework for the assessment..., 2019], and it fits well with the needs and limitations of educational institutions, in which the need for an original approach is often combined with the need to follow the rules.

The assessment of creative thinking according to the PISA model was conducted as part of the Russian monitoring of the formation of functional literacy for pupils in grades 5, 7, 8 and 9 in 2020. Typical problems encountered by Russian schoolchildren when performing tasks on creative thinking were identified [Loginova et al., 2020]. First, students do better on tasks in the content areas of inventing texts and coming up with solutions to social problems. In contrast, tasks related to generating non-standard solutions in STEM fields are more difficult for them. Secondly, only a small number of students demonstrate fluency of thinking (putting forward several possible answers that differ from each other, but are not

necessarily original), even at an intermediate level. Students perform better on tasks aimed at putting forward one original idea. Thirdly, the most difficult tasks for Russian schoolchildren are tasks for original revision of someone else's idea, when it is necessary to come up with an interesting solution not from scratch, but tracing the logic in someone else's solution and supplement it with their own original development.

The introduction of new teaching methods, the development of basic skills and abilities by students, increasing their motivation to learn, and involvement in the educational process are important tasks set for the educators[1]. It cannot be said, however, that the introduction of new teaching methods in Russia is carried out “from scratch”. For example, perestroika and the 1990s are usually associated with attempts to institutionalize such developments as developmental learning, methods of innovative teachers, etc. [Dneprov et al., 1997]. Thus, in the second half of the 1990s, a community of schools became Federal Experimental Sites and was created with state support [Adamsky, 2003]. The main ideas of the pedagogy of this community, under the auspices of the Free University "Eureka", were, 1) creativity as an immanent feature of the teaching profession, 2) child-centeredness, 3) liberation of the teacher's identity, 4) collaboration, and 5) project-based practice. But despite attempts to institutionalize the socio-pedagogical movement and the dissemination of innovative pedagogical ideas on less marginal grounds, there was and still is a large gap in the field of educational content and teaching practices between mass schools and "avant-garde searches" [Klarin, 2016. pp. 369-473]. The ideas of the innovative pedagogical movement of the late 80s-early 90s were not widely spread. This was due, in particular, to the peculiarities of their emergence and preservation based on the figure of a charismatic leader. When he left the project, teachers who mastered innovations found themselves in a hostile environment [Safronov, Sidorova, 2016].

[1] Decree of the President of the Russian Federation "On National goals and strategic objectives of the development of the Russian Federation for the period up to 2024" dated May 7, 2018.

In the late 2000s, a new educational standard was introduced, which established the importance of achieving, along with subject, meta-subject and personal educational outcomes, and gave schools relative freedom in choosing the means of achieving them. However, the state final attestation still measures the achievement of subject results. Although there are certain advances in this area [Reshetnikova, 2019], and many open-response tasks (e.g. essays, tasks that require seeing a problem in a new situation and independently choosing a solution) are largely aimed at assessing the ability of independent thought and creativity. Usually, these are tasks of high complexity and schools have a tradition of "coaching" to solve them with the help of template answers.

This kind of reflection allows us to summarize the main theses that determine the relevance of the thesis research:

- an increasing proportion of non-routine actions and operations in the workplace;

- insufficient level of creative thinking of Russian students, especially in certain content areas;

- the orientation of Russian teachers to use templates in preparing students for standardized diagnostic procedures, even despite the gradual change in control and measuring materials towards the assessment of metacognitive skills;

- the trend of instability in the dissemination of innovative pedagogical practices and ideas, which can be traced through post-Soviet history.

The degree of elaboration of the research problem

The topic of innovation acceptance and resistance [Rogers, 1971] has long been discussed in the educational community. Both stages of innovation acceptance (recognition, interest, appreciation, adoption, acceptance) and stages of resistance (recognition, lack of interest, denial, probation, rejection) have been described [Nisbet & Collins, 1978]. Trajectories of acceptance and resistance may overlap. Neither rejection nor acceptance are most often final stages. They may be followed

by a pause, after which there is again a trial followed by a decision in favor of rejection or in favor of acceptance. When innovation becomes a part of everyday life, we can talk about "full" implementation.

Due to the spread of the 21st century skills development agenda, creativity is recognized worldwide as an important educational outcome. Therefore, a large amount of empirical evidence and expert opinion have been accumulated regarding the conditions and barriers to the implementation of teaching practices that promote creativity in the classroom. In the most recent systematic review of 20 studies on this subject by E.O. Bereczki and A. Kárpáti, barriers and drivers are grouped by levels (Table 1).

Table 1. Distribution of barriers and drivers for creativity development in education by level [Bereczki & Kárpáti, 2018].

Level	**Barriers**	**Drivers**
Educational context	Lack of time, overloaded curriculum, standardized testing, inappropriate materials and resources, ICT, large class sizes, unfavorable school culture	Curriculum, ICT, school culture
Teachers	External: lack of preparation/training, heavy workload, lack of freedom and autonomy, difficulty in assessing creativity	Teachers' attitudes, knowledge and skills
	Internal: difficulties in teaching creative skills, traditional teaching methods, lack of knowledge about creativity	
Students	Individual differences between students, lack of engagement	Students' attitudes, knowledge and skills
Parents	Negative attitude and lack of support	Parents' attitudes and support

The selection of levels is made directly from the data obtained, first from individual studies and then from their summarization in the review. We see several disadvantages in this selection. Firstly, drivers, when compared to barriers, appear to be formulated in a very general way (although the description of barriers is not devoid of excessive generalization): for example, parents should have positive

attitudes instead of negative ones. Secondly, with such a nomenclature-list distinction, there is a lot of overlap between the levels. For example, 'lack of time' at the context level clearly overlaps with 'heavy workload' at the teacher level, and 'traditional teaching methods' with 'lack of student engagement'. It is not clear exactly which of these is primary and at which level attempts to overcome this obstacle should begin. Third, the above selection seems rather disconnected from the specific ways in which creativity can be fostered in subject content within the classroom - here some barriers from different categories could be combined, since the problem of overloading the curriculum could be partially solved by teachers' knowledge of how creativity can be fostered in subject material. The last drawback closely overlaps with an additional problem: there are few studies showing how teachers' ideas about barriers and drivers really manifest themselves in their practice. Thus, in the research tradition of identifying conditions and barriers to creativity development in education, there is a tendency towards a “list” approach with data-driven grouping. This approach has a number of shortcomings that may affect, among other things, how to apply the findings in practice.

To formulate the research problem, we will also focus on describing how the teaching of Russian teachers is aimed at the formation of meta-subject educational results.

The data of the international comparative study TALIS 2013, showed that, compared to the average for OECD countries and the average for leading countries in terms of education quality, fewer Russian teachers use work in small groups to jointly find a solution to a task or problem [Pinskaya, Ponomareva, 2016]. In the TALIS 2018 study, this indicator remained unchanged (42%). Nevertheless, according to TALIS-2018[2], on average, in Russia, 60% of teachers report that they often or always give tasks that require students to think critically (which is almost identical to the average result for all countries), and 58% of teachers say that they give tasks for which there is no obvious solution (which is 20 p.p. higher than the

[2] https://fioco.ru/Talis-18-results

average for the study). Also, 45% of Russian teachers say that they ask students to choose their own ways to solve complex problems. It is important, however, that during the survey, Russian teachers tend to be overly optimistic about their teaching [Pinskaya, Ponomareva, 2016; Tyumeneva, Kapuza, 2016]. For example, when comparing the responses, in TALIS, of teachers from the leading countries according to PISA 2015 (Singapore, Japan, Estonia, Canada) and teachers of outsider countries (Colombia, Mexico, Brazil), researchers note that the former are much more "modest" in assessing their use of critical and creative thinking practices than the latter. Russian teachers often tend to declare their active use of such practices almost as often as teachers from outsider countries.

Based on the data from the study "Trajectories in Education and Profession" [Larina, Kapuza, 2020], it was recorded that teachers more often use mathematics teaching practices aimed at high-order cognitive processes (performing tasks without teacher guidance; establishing links between mathematics and real life; solving non-standard tasks) in large classrooms, but at the same time teachers who teach in very small (less than 3 thousand people) and small (50-100 thousand people) settlements, use similar practices more often than teachers from large cities. There was a positive relationship between the use of such practices and the results of students in mathematics.

The analysis of video observations of mathematics lessons in schools with very different social contexts [Larina, Markina, 2019], showed that teaching practices at school are rather low in terms of student engagement and cognitive activation. While giving students the opportunity to think independently without prompting was presented to some extent in 23 lessons out of 25, teacher requests to apply knowledge to new types of problems or new situations appeared, to some extent, in 14 lessons out of 25, and teacher requests to compare different solutions and comment on the course of reasoning in each of them appeared in 9 lessons out of 25. In more than half of the 25 lessons, teachers did not take the opportunity to involve the majority of the class in problem solving or discussion about the solution,

focusing solely on individual students, such as those at the blackboard who are openly trying to solve the task.

