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**TEACHING SCHOOL STUDENTS THE LEARNING STRATEGIES  
IN A MODERN EDUCATIONAL ENVIRONMENT**

**SUMMARY OF THE THESIS**

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1. Chernyshova N.A. Self-regulated learning strategies and lifelong learning skills: ideas developed in American scientists' theories. // Pedagogy. 2019. No. 1
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3. Chernyshova N.A., Romanova O.A. Relationships between using modern ICT educational resources and schoolchildren's academic performance // Science for Education Today. 2020. Vol.10, No. 6, pp. 162-180.

Other publication:

1. Chernyshova N.A. The conditionality of schoolchildren's choice of teaching strategies by the cultural capital of the family. // Standards and Monitoring in Education. 2018. Vol. 6, No. 6, pp. 13-19.

The research results were also presented at the international XXVIII Conference of CESE "Identities and Education: Comparative Perspectives in an Age of Crisis", Nicosia, Cyprus (May 2018).

## 1. Research Terminology and List of Abbreviations

Definitions of terms in relation to the research are based on the analysis of scientific works presented in Chapter 1 hereof.

### 1. General research terminology:

**Educational environment** – a special form of school students' communication with each other and with other participants in the educational process through a system of educative and educational influences that explicitly or indirectly implement pedagogical attitudes and include goals, tasks, forms, methods and teaching aids [Rubtsov, Ivoshina, 2003].

**FSES GE** – federal state educational standards of general education.

**ICT** – information and communication technologies.

**Learning** – a special type of the cognitive activity of a subject with the aim of assimilating a certain set of knowledge, competences, and intellectual skills [Vygotsky, 2003].

**Motivation** – the desire for something, the need for something [Maslow, 1954].

**PISA** – Program for International Student Assessment, an international comparative study of the education quality in reading, mathematical and natural science literacy, held every 3 years among 15-year-olds.

**Reflection** – a set of actions or mental processes aimed at analyzing the experience gained [Dewey, 2008].

**Teaching** – a purposeful process of organizing school students' activities to acquire knowledge, skills, abilities and competence, gain experience of activity, develop abilities, gain experience in applying knowledge in everyday life and form school students' motivation to receive education throughout their lives [Federal Law "On Education in the Russian Federation" dated December 29, 2012 No. 273-FZ].

**Teaching aids** – devices, equipment, including sports equipment and inventory, instruments (including musical), educational-visual materials, computers, information and telecommunication networks, hardware, software and audiovisual means, printed and electronic educational and information resources and other material objects necessary for the organization of educational activities [Federal Law "On Education in the Russian Federation" dated December 29, 2012 No. 273-FZ].

**UEA** – universal educational activities; the ability of the educational activity subject for self-improvement and self-development through the acquisition of social experience [Asmolov, 2008].

**Universal competences** – metasubject skills not limited to a specific area of knowledge [Frumin, Dobryakova et al., 2018].

### 2. Strategies and learning self-regulation:

Today, both Russian and foreign educational researchers distinguish several types of strategies: learning, training, informative, educational, cognitive and metacognitive. At the same time, certain disparities in the intended meanings of these concepts occur, which makes it difficult to interpret them unambiguously and

make a conclusion about their synonymy and/or establish a correlation between them.

**Cognitive strategies** – learning activities aimed at obtaining and analyzing information [Ilyasov, 1986].

**Educational strategies** – a system of school student behavior that determines the choice and use of the educational environment resources to achieve their long-term goals, including educational transitions and academic results [Zaborova, Ozerova, 2013].

**Informative strategies** – a sequence of mental operations and certain actions aimed at achieving educational goals [Pligin, 2009].

**Metacognitive strategies** – learning activities aimed at coordinating and monitoring the educational activities [Ilyasov, 1986].

**Training strategies** – complexes of learning actions made automatically by the subjects of learning activities when solving specific learning problems [Dvornikova, Kostromina, 2007]; information processing tools that involve the activation of all types of cognitive activity [Weinstein, Mayer, 1986].