An analysis of two first grade lessons – the developmental learning system and the traditional one [Tsukerman, 2010] – from the point of view of using the triad of educational dialogue (teacher's question – student's answer – teacher's reaction) [Sinclair, Coulthard, 1975], showed that a digression from the triad associated with the child's initiative action in a traditional lesson occurs only in game moments, which precede immersion in the subject and makes up 13% of the entire lesson. In the Elkonin–Davydov developmental learning system, the triad is deviated from, not only in organizational moments, but also during the actual teaching of the subject, and occurs in 47% of all lesson triads. Consequently, in the traditional education system, at least in primary school, teacher-centered educational activities are still more valuable.

When considering the process of changing teachers' perceptions [Mikhailova, Pinskaya, 2022] about the use of ICT in the classroom as a tool for the formation of critical thinking and creativity, a curious trend was recorded: teachers who have undergone an intervention to develop and conduct innovative lessons determine high-order thinking skills through the most specific forms of educational work (work in groups, building concept maps, etc.), and not through psychological or pedagogical concepts. Teachers seem to become more skilled in the use of specific practices rather than more knowledgeable in the field of filling the constructs of "critical thinking" and "creativity" – or at least the latter is much less important for them.

Based on the analysis of experience in training teachers to develop and evaluate creative thinking, the teachers' difficulties in finding a place for the formation of creative thinking in the teaching process have been identified [Abdulaeva et al., 2023]. Teachers find it difficult to select tasks aimed at the formation of creative thinking within their subject, to apply appropriate teaching techniques, and, in general, to organize students' activities.

Thus, judging by the above evidence, Russian teachers tend to exaggerate the frequency of using the practices of metacognitive skills formation in the classroom. In reality, they may use them, for example, in the context of working with single students at the blackboard without involving the majority of the class. In the work of teachers who are aware of innovative systems, such as developmental learning, there are signs of a greater focus on stimulating students' exploratory activity while working with new subject content. When adopting innovations in teaching, teachers tend to “think in terms of practice” rather than in terms of the educational outcomes to which the practices are directed. We can trace a positive connection between the use of practices of problem solving related to real life, and students' results in mathematics. In the area of creativity formation, teachers' inability to both select subject tasks promoting such formation and integrate them into the teaching process is noticeable.

Taking into account all of the above, the scientific problem of our dissertation research can be formulated as follows. The difficulties associated with the implementation of practices aimed at the formation of creativity in the educational process are usually identified rather enumeratively, without using any theoretical model to group them, and without immersion in the peculiarities of specific practices. There are gaps in the description of what problems may arise at the micro-level of teacher-student interaction in the classroom in the context of the application of such practices. An attempt to identify barriers and drivers for creativity formation using a holistic model, especially one that takes into account the characteristics of creativity-fostering practices, seems to be productive, since the integration of such practices into their own teaching is, according to various evidence, a problem for Russian teachers.

Positioning research in the scientific field

Implementation research is a scientific field focused on how to make practices that are effective in achieving certain goals sustainable, to bring them into everyday use [Bauer&Kirchner, 2020]. A practice may show effectiveness in a number of

studies, including experimental studies, be 'evidence-based', i.e. working under controlled conditions, but attempts to scale it up will fail because of the characteristics of the context in which it is disseminated. The study of such contextual features is what implementation research is all about. Despite the important applied role of such studies, they do not begin with a specific problem that has arisen in a certain place (institution), but with a regularly occurring problem perceived as a trend.

There are three generalized goals, depending on which theoretical framework for implementation studies is selected [Nilsen, 2015]: description of the process of “translation” of a technology/innovation into everyday routine practice; description of possible factors of implementation performance; evaluation of implementation success. A framework suitable for the second objective helps to categorize barriers and conditions and can help to highlight them in both discrete logic and holistic logic. The latter way of highlighting is more helpful in explaining what the success of implementation depends on. Such frameworks include both concepts common to different fields in the social sciences, such as A. Bandura's concept of self-efficacy [Avery et al., 2015], and specific ones. In our study, we used specific frameworks directly related to the object of implementation - creativity-fostering teaching practices.

In the dissertation research, we use the definition of the term "creativity" formulated by R. Sternberg and T. Lubart [1999], and we understand it as a key competence [Dobryakova et al., 2020] associated with the generation and development of ideas – new, original and relevant to the context in which they are produced. This definition of creative thinking is a kind of consensus, a compromise that takes into account the divergence of thinking [Guilford, 1950; 1973; Torrance, 1966], the process of analyzing facts and concepts (convergence of thinking) [Mednick, 1962], the social nature of creativity (the idea must be recognized as original by the community) [Sternberg, 2012], as well as the role of the knowledge base, motivation and perseverance in developing a creative solution [Amabile and

Pillemer, 2012; Lucas, 2016]. Learning, understood as the development of cultural means by a person, can simultaneously suppress the originality of thinking and give an individual the opportunity to show it, taking into account new knowledge and limitations [Poddyakov, 2006]. When analyzing the concepts of research behavior and giftedness – close to the creativity of thematic fields – this contradiction can also be observed [Savenkov, 2024a; Savenkov, 2024b]. Apparently, it is essential when talking about the development of original thinking in school.

Educational programs based on the involvement of students in the problem-solving process contribute to the formation of creative thinking. This is evidenced by a meta-analysis that includes experimental studies measuring the increase in creative thinking in various ways [Scott et al., 2004]; a number of other studies, both quantitative and qualitative, also support this [Davies et al., 2013; Cremin & Chappell, 2021]. The use of heuristic techniques helps to facilitate the passage of the stages of problem solving, which paradoxically are a reproductive tool used to stimulate productive thinking [Spiridonov, 2011]. In addition to solving non-standard problems, shifting the focus from the teacher to the student, providing space for "playing" with ideas, the opportunity to discuss ideas, and delayed feedback on the inaccuracy or correctness of the method of developing a solution, are important for the formation of creativity in a school lesson. Assignments containing relevant context for students also have a high potential for fostering creative thinking.

The works of Soviet and Russian scientists theoretically and empirically justify the training of exploratory creative activity with the help of students' encounter with problem situations [Lerner, 1974; Lerner, Skatkin, 1975; Davydov, 1995; Guruzhapov, 2006; Matyushkin, 2009; Ponomarev, 1976]. The high level of students' subject knowledge (e.g., the use of generalized theoretical concepts), can be used to solve ill-structured tasks. In the Soviet-Russian pedagogical tradition, not so much attention is paid to the peculiarities of problem solving using non-subject means.

Problem-based learning and project-based learning models, originally developed for university education, contain many similarities, such as student-centeredness, posing a sufficiently complex problem related to real life, taking into account the interdisciplinary context, involving a group of students/learners in the problem-solving process [Kolmos, 2009]. The differences between these models relate to the beginning and end of work on a problem or project. There is evidence to support the fact that using both of these models leads to increased creativity. The OECD's model of a lesson aimed at fostering critical thinking and creativity contains similar characteristics to those highlighted when considering project-based learning and problem-based learning models [Vincent-Lancrin et al., 2019], namely:

- create conditions to stimulate student interest and curiosity: for example, by addressing “big questions”, student interests or real-life contexts;

- be sufficiently complex to present a cognitive challenge to students;

- contribute to the development of subject knowledge and skills;

- involve the development of a visible product (both artifacts and progress reports);

- involve students, working collaboratively on a solution;

- work on problems that can be looked at from multiple perspectives;

- leave room for the unexpected (e.g., unexpected student ideas); be willing to move away from a rigid lesson plan;

- give students time and space for reflection and feedback.

Thus, the use of project-based and problem-based tasks in subject lessons at school can be considered as a practice that promotes the development of creative thinking, and explores the difficulties of its implementation.

The theoretical framework of the study

Two theoretical concepts were used at different stages of the study.

1. Teachers' implicit perceptions of creativity and its development in school versus explicit scientific and expert perceptions.

Teachers' work involves an almost continuous response to what is happening in the classroom. Teachers usually do not have enough time to reflect on what is happening and to work consciously with their perceptions. Teachers' perceptions (beliefs, attitudes: researchers acknowledge that the construct is “confusing” in terms of the definiteness of terminology) about what learning is, what it means to learn, what school is for, the roles of teachers and students, all affect teachers' judgments, and classroom behavior, and are shaped by teachers' knowledge, life experiences, and work experience (Pajares, 1992). Although they are closely related to the knowledge that teachers have (knowledge of subject content, knowledge of child psychology, procedural knowledge of lesson management), teachers' perceptions are characterized by a significant affective component. They are able to persist despite undergoing training or encountering events that suggest the opposite of them [Fives & Buehl, 2012].