Based on the analysis of scientific works, two main definitions, which are used within the frame of this thesis, were formulated.

**Learning strategies** – the main component of learning self-regulation; a set of educational resources and learning techniques used, united by a long-term goal and consciously applied in the process of self-regulation [Collaboration of interpretations: Ilyasov, 1986; Crowe, 1989; Mescon et al., 1993; Pligin, 2009; Zaborova, Ozerova, 2013].

**Self-regulated learning (SRL)** – a result of developing universal educational activities; deliberate organization of the educational process using learning strategies with the effectiveness established by the individual empirically in relation to themselves [Collaboration of interpretations: Boekaerts, 1992; Winne, Hadwin, 1998; Zimmerman, Campillo, 2003; Pintrich, 2004; Efklides, 2011].

## **2. Introduction: relevance of the research**

The rapidly changing standard of living has raised the bar for the minimum required skills in recent years. Consequently, a set of universal competencies is also undergoing changes, and the graduates of educational institutions of all levels are expected to possess it. The importance of special search for information as such is gradually depreciating due to its availability. In this regard, the skills of verification and competent use of information, including the digital environment, are of paramount importance today. At the same time, an ongoing update and complication of the educational content also require the development and enhancement of individual learning strategies that allow processing the maximum amount of information in a short time and acquiring new competencies.

This issue has been closely regarded by both Russian and foreign scholars in recent years. Multiple foreign studies confirm a positive correlation between self-regulated learning in general and the development of learning strategies in particular with the academic results of school students [Muelas, Navarro, 2015; Sun, Xie, Anderman, 2018; Ardura, Galan, 2019]. Thus, self-regulated learning, the development of learning strategies throughout life are becoming the most significant task of modern school today.

Federal state educational standards of general education establish requirements for the outcomes of mastering the general educational program, among which meta-subject outcomes are grouped separately. The latter include the development of universal educational activities (regulatory, cognitive, communicative), i.e. the ability to learn. Despite the fact that the federal state educational standards of general education presuppose the development of school students' meta-subject skills, the results of the international comparative study (PISA), which checks, inter alia, the educational independence of school students, demonstrate a low level of their development in Russia. To illustrate, the level of reading (479 points), mathematical (488 points) and natural science (478 points) literacy of 15-year-old Russian school students in 2018 decreased by 16, 6 and 9 points, respectively, compared with 2015, having become lower than the OECD average by 8, 1 and 11 points, correspondingly. In addition, PISA-2018, held entirely in a digital format, caused difficulties for many Russian school students and revealed a lack of the development of elementary skills in information search on the Internet. In many countries of the world, PISA data are used to study the possible usage of modern educational resources to increase the academic success of school students, which emphasizes the importance of research in this area [Anshari et al., 2017; Hu, 2017; Hu et al., 2018; Srijamdee, Pholphirul, 2020]. It should be noted that based on the Moscow sample from 2018 school students demonstrate quite high results. They gained 534 points and came third in reading;

they scored 534 points and came fifth in mathematics along with 528 points and the sixth place in natural science.

At the same time, Russian researchers have been arguing that the existing model of education requires qualitative changes to implement mechanisms similar to those on the basis of which modern innovative economy functions [Kuzminov, Frumin, 2008]. In this respect, the educational and economic models are still developing concurrently. So, despite the obvious need to develop skills for self-regulated learning, the educational content still lacks elements that develop these skills. In addition, there remains a shortage of pedagogical situations that contribute to the metacognitive knowledge development. Along with this, academic failure of school students is often related to their inability to learn, i.e. with the lack of effective individual learning strategies. In this case, one of the most essential tasks of a teacher is to provide school students with these strategies, without imposing specific self-learning techniques, but helping to choose and form the skills for selecting the most suitable strategies for each school student.

A practical problem may also lie in the fact that that a teacher does not pay attention to teaching learning strategies because they do not possess these skills themselves. In other words, not only do the learners lack knowledge of effective self-regulated learning, but also teachers may not know how to guide them.

It should be stated that the relevance of this thesis research rapidly increased in 2020. The restrictions that the whole world faced in 2020 due to the forced self-isolation caused by the spread of the coronavirus infection (COVID-19) affected all areas of activity, including the educational environment. As a result, is no longer limited to the school space today. Both school students and teachers were forced to adapt to new learning conditions. Many of modern school students had to face the problems of homeschooling for the first time: the absence of constant supervision on the part of the teacher, the need for self-organization, planning their own time, the ability to overcome themselves. Thus, self-regulated learning came to the fore, making such business-related terms as goal-setting, time management, self-efficacy, and reflection an indispensable part of and a foundation for educational levels at school.

### **3. Contradictions and gaps in scientific knowledge**

Contradictions in theory are also present. For many years, the educational process was considered one-sidedly – "from above", i.e. on the part of the teacher. In this case, teaching strategies and methods play an important role, including case-study, problem solving, brain storming, which have recently begun to penetrate schools and universities. Similarly, different types of educational content involve the use of different learning strategies, as is emphasized in the concepts of V.S. Lednev (activity) [Lednev, 1989], I.Ya. Lerner (culturological) [Lerner, 1989], V.V. Rubtsov (communicative) [Rubtsov, 1987], where the educational content types correlate with the types of educational activities. Currently, the theoretical basis in this area is represented by research on self-regulating processes and metacognition. It is noted in many papers that learning effectiveness increases due to conscious self-regulation [Boekaerts, 1992; Winne, Hadwin, 1998; Zimmerman, Campillo, 2003; Pintrich, 2004; Efklides, 2011].

Despite a wide range of studies that consider the educational process both "from above", on the teacher's part, and "from below", on the part of school students, the share of research papers studying all these components (educational content, type of educational activity, learning strategies) as a whole, is extremely small. Only with a comprehensive view of the educational process does a teacher receive answers to their questions: what, how and with what type of educational activity they should teach.

The relevance of the research is determined by modern conditions of an individual's life. In particular, trends in education, including lifelong learning, educational mobility, and the growing variability of educational programs every year, necessitate goal-setting, long-term planning, and, consequently, the development of individual strategies.

Both Russian and foreign educational researchers distinguish several types of strategies: learning, training, informative, educational, cognitive and metacognitive. However, certain disparities in the intended meanings of these strategies occur, which makes it difficult to interpret them unambiguously and make a conclusion about their synonymy and/or establish a correlation between them.

A.A. Pligin introduces the concept of an "informative strategy", defining it as a sequence of intellectual operations and certain actions aimed at achieving educational goals [Pligin, 2009]. The author notes that informative strategies act as a link between abilities and activities. Defining informative strategies as a complex dynamic organization of cognitive processes, the author identifies several of its stages:

- goal setting and its achievement criteria definition;
- actions aimed at meeting the established criteria;

- correction of executed operations;
- fixing the result.

Thus, this sequence mostly repeats the cyclical model of the self-regulated learning by B. Zimmerman [Zimmerman, 2002].

T.A. Dvornikova and S.N. Kostromina use the concept of "training strategies", considered as complexes of educational activities performed unconsciously by subjects of an educational activity in solving specific educational problems [Dvornikova, Kostromina, 2007].

K.E. Weinstein and P.E. Mayer understand learning strategies as information processing tools that involve activating all types of cognitive activity [Weinstein, Mayer, 1986].

I.I. Ilyasov distinguishes two levels in the learning process structure:

- learning activities aimed at obtaining and analyzing information (cognitive learning strategies);
- learning activities aimed at coordinating and monitoring educational activities (metacognitive learning strategies) [Ilyasov, 1986].