R. Sternberg [Sterngerg, 1985] proposed to divide implicit theories of creativity, which may be shared by laypersons, and explicit theories - based on research and shared by scientists. Teachers' conceptions about creativity and its developing practices are, most often, studied in the logic set by Sternberg, that is, in the context of correlating them with normative scientific knowledge and identifying the degree of agreement. In empirical studies on teachers' ideas about creativity and its development, three large groups are distinguished [Andiliou & Murphy, 2010; Bereczki & Kárpáti, 2018]: ideas about the nature of creativity; ideas about creative students; ideas about the environment and teaching practices that promote creativity.

The topic of teachers' everyday perceptions and their role in education is often discussed in domestic works [Chumakov, 2006; Popova, Meshkova, 2015; Shmakova, 2016; Larionova, Safronova, 2018]. There are also domestic studies of teachers' perceptions of creativity. Thus, many Russian teachers believe that creativity, unlike critical thinking, cannot be taught at school, it is an innate quality

[Dobryakova et al., 2018]. Research often shows that the students which are defined as creative by their teachers are not the same students who show high results in creativity tests [Ledneva, 2003; Petrova, 2016].

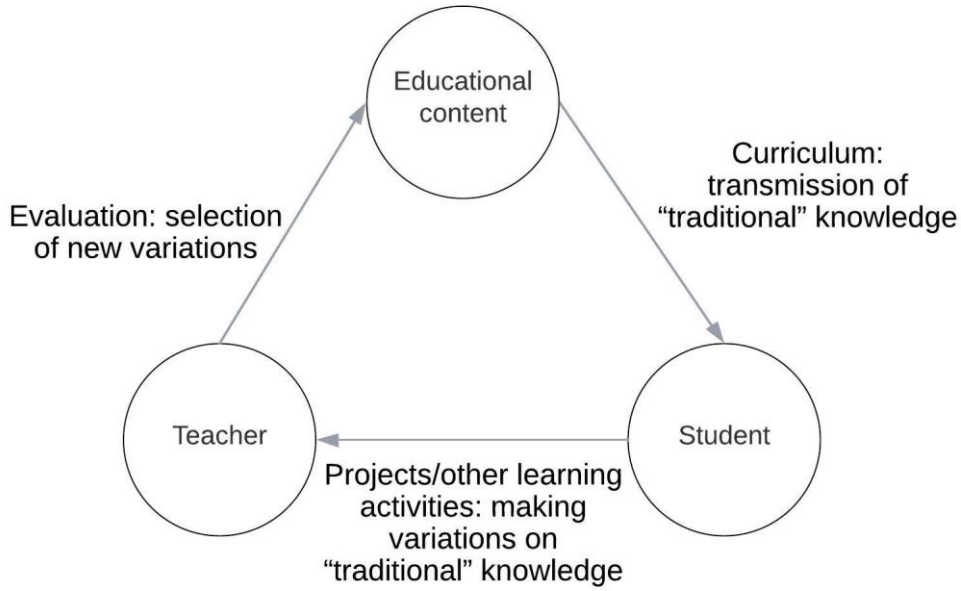
2. The Systems Model of creativity in relation to "mini-c creativity", which can be developed in education.

J. Kaufman and R. Begetto pointed out that research on creativity is largely focused on two of its manifestations: on the creativity of outstanding people demonstrating achievements in a specific area of their activity – the so-called "big" creativity (Big–C) - and on everyday creativity, which can be manifested in everyday activities to a greater or lesser extent, characteristic of each person (little-c) [Kaufman & Beghetto, 2009]. According to Begetto and Kaufman, such a dichotomy does not allow us to describe other types of creativity, in particular, creativity that is only incipient and can be developed in school education. Such creativity, which is described through small “discoveries” that are important (for now) only for a certain person, and which can be observed in learning, they call “mini-c” creativity. Neglecting 'mini-c' creativity in the learning process can lead to missed potential for development.

M. Csikszentmihalyi, who has been studying the creativity of outstanding people for a long time (the one that Kaufman and Begetto call Big-C), has developed a systems model of creativity. In his opinion, creativity arises in the connections of a system consisting of three main parts: a certain area of human culture ("domain"), a field of experts ("gatekeepers" at the gates of the domain), and the individual [Csikszentmihalyi, 2014]. Creativity arises when an individual working within a certain area of human culture comes up with a new idea, and the field recognizes this idea as valuable in order for it to be assimilated by the field. Based on numerous interviews with prominent people [Csikszentmihalyi, 2017], Csikszentmihalyi describes, in detail in his works, the factors influencing the fate of a creative idea within the framework of a systems model.

The variation of systems model that is relevant for “mini-c creativity” in school education [Csikszentmihalyi, Wolfe, 2014] contains the same three components (individual, field, domain). The “individual” is understood as a student, the “field” is understood as teachers who are able or unable to recognize the manifestations of creativity in students' ideas, and the “domain” is understood as educational material, educational content, which may or may not contain the potential for manifestation of creativity (see Figure 1).

Figure 1: Systems model of creativity in relation to education



In some studies, the systems model is used to consider barriers and conditions for the formation of creativity in education. So, in one of them [Chien, Hui, 2010], it was checked to discover to what extent teachers from Shanghai, Hong Kong and Taiwan recognize barriers from each of the components of the system model. It was revealed that teachers in Shanghai see barriers on the part of the "individual" (student) and the "field" (limitations in their own qualifications, restrictions on the part of the administration — how much it encourages innovative teaching practices), but do not consider barriers on the part of the "domain" (learning content) to be influential. Teachers in Hong Kong and Taiwan generally see more restrictions from all three components than teachers in Shanghai.

Research methodology

The purpose of the study is to empirically identify and systematize the problems that arise when teachers introduce practices that form creativity, namely project–based and problem-based learning. To achieve this goal, it is necessary to solve the following **tasks:**

- to study and systematize the existing theoretical concepts to describe the difficulties of implementing creativity-forming practices in education;

- to identify teachers' beliefs about creativity and its development at school and to evaluate their consistency with the existing scientific conceptions on these issues;

- to identify and classify possible reasons for teachers' (non)use of creativity-forming practices in the teaching process;

- identify the difficulties arising in the process of introducing creativity-forming practices in the classroom;

- evaluate the possibilities of different theoretical concepts as explanatory models to describe and systematize the difficulties of implementing creativity-forming practices in the classroom.

We were looking for answers to the following **research questions:**

1. To what extent do teachers share the ideas existing among academics and experts about creativity and the possibilities of its development within the framework of school education?

2. What opportunities and obstacles do teachers see for the introduction of creativity-forming practices into the educational process?

3. What behavior do teachers demonstrate when trying to introduce creativity-forming practices into the educational process?

Stages of empirical research

A separate research stage with its own methodology and empirical base was devoted to finding an answer to each research question (see Table 2). It is important that the thesis research is based on the data obtained within the framework of various research and applied projects of the Institute of Education of the National Research University Higher School of Economics, which had their own goals, partly overlapping with the goals of our research, partly outside its zone. This explains the fact that Table 2 traces the logic of "backward" movement of the research stages in time. Thus, we collected the data of lesson observations before anything else, and the attempts to analyze them in the context of our various research questions continued for quite a long time. However, we selected the most accurate analysis tools for this category of data when the analysis of the survey and focus group data, which were conducted later, was completed.

Table 2. Methodology of the three stages of the empirical study

Data characteristics	**Data analysis procedure**
Stage 1. A survey of teachers (N=115) from two regions of the Russian Federation who participated in training on the formation of 4C skills in March 2019. The OECD questionnaire: 8 statements about creative thinking in general and 10 statements about the development of creative thinking in school, the degree of agreement.	Data analysis: descriptive statistics. Comparison of the identified beliefs of teachers with normative scientific/expert ones.
Stage 2. 15 focus groups with teachers from one of the regions of the Russian Federation (N=144) from six schools, in 2018, on the practice of project-based assignments: teacher associations, examples of successful and unsuccessful implementation of practice; attitude to practice, possible reasons for its use or non-use.	Analysis: categorizing responses into groups, by system model components (student, teacher, instructional material); thematic coding, combining codes into categories, revising, adjusting.

Stage 3. Transcripts of video recordings of math and science lessons aimed at building 4C skills (2016-2017 academic year, megapolis of the Russian Federation). Total: 9 lessons, 38 episodes (1 episode = a group of children presents a solution to the problem + the teacher and the rest of the class react)	The lessons are based on the logic of students jointly solving a non-standard problem in a group. Analysis of teacher-student communication at the stage of solution presentation: Sociocultural discourse analysis (Mercer, 2004).

The main results of the study

Research Question 1: To what extent do teachers share existing academic and expert perceptions of creativity and opportunities for its development within school education?

Stage 1 results

During a questionnaire survey of 115 teachers, from two regions of the Central Federal District of the Russian Federation, who participated in the training on the development of 4C skills (creativity, critical thinking, communication, cooperation), the degree of agreement of teachers with 8 statements about the nature of creativity and 10 statements about its development in school was revealed. The sample consisted of 53.04% of subject teachers and 46.96% of primary school teachers. 4 out of 115 teachers are men, the rest are women. The teachers who took part in the training were from both of the central cities of these regions (45%), as well as from small towns (23%) and other settlements (32%).

The OECD questionnaire was used. Figures 2 and 3 show diagrams with the results.

Figure 2: Number (in %) of teachers who agree to varying degrees with scientific/expert perceptions of the nature of creativity.

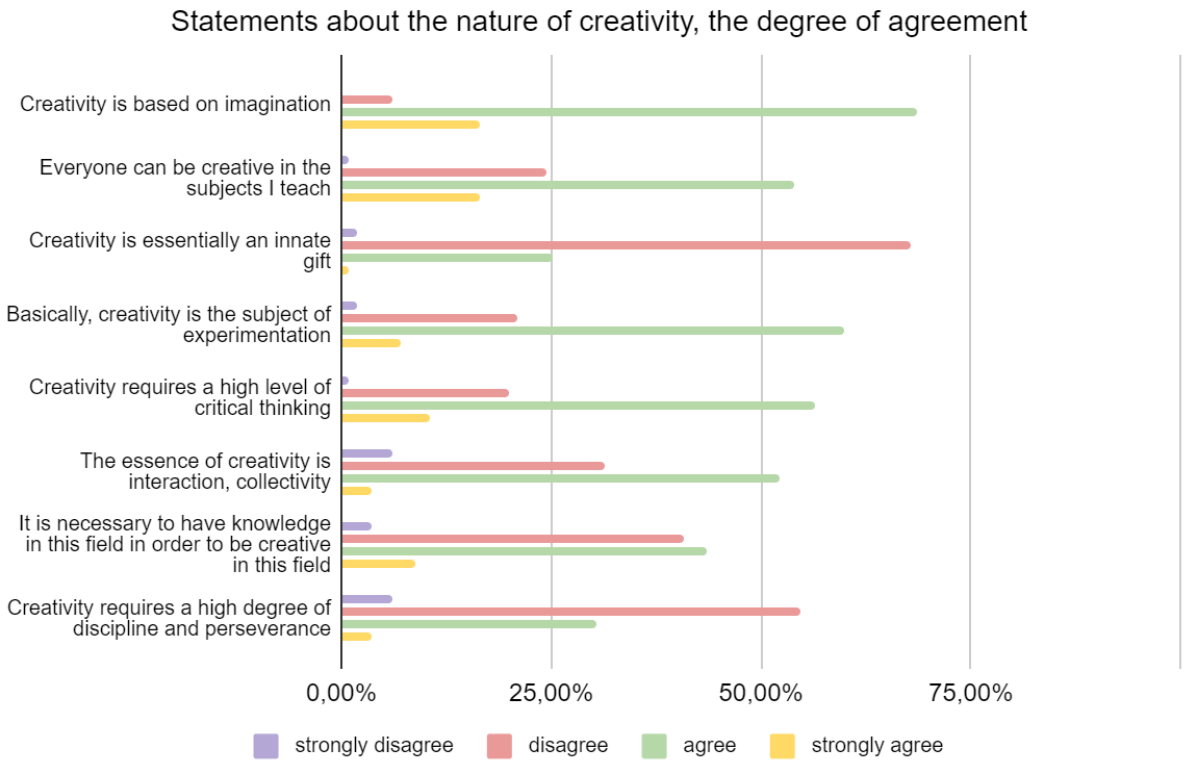
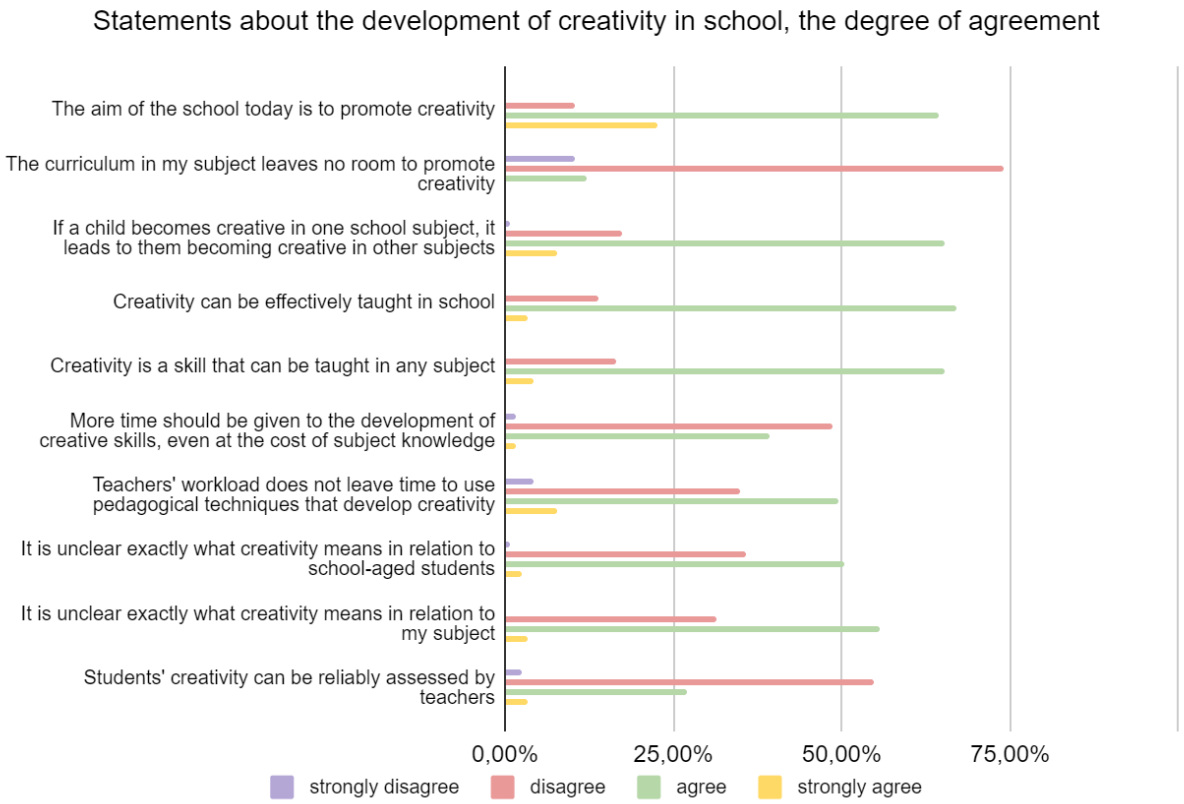


Figure 3: Number (in %) of teachers who agree to varying degrees with the statements regarding the opportunities and challenges of creativity development in schools.



A detailed interpretation of the results obtained, indicating the percentages, is contained in the text of the dissertation. Thus, at stage 1, it was revealed that teachers' ideas are more consistent with expert ones in terms of understanding various aspects of creativity as a construct (such as imagination, experimentation, the possibility of development, connection with critical thinking, social nature), and simply postulating the importance of developing creativity within school subjects. They show less agreement when it comes to specific aspects of integrating creativity-forming practices into their teaching (the ability to evaluate creativity, recognize its manifestations within a certain subject and a certain age, its combination with gaining knowledge and perseverance) in conditions of high workload. In other words, the ideas of teachers and researchers are consistent only at a basic level, but the issue of implementing the practices of creativity formation in their own teaching remains problematic.

Research Question 2. What opportunities and obstacles do teachers see for the introduction of creative practices into the educational process?

Stage 2 results

In order to identify teachers' perceptions of opportunities and obstacles to the implementation of project-based tasks, 15 focus groups were conducted in April-May 2018 in six schools in one of the regions of the Central Federal District of the Russian Federation. Four schools are located in urban areas, two are rural. 144 teachers of these schools (8 of them are men) participated in the focus groups. School principals independently decided which teachers to invite to participate. In the case of rural schools, most of their teachers were involved in the conversation. Based on the focus group data, we were able to use open thematic coding and categorization to identify a number of implementation success factors, grouping them into three components of the systems model of creativity: student, teacher, and curriculum.