Cognitive strategies are involved in the cognitive process, while metacognitive strategies control this process. The use of cognitive and metacognitive strategies leads to the achievement of the goal [Sternberg, 1985].

The term "educational strategies" is interpreted ambiguously. P. Bourdieu considers long-term investments as educational strategies, rather not in economic or monetary terms, but as the reproduction of social agents inheriting the properties of the group [Bourdieu, 2005]. In a number of studies, educational strategies are synonymous with educational trajectories and involve a transition to the next level of training [Maksimova, 2007; Kharchenko, 2007; Pinskaya, Havenson et al., 2018]. In school, this choice arises after completing grade 9 and 11. E.N. Zaborova and M.V. Ozerova combine these interpretations and define educational strategies as a system of school student behavior that determines their choice and the use of the educational environment resources to achieve their long-term goals, including educational transitions and academic results [Zaborova, Ozerova, 2013]. This understanding of educational strategies determines the key role of long-term goal-setting.

Thus, there is no common understanding of different types of strategies in education today. More than that, no clear boundaries are defined to identify their distinctive characteristics.

#### **4. Scientific research apparatus**

**Object of the research** is the educational activity of school students in the modern educational environment.

**Subject of the research** is the development of school students' learning strategies.

##### **Research questions:**

1. How are the concepts of "learning strategies", "training strategies", "cognitive strategies" and "metacognitive strategies" related?
2. What learning strategies do school students under study possess and how developed are they?
3. To what extent are teachers and school students aware of what learning strategies are?
4. Do teachers develop school students' learning strategies? If they do, what methods and resources of the modern educational environment do they use to develop these strategies?
5. How is the use of the modern educational environment resources related to the academic results of school students?

##### **Research hypotheses:**

1. Learning strategies are more developed among school students of those schools where teachers have knowledge about learning strategies and purposefully develop them among school students, forming their skills in the conscious application of strategies in the learning process.
2. Teachers directing their teaching methods primarily towards the development of school students' cognitive strategies, do not contribute to the development of metacognitive strategies, value strategies, expectations strategies, affective strategies, collaborative learning strategies, and resource management strategies as higher order strategies.

**Goal of the research** is to determine the relation between teachers teaching learning strategies and their development in school students.

##### **Research tasks:**

1. Review domestic and international research on learning strategies.
2. Operationalize the concepts of "learning strategies", "training", "cognitive strategies" and "metacognitive strategies", "educational strategies", as well as interpret the processes associated with them.
3. Analyze the existing tools for determining cognitive and metacognitive learning strategies and develop a questionnaire to determine the school students' learning strategies (psychodiagnostic research methods).
4. Interview teachers about the methods they use aimed at developing universal learning activities, learning strategies and motivation in school students, as well as the use of the modern educational environment resources in their practice (qualitative research methods: in-depth semi-structured interviews, focus groups).

5. Conduct an analysis to identify the relation between the formation of learning strategies in school students and their development by teachers (statistical research methods: regression analysis, content analysis).

6. Determine the relation between the use of modern educational environment resources with the school students' academic results (statistical research methods: factor analysis, regression analysis).

7. Build a matrix structure of the learning strategies formation process, reflecting the relation between the stages of self-regulated learning, teaching methods, universal learning actions and learning strategies.

8. Develop guidelines for teaching school students in learning strategies using the modern educational environment facilities.

## **5. Theoretical and methodological basis of the research**

Among domestic studies of educational activity self-regulation, one should consider the works of G.S. Prygin [Prygin, 1984], O.A. Konopkin. [Konopkin, 2004] on the relation of school students' academic performance with the peculiarities of their self-regulation, N.L. Rosina [Rosina, 1998] and N.F. Kruglova [Kruglova, 2003], studying, the characteristics and structure of self-regulation in first-graders and school students of different ages, respectively, M.V. Polyantseva [Polyantseva, 2005], on the development of school students' self-regulation when studying mathematics.