Contributions to the success of project implementation in school on the part of the student (“individual"):

1) the student's interest, curiosity, "passion" for the project topic;

2) independence of the student in work, desire to do it himself/herself, readiness for intensive work; includes such a subcategory as external motivation in the form of project work contests, Olympiads, etc. (quote from a focus group with subject teachers: "Now I have children who did not pass the district <conference/project presentation>, they had mistakes there, but they came to me and said that we are already starting to work further. They are motivated, here this year they could not pass, and now for next year in the summer they will work, and in the fall, they will come and we will finish");

3) preliminary level of basic skills (for example, ability to assign roles in the process of group work, a quote from a focus group with elementary school teachers: "And then they made a folding book, somehow folded it, glued it, that is, they were the authors of this book, illustrators and editors. It was so interesting for them, they spent several days, several lessons doing it all... The most important thing was that they distributed their work. You will be this one, you will be that one"); includes such a subcategory as parents' help in case of insufficient level of skills.

Teacher contribution to the success of project implementation in the school ("field"):

1) experience of conducting or observing projects and assessment of this experience as positive or negative (for example, a subject teacher speaks about the negative experience of observing the implementation of project activities at school: "We, teachers, we have to teach something at school, but I do not understand what educational purpose the project should pursue, what I see does not teach anything. Only to cheat"); includes such a subcategory as the externally recognized value of project work;

2) sufficient level of knowledge or qualification of the teacher; includes such subcategories as the ability to facilitate, "guide" students' work on projects (for example, an elementary school teacher reflects on this: "With the help of the teacher, perhaps, <child> understands what purpose the project should pursue - although, perhaps, the child himself can say why he wants to do it. Next comes what the teacher can help with. What the child gets himself first of all, and then some help from outside"), - and the ability to give pupils a certain space of freedom, for example, the possibility of choosing a topic or a way of working on the project.

Contribution to the success of project implementation in the school from the curriculum ("domain", cultural area):

1) the influence of the subject and the traditions of conducting projects in that subject (for example, a math teacher complains that it is difficult to come up with a project topic for her subject in general, and she managed to find it only by looking at the interdisciplinary connections between math and linguistics);

2) connection of the project topic to real life (the child's extracurricular interests or putting the child in the role of an adult);

3) sufficient amount of time to work on projects;

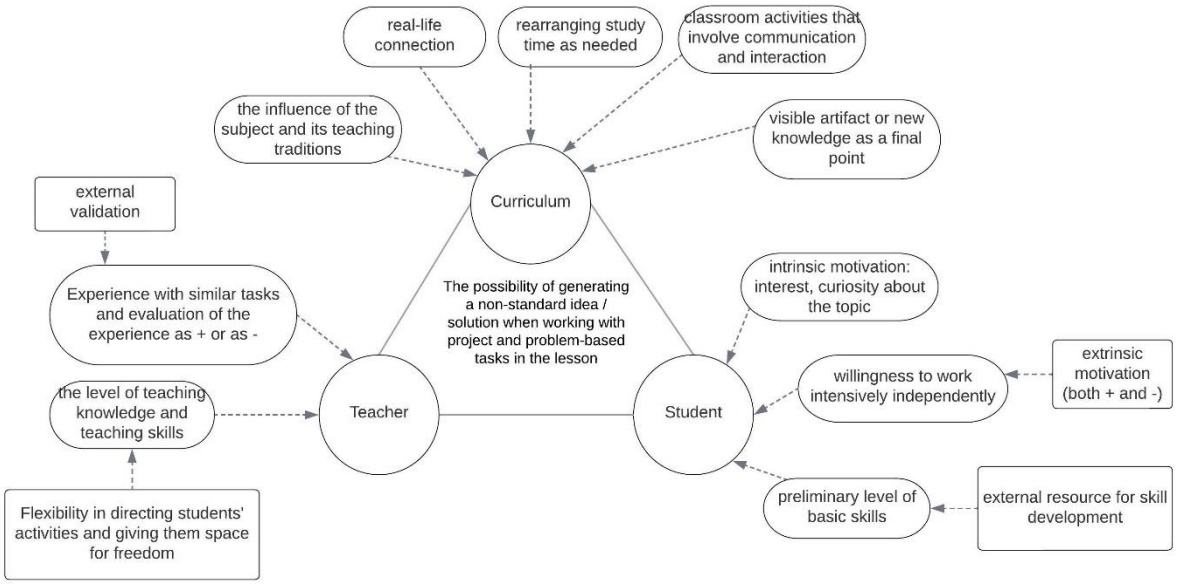
4) realization of pupils' need for communication when working on the project (a quote from a focus group with elementary school teachers: "And so they sat down

together, one group here, the second group there, the third group there, and did all sorts of ... discussion, what is important to take, what is not important to take, where to stick what, how to write, well, let's say, measurements <...> then they made conclusions - which ones are more successful, which ones are not, what are the pros, what are the cons. <...> And then we presented them to each other. It is very interesting, informative, and group work, and they learn something new. And they start to communicate");

5) the possibility to get the project result in the form of a product or to comprehend the obtained new knowledge as a product (from a focus group with subject teachers: "There is a lot of fantasy here, so different from the scientific point of view. <...> we took the lighting of the classroom, made a spectral analysis, measured these windows, the illumination was calculated there, depending on the lamps, such a lamp, such a lamp, and in the end, we found out that we have generally wrong lighting, there is something background everywhere, we went to the director, <said> that it is impossible for us to study at all, this is the so-called product we got. Then we went to the mayor of the city, and it all started spinning").

We also presented the factors identified by the three components in the form of a visual scheme (Figure 4), somewhat summarizing their formulations.

Figure 4: Factors describing conditions and obstacles for successful implementation of project and problem-based tasks.



Research Question 3: What behavior do teachers demonstrate when trying to introduce creativity-forming practices into the educational process?

Stage 3 results

For this part of the study, we used the data collected through video recording and further transcribing of lesson episodes that were conducted as part of the 4C project (the Russian part of the OECD Center for Educational Research and Innovation's project "Developing Creativity and Critical Thinking at School") in 2016-2017. [Avdeenko et al., 2018]. For the project, a series of lessons in mathematics and science for primary (3-4 grades) and secondary (8-9 grades) schools based on the OECD lesson model was developed by a number of subject matter experts. From November 2016 to May 2017, individual teachers from 10 schools in a Russian megapolis implemented the developed lessons, while the researchers observed the implementation process.

Each lesson developed followed the logic of solving non-standard problems in a group. At the beginning of the lesson, the teacher presented the students with an unusual task; having accepted the problem, the students worked out the solution in the group, using the group work sheet as a “navigator”; in the second part of the lesson, the groups presented their solutions in front of the teacher and the rest of the

class. The process of presenting each group's solutions was recorded by the researchers on a smartphone camera. These recordings were later transcribed; the final text transcripts are the data we analyzed.

As part of the dissertation research we used transcripts of "Seasons" lesson episodes in elementary school and "Banks and Deposits" lesson episodes in secondary school. Both of these designs meet the lesson criteria developed by the OECD Center for Innovation in Education.

To analyze the transcripts of 38 episodes of 9 lessons (15 episodes of 4 lessons “Seasons” and 23 episodes of 5 lessons “Banks and Deposits”) conducted by different teachers from different schools, we used the methodology of sociocultural discourse analysis [Mercer, 2004], developed on the basis of L.S. Vygotsky's ideas about the social nature of learning and M.M. Bakhtin's ideas about the dialogical nature of culture. This method is used to investigate how instructional dialog can be directed toward achieving certain educational outcomes, especially those related to thinking. We analyzed teachers' evaluative statements, questions, including “leading” questions, requests to clarify their position or justify statements, attempts to reformulate students' words, etc.

As part of the initial analysis, we labeled teachers' remarks (and partially students' remarks, where they are involved in evaluating their classmates' response) using a list of techniques developed by Mercer based on the concept of triads of instructional communication (teacher's question - student's response - addition or feedback from the teacher) [Mercer, 1995], as a means for initial understanding of the episode.

We then described the lesson episodes, focusing on the connections of the components of the systemic model of creativity (student, teacher, and instructional content) as manifested in the communication of the solution presentation phase of the lesson. After conducting an initial analysis and summarizing the results, we categorized the types of teacher reactions.

An analysis of 38 episodes of 9 lessons showed that the behavior of teachers during the presentation of solutions to non-standard problems by students differs in the degree and quality of "intrusion" into children's answers. First of all, some of the teachers refrain from making judgments, playing a kind of "conductor" role in the process: they make sure that the group has told everything that was required, and other groups have commented on the response if they had any comments. Secondly, there are teachers who give hints, ask leading questions (moderately or persistently) about how to change the decision, referring to details that students did not take into account or comparing their approach with what other groups demonstrated. Finally, some teachers carefully study whether the subject component was taken into account in the answer, whether everything is correct in terms of using the subject potential of the task, the necessary subject knowledge and skills to solve a non-standard problem.

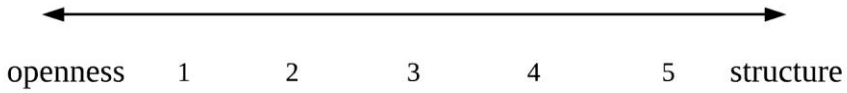
Teachers can "expose" various obstacles to the final acceptance of ideas. Some of them intensively "defend" the subject, some do not defend at all, some are ready to accept students' answers, but first they subject them to verification. The way teachers test the value of an answer also varies from a subject point of view. Some of the teachers express doubts, saying that the answers are generally correct, but not interesting or original enough. Some teachers try to double-check everything from the point of view of scientific or mathematical correctness and show unwillingness to accept the answer if something is wrong.

Using the concept of finding a balance between openness and structure as an important pedagogical strategy for fostering creativity, we analyzed the extent to which a teacher tends to lean towards one of these poles. There are teachers who, through their behavior, create a safe space for the expression of ideas, but do not give students any feedback. Some teachers explicitly (and sometimes quite harshly) evaluate students' responses, and this can be frustrating or disappointing to children, but can also be perceived as a cognitive challenge. Many teachers show "median" reactions, for example, gently, without insistence, pointing out that the answer could

be more interesting and asking to look for alternative solutions, or calmly indicating that it would be nice to double–check the solution in terms of its effectiveness.

Summarizing the results of this part of the study, we developed the idea of a scale or continuum between the poles of openness and structure (Figure 5). Different points on this continuum mean generalized types of reactions.

Figure 5. Continuum between "openness" and "structure".



The description for each of the points marked with numbers is an average: the teacher's behavior at a given point may either coincide with that point or represent some intermediate variant that is in the segment between the two points:

1. The teacher gives the students the opportunity to present the solution, but does not engage in a discussion about it, makes almost no evaluative comments. In this case, the students can express their ideas quite freely, but do not receive any feedback from the teacher (while possibly receiving it from the class).

2. After the presentation, the teacher gives brief feedback on the value of the solution. The teacher does not try to question the students' response or "direct" the students to think about the problem from another perspective. As a consequence, students have the opportunity to describe their idea quite freely and get some feedback on its strengths and weaknesses to consider in the future.

3. After or during the presentation, the teacher tries to "guide" the students: questioning the answer, asking tricky questions, etc. This behavior can be perceived as a kind of support (scaffolding) for students, thanks to which they can come up with more interesting solutions. Students are given the opportunity to express their

ideas, but also through teacher questioning they can think of alternative approaches to the solution. Although this strategy is generally promising, some students may perceive even a small number of comments or questions as discouraging.

4. During the presentation, the teacher tries to "steer" the response toward the subject matter potential of the solution so that the students test their approach to the task with subject matter knowledge. The teacher will then recognize an answer as "good" or "promising" if it has a subject matter component. Although students may feel uncomfortable that their initial ideas are being challenged, they are given the opportunity to deepen their subject knowledge and skills and see their benefit in working with a nonstandard task.

5. During the presentation, the teacher is quite explicit about whether the approach to the task is correct. He or she approves if the students work with a problem that has the potential for creativity in a way that is almost familiar to them, as if it were a subject matter task with a clearly defined algorithm for solving it. In such a case, subject knowledge and skills are mastered and deepened, but there is no space for creativity formation.

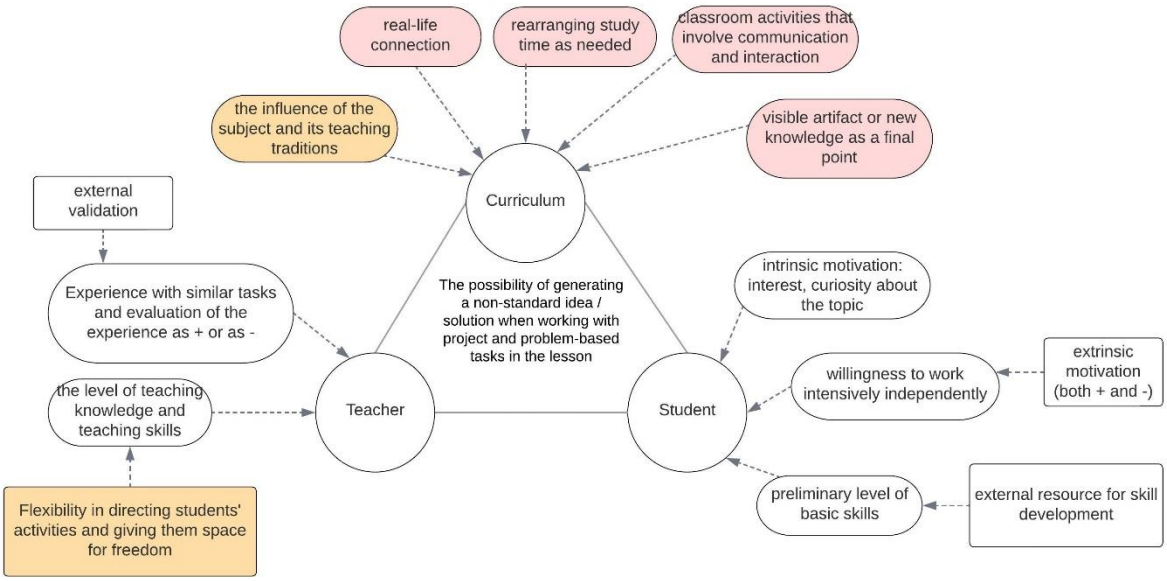
On the continuum we have developed, it is impossible to mark the point at which teacher's behavior when presenting students with a solution to a non-standard problem will serve the purpose of creativity development to the greatest extent. However, we can state with a fairly high degree of certainty that a shift to both "poles" of this scale is risky, albeit in different ways. The pole marked by point 5 (complete, absolute "structure") means that the task loses openness to different ways of solution, because the teacher expects a completely definite answer, which is arrived at in a completely definite way. Thus, the goal of forming creative thinking becomes lost here. The pole marked with point 1 (full, absolute "openness") means that the teacher accepts all answers without checking them for their strength and value - for example, in terms of taking into account subject knowledge and the correct application of subject skills. In this case, not only the subject matter

component of the assignment is lost, but also the educational potential of the practice itself, since students do not receive feedback from the teacher.

The developed continuum helps to draw attention to the difficulties of implementing creativity-forming practices that arise at the micro-level of student-teacher communication in the classroom. When students try to solve a non-standard, loosely structured problem, it may be more difficult than usual for the teacher to predict their possible answer. Therefore, the teacher has to react relatively spontaneously at the moment of presenting the solution. This response may be influenced by various factors, such as the teacher's personal tolerance for uncertainty, the teacher's history with the class, and their skills in facilitating the discussion. However, this part of our study shows that subject content can also play a significant role in this process as it is related to the nature of learning in school.

Describing above the results of stage 2, based on the analysis of focus group data, we presented a scheme of factors potentially influencing the implementation of project and problem-based tasks in the lesson, grouped around three actors of the learning process: student, teacher, and curriculum. If we revisit the scheme with the results we obtained after analyzing the lesson transcripts, we are able to see some differences. The lesson model proposed by the OECD, on the basis of which the assignments "Seasons" and "Banks and Deposits" were developed, touches in one way or another on all the characteristics of the learning content we listed in the diagram (influence of the subject matter, connection of the assignment to real life, flexibility of teaching time, collaborative work, product development). Judging by the results we obtained in Step 3, when the curriculum in the classroom meets all the criteria suitable for creative thinking, the flexibility of the teacher's behavior in giving students the space to express their ideas begins to play a special role. At the same time, the teachers' behavioral repertoire is found to be related to the extent to which the solution is relevant to the subject matter context.

Figure 6. Factors of successful implementation of project and problem-type tasks in the learning process: change of educational content.



In Figure 6, we presented an updated scheme of implementation success factors: when the instructional content is changed (elements shaded in pink), the connection between the teacher's ability to be flexible in guiding students' responses and the subject content of the task is actualized (elements shaded in orange).

Comparing the capacity of two theoretical frameworks to explain implementation complexities

An additional, but important result of the dissertation research was a comparison of the possibilities of different theoretical frameworks to explain the difficulties of implementing creativity-forming practices. At stage 1 we used the concept of teachers' implicit perceptions of creativity and its development in school, and at stages 2 and 3 we used the systems model of creativity. It was found that using the concept of teachers' implicit perceptions from this point of view has certain limitations. It is problematic to describe all the nuances that arise when introducing creativity-forming practices in teaching. The systemic model of creativity as a concept that focuses not only on teacher attitudes but also on the three components of implementation (student, teacher, and instructional content) provides more opportunities to analyze the problems that arise in implementation and find connections between them. The three-component systems model makes it possible to focus almost entirely on the learning activity as an implementation event. The

"external" components, such as parental support, teacher motivation, school administration, and school climate, do not disappear within this lens, but begin to play a peripheral role. It is conceivable that their functions of facilitating or hindering the implementation of creative thinking practices could be transferred to other actors.

Statements put forward for defense

1. It is more productive to use a systems model of creativity as a theoretical framework for identifying factors that may influence the implementation of creativity-forming practices in the classroom than a nomenclature-based identification of implicit teacher perceptions of barriers and stimuli, since such a model allows us to show complex relationships between significant factors and subsequently suggest more targeted ways of overcoming problems.

2. The content of education is an important component of finding a gap in the implementation of creative practices. Teachers may simultaneously share the idea of the importance of developing creativity based on the material of school subjects and not see opportunities for the real use of existing practices of its formation on the basis of the subject content fixed in the curriculum.

3. The factors influencing the implementation of creativity-forming practices can be divided into three groups regarding the components of the systems model of creativity - teacher, student and curriculum in their interrelation. Among the non-obvious, little-mentioned factors we can single out 1) the influence of the subject; 2) the preliminary level of students' basic skills; 3) the impact on students' autonomy by means of external motivation; 4) the teacher's flexibility in providing students with the space of freedom.

4. Teacher's behavior in the context of creativity formation can be characterized using the "openness – structure" continuum. When approaching the "structure" pole, the role of the subject content and determining the students' response as correct or incorrect increases. When approaching the "openness" pole, there is an increasing possibility for students to display their imagination without taking into account various limitations imposed by both the subject matter and the learning situation as a whole.

Theoretical significance and scientific novelty of the study

In the framework of the study, the concept of the systems model of creativity, originally developed by M. Csikszentmihayi to describe the factors influencing the creativity of outstanding people was refined in the context of the conversation about creativity in education. A complex, holistic model of possible determinants of implementation of practices forming creative thinking in a school lesson was proposed.

It was found that while a satisfactory level of coherence between current scientific conceptions of creativity and teachers' conceptions of creativity has been achieved, teachers may still have serious uncertainty about what tools are available to support the development of creativity in the classroom and how to reconcile this with the acquisition of subject knowledge.

Among the factors potentially influencing the implementation of creativity-forming practices in the learning process, the following factors, which were relatively little mentioned in previous studies, were identified: the influence of the subject matter; the preliminary level of students' basic skills; the impact on student autonomy through external motivation; and the teacher's flexibility in providing students with a space of freedom. For another part of the formulations (e.g. "individual differences between students", "traditional teaching methods", "lack of preparation/training") the context was clarified.

On the basis of lesson observation, the difficulties arising when trying to introduce creative thinking practices into the teaching process at the micro-level of communication between teachers and students were analyzed. For the first time on empirical material possible types of teachers' behavior with regard to reaction to students' presentation of non-standard problem solving are described and systematized.

Practical significance of the study

The results of the dissertation research can be used in formulating recommendations for teacher training at professional development courses and in

the workplace, including within the framework of professional learning communities using lesson study technology.

Based on the identified determinants of implementation, it is possible to further empirically investigate the effectiveness of different types of implementation of creativity-forming practices. For example, in a quasi-experimental study it is possible to identify classes or whole schools in which project and problem-based tasks are implemented taking into account the conditions we have described. Then, it is useful to evaluate the effectiveness of such a method of implementation in comparison with the teachers undergoing a separate training without further efforts to remove barriers to implementation. Also, based on the results obtained, it is possible to develop tools for assessing readiness to implement creativity-forming practices in schools and to supplement existing tools, for example, questionnaires used in monitoring.

The proposed openness-structure continuum can be further tested on other data and, in particular, used for lesson observations. The generalized types of reactions identified can serve as a basis for scripted questionnaires aimed at assessing teacher behaviour.

References

1. Abdulaeva O.A., Loginova O.B., Yakovleva S.G. What difficulties do teachers experience in the process of formation and evaluation of creative thinking? // Otechestvennaya i zarubezhnaya pedagogika. 2023. T. 2, № 1 (90). C. 184-200. doi: 10.24412/2224–0772–2023–90–184–200.
2. Avdeenko, N.A., Denischeva, L.O., Krasnyanskaya, K.A., Mikhailova, A.M., Pinskaya, M.A. Creativity for everyone: implementation of the development of 21st century skills in the practice of Russian schools // Voprosy obrazovaniya. - 2018. №4. - C. 282-304.
3. Adamskiy, A. I. Public-pedagogical movement in domestic education in the 80-90-ies of the XX century. : abstract of the dissertation. ... candidate of pedagogical sciences: 13.00.01 / Institute of the Theory of Education and Pedagogy of the Russian Academy of Education. - Moscow, 2003. - 24 c
4. Guruzhapov V.A. On the phenomenology of setting and solving a learning task in developing learning: an attempt to integrate the ideas of V.V. Davydov and J. Dewey // Cultural and Cultural Problems in Developmental Learning. Davydov and J. Dewey // Cultural-Historical Psychology. 2006. Vol. 2. No. 2. C. 82-88. https://psyjournals.ru/journals/chp/archive/2006_n2/Gurujapov
5. Davydov V.V. About the concept of developing learning. Collection of articles. - Tomsk: Peleng, 1995.
6. Dobryakova M. S., Novikova E. G., Yurchenko O. V. Skills of the XXI century in the Russian school: the view of teachers and parents. MOSCOW: NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS. 2018. URL: https://publications.hse.ru/books/228987019
7. Innovation movement in Russian school education. Moscow: Parsifal, 1997. Under the general editorship: E.D. Dneprov, A.G. Kasprzhak, A.A. Pinsky
8. Korshunov I. A., Lubnikov S.. V., Shirkova N. N. Adult education and training for the development of problem-solving skill // Education and Science. 2023. T. 25. № 6. C. 166-192.
9. Larina G. S., Kapuza A. V. Cognitive processes in teaching: connection with

students' achievements in mathematics // Education Issues. 2020. T. 1. № 1. C. 70-96.

10. Larina, G.S., Markina, V.M. (2019) Interaction in the classroom / In Vn. (Non)ordinary schools: diversity and inequality. Edited by M. Karnoy, G.S. Larina, V.M. Markina. Moscow: Izd. house of the Higher School of Economics. C. 38-61.
11. Larionova, L.I., Safronova, M.A. Implicit representations of intellectually gifted personality //Psychology. Historical and critical reviews and modern research. - 2018. - T. 7. - № 1A. - C. 76-82.
12. Lerner I.Ya. Problem-based learning. M., Znanie, 1974.
13. Lerner I.Y., Skatkin M.N. (1975). Methods of teaching / in Danilov M.A. et al. Didactics of secondary school. Some problems of modern didactics. Textbook for students of pedagogical institutes. Edited by M.A. Danilov and M.N. Skatkin. Moscow, Prosveshchenie, 1975, pp. 146-185.
14. Loginova O. B. B., Avdeenko N.A., Yakovleva S.G., Sadovshchikova O.I. Project "Monitoring the formation of functional literacy. Creative thinking: first results // Domestic and foreign pedagogy. 2020. T. 2, № 2 (70). C. 132-154.
15. Matyushkin A. M. Problem situations in teaching // Matyushkin A.M. Psychology of thinking. M. Problem situations in learning // Matyushkin A.M. Psychology of thinking. Thinking as the resolution of problem situations. Edited by A.A. Matyushkina. M. KDU, 2009. p. p. 134-170.
16. Mikhailova A.M., Pinskaya M. A. Practices changing teachers' perceptions: ICT in the lessons forming critical and creative thinking // Psychological Science and Education. 2022. T. 27. № 6. C. 36-45.
17. Petrova, S.O. Teachers' perceptions of children's creativity and its development in learning activities //Psychological Studies. - 2016. - №9(46). - C. 10.
18. Pinskaya, M.A., Ponomareva, A.A. What teachers can do and how they assess their capabilities (according to the TALIS study) / in Russian teachers in the

light of research data, National Research University Higher School of Economics, 2016. p. p. 111-126. 111-126.

19. Poddyakov A.N. Research behavior: cognitive strategies, assistance, opposition, conflict. Moscow: Erebus, 2006.
20. Ponomarev Y.A. Psychology of creativity and pedagogy. M., "Pedagogy", 1976.
21. Popova, L.V., Meshkova, N.V. Representations of administrators of educational institutions about gifted students //Psychological Science and Education. - 2015. - T. 7. - № 1. - C. 97-110.
22. Reshetnikova O. A. (2019). Approaches to the assessment of meta-subject results and creativity in the control measurement materials of the state final attestation. Pedagogical measurements, (2), 5-8.
23. Savenkov A.I. Psychology of child giftedness: textbook for secondary vocational education, 2nd ed. - Moscow: Yurait, 2024. Chapter 3. Modern concepts of giftedness, pp. 46-77. Chapter 5. Gifted Children. Peculiarities of Mental Development, pp. 94-138.
24. Savenkov, A. I. Pedagogy. Research approach: textbook and workshop for universities / A. I. Savenkov. - 2nd ed., revised. and ext. - Moscow: Yurait Publishing House, 2024.
25. Safronov, P.A., Sidorova, K.D. (2016) Subjective innovations: pedagogical movement in the conditions of radical social change // Educational Studies Moscow. № 3. C. 224-237.
26. Spiridonov V.F. Heuristic strategies in the cultural context // Creativity: from biological bases to social and cultural phenomena / Edited by D.V. Ushakov. Moscow: Institute of Psychology, Russian Academy of Sciences, 2011. C. 318-327.
27. Tyumeneva Y. A., Kapuza A. V. Reliability and structure of the social desirability scale TALIS: evaluation within the framework of modern testing theory // Public Opinion Monitoring: Economic and Social Change. 2016. № 16. C. 14-29.

28. Universal competencies and new literacy: from slogans to reality / edited by M. S. Dobryakova, I. D. Frumin; with the participation of K. A. Barannikov, N. Ziel, J. Moss, I. M. Remorenko, Y. Hautamäki; National Research University Higher School of Economics. - Moscow: Izd. dom Higher School of Economics, 2020. https://ioe.hse.ru/mirror/pubs/share/385631158.pdf
29. Federal Institute for the Assessment of Education Quality / Report on the results of the TALIS 2018 (Teaching and Learning International Survey). https://fioco.ru/talis 2019
30. Frumin I.D., Dobryakova M.S., Barannikov K.A., Remorenko I.M. Universal competencies and new literacy: what to teach today for success tomorrow. Preliminary Conclusions of the International Report on the Trends of School Education Transformation. MOSCOW: NATIONAL RESEARCH UNIVERSITY HIGHER SCHOOL OF ECONOMICS. 2018. 28 с. URL: https://publications.hse.ru/books/228988538
31. Csikszentmihayi M. Creativity. Flow and psychology of discoveries and inventions. M.: Career Press, 2017.
32. Chumakov, M.V. Psychological content of everyday representations of the emotional and volitional sphere of personality //Psychological Science and Education. - 2006. - №1. - С. 63-68.
33. Shmakova, V.A. Implicit representation of "self-development" in the consciousness of subjects of educational and professional activity // Vestnik Saratov Regional Institute of Education Development. - 2016. - №4 (8). - С. 49-52.
34. Amabile, Teresa M., and Julianna Pillemer. "Perspectives on the Social Psychology of Creativity." Journal of Creative Behavior 46, no. 1 (2012): 3–15.
35. Andiliou, A., & Murphy, P. K. (2010). Examining variations among researchers' and teachers' conceptualizations of creativity: A review and synthesis of contemporary research. Educational Research Review, 5(3), 201–219. https://doi.org/10.1016/j.edurev.2010.07.003

36. Avery, L., Charman, S.J., Taylor, L. et al. Systematic development of a theory-informed multifaceted behavioural intervention to increase physical activity of adults with type 2 diabetes in routine primary care: Movement as Medicine for Type 2 Diabetes. Implementation Sci 11, 99 (2015). https://doi.org/10.1186/s13012-016-0459-6
37. Bereczki, E. O., & Kárpáti, A. (2018). Teachers' beliefs about creativity and its nurture: A systematic review of the recent research literature. Educational Research Review, 23, 25–56. https://doi.org/10.1016/j.edurev.2017.10.003
38. Chien, Ch. & Hui, A. (2010) Creativity in early childhood education: Teachers' perceptions in three Chinese societies. Thinking Skills and Creativity. Vol. 5. P. 49-60. https://doi.org/10.1016/j.tsc.2010.02.002.
39. Cremin, Teresa & Kerry Chappell (2021) Creative pedagogies: a systematic review, Research Papers in Education, 36:3, 299-331, DOI: 10.1080/02671522.2019.1677757
40. Cropley, Arthur (2006) In Praise of Convergent Thinking, Creativity Research Journal, 18:3, 391-404, DOI: 10.1207/s15326934crj1803_13
41. Csikszentmihalyi, M. (2014) Society, Culture, and Person: A Systems View of Creativity. In: The Systems Model of Creativity. P. 47–61. https://doi.org/10.1007/978-94-017-9085-7_4.
42. Csikszentmihalyi, M., Wolfe, R. (2014) New Conceptions and Research Approaches to Creativity: Implications of a Systems Perspective for Creativity in Education. In: The Systems Model of Creativity. P. 161–184. https://doi.org/10.1007/978-94-017-9085-7_10.
43. Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013). Creative learning environments in education—A systematic literature review. Thinking skills and creativity, 8, 80-91.
44. Fives, H., & Buehl, M.M. (2012). Spring cleaning for the "messy" construct of teachers' beliefs: What are they? Which have been examined? What can they tell us? In K. R. Harris, S. Graham, T. Urdan, S. Graham, J. M. Royer, & M. Zeidner (Eds.), APA handbooks in psychology. APA educational

psychology handbook, Vol. 2. Individual differences and cultural and contextual factors (pp. 471-499). Washington, DC, US: American Psychological Association. DOI: 10.1037/13274-019.

45. Framework for the Assessment of Creative Thinking in PISA 2021: Third Draft. OECD, 2021. URL: https://www.oecd.org/pisa/publications/PISA-2021-creative-thinking-framework.pdfКларин, 2016. С. 369-473
46. Guilford, J.P. (1973). Characteristics of creativity, Springfield, IL: Illinois State Office of the Superintendent of Public Instruction, Gifted Children Section.
47. Guilford, J. P. (1950). Creativity. American Psychologist, 5(9), 444–454. https://doi.org/10.1037/h0063487
48. Kaufman, J. C., & Beghetto, R. A. (2009). Beyond Big and Little: the Four C model of creativity. Review of General Psychology, 13(1), 1–12. https://doi.org/10.1037/a0013688
49. Kolmos, A. (2009). Problem-Based and Project-Based Learning. In: Skovsmose, O., Valero, P., Christensen, O.R. (eds) University Science and Mathematics Education in Transition. Springer, Boston, MA. https://doi.org/10.1007/978-0-387-09829-6_13
50. Lucas, B. (2016). A Five-Dimensional Model of Creativity and its Assessment in Schools. Applied Measurement in Education, 29(4), 278–290. https://doi.org/10.1080/08957347.2016.1209206
51. Mednick, S. (1962). The associative basis of the creative process. Psychological Review, 69(3), 220–232. https://doi.org/10.1037/h0048850
52. Mercer, N. (1995). The Guided Construction of Knowledge: talk amongst teachers and learners. https://openlibrary.org/books/OL1100333M/The_guided_construction_of_knowledge
53. Mercer, N. (2004). Sociocultural discourse analysis: analysing classroom talk as a social mode of thinking. Journal of Applied Linguistics, 1(2), 137–168. https://doi.org/10.1558/japl.2004.1.2.137

54. New Vision for Education: Fostering Social and Emotional Learning through Technology. World Economic Forum, 2016. 36 p. URL: https://www.weforum.org/reports/new-vision-for-education-fostering-social-and-emotional-learning-through-technology
55. Nilsen P. Making sense of implementation theories, models and frameworks. Implement Sci. 2015 Apr 21;10:53. doi: 10.1186/s13012-015-0242-0. PMID: 25895742; PMCID: PMC4406164.
56. Pajares, M.F. (1992). Teachers' Beliefs and Educational Research: Cleaning Up a Messy Construct. Review of Educational Research, 62(3), 307–332.
57. Scott Ginamarie, Lyle E. Leritz & Michael D. Mumford (2004) The effectiveness of creativity training: A quantitative review, Creativity Research Journal, 16:4, 361-388, DOI: 10.1080/10400410409534549
58. Sinclair, J., & Coulthard, R. (1975). Towards an analysis of discourse : the English used by teachers and pupils.
59. Sternberg, R. J. (1985). Implicit theories of intelligence, creativity, and wisdom. Journal of Personality and Social Psychology, 49(3), 607-627.
60. Sternberg, R. J. (2012). The assessment of creativity: An investment-based approach. Creativity research journal, 24(1), 3-12.
61. Sternberg, R. J., & Lubart, T. I. (1999). The concept of creativity: Prospects and paradigms. In R. J. Sternberg (Ed.), Handbook of creativity (pp. 3–15). Cambridge University Press.
62. Torrance, E. P. (1966) Torrance Tests of Creative Thinking (TTCT)[Database record]. APA PsycTests. https://doi.org/10.1037/t05532-000
63. Vincent-Lancrin, S., Gonzalez-Sancho, C., Bouckaert, M., de Luca, F., Fernandez-Barrerra, M., Jacotin, G., Urgel, J., & Vidal, Q. (2019). Fostering Students' Creativity and Critical Thinking: What it Means in School. Educational Research and Innovation, OECD Publishing, Paris