Among foreign concepts, the SRL (self-regulated learning) model developed by the American scientist B. Zimmerman [Zimmerman, 1989], is widely known. It should be noted that B. Zimmerman is one of the first authors of SRL. To date, the scientist has already presented 3 models of self-regulated learning. The first was published back in 1989 and included three forms of self-regulation: environment, behavior and personal level. The model is based on the triadic interdependence of A. Bandura's social cognition [Bandura, 1986]. This definition implies a causal relation between personal, external and behavioral determinants of self-regulated learning. Thus, SRL is viewed through a certain locus of control as a way of explaining the degree of one's success: internal (personal attitudes of an individual) and two external (behavior of other people, environmental conditions) factors.

The second self-regulated learning model was developed by B. Zimmerman together with M. Campillo [Zimmerman, Campillo, 2003]. It was this model that formed the basis of the thesis research. According to this concept, all self-regulated processes have a cyclical structure consisting of three phases: "preparatory" or planning phase, "executive" or implementation stage, "correctional" or reflection phase.

At the planning stage, the authors identify two most important processes: task analysis and individual expectations. The implementation phase is characterized by the processes of self-control and self-observation. At the same time, self-control is exercised over the application of strategies and the implementation of tasks identified at the planning stage. Self-observation, as a rule, establishes a connection between the actions performed and their results. At the self-reflection stage, self-assessment and self-response are implemented. The first is determined by internal and external factors: 1) comparison of one's own results with the established norms, as well as with the success of others; 2) the perception of the grade awarded for the work done. Self-response is seen as a level of self-satisfaction with the results. Nevertheless, as is emphasized by B. Zimmerman, the higher this degree of self-satisfaction, the higher the motivation.

The third variation of B. Zimmerman's model is represented by four stages. At each, school students acquire self-regulation skills: observation (indirect

induction of a skill through the acquisition of experience), emulation (imitation of the general model conventionally adopted by the surrounding society), self-control (independent demonstration of skills in the present context), self-regulation (adaptive use of skills in changing personal and environmental conditions) [Zimmerman, 2008].

The second model of B. Zimmerman's self-regulated learning is closely intertwined with the basic scheme of project activities proposed by the Russian psychologist N.G. Alekseev, which includes the triadic structure "concept-implementation-reflection". However, an important component that the author highlights is the search for cultural support for generating an idea and testing its feasibility in accordance with the values [Alekseev, 2002]. Taking into account the assumed complexity of these terms' interpretation by the research participants (school students and teachers), a choice was made in favor of B. Zimmerman's second model, also due to its simplicity and a more comprehensible application within the researched school students' age group.

Within the framework of his theory, B. Zimmerman views self-regulated learning as the use of a specific set of strategies to achieve learning goals based on self-efficacy [Zimmerman, 2002]. This interpretation of self-regulated learning presupposes the connection of specific educational processes, the students' self-awareness level and motivation, as well as the presence of the three essential components: learning strategies, self-assessment of skills and adherence to educational goals. B. Zimmerman defines self-regulated learning strategies as actions and processes aimed at obtaining information or developing skills necessary to obtain and apply acquired knowledge [Zimmerman, 2002].

Learning strategies in the research are considered as the main component of self-regulated learning and are interpreted as a set of educational resources and learning techniques, united by a long-term goal and consciously applied in the process of self-regulation. The classification of learning strategies includes groups of value strategies, cognitive and metacognitive strategies, affective strategies, expectation strategies, collaborative learning strategies, and resource management strategies. This definition and classification of strategies is based on the works of P.R. Pintrich, A.A. Pligin, T.A. Dvornikova.

Thus, the process of developing conscious self-regulation in school students is lined up in a spiral: planning – implementation – reflection. Each stage involves a variety of versatile learning activities being developed in this ongoing process. Learning strategies are an essential part of self-regulated learning and may determine the academic success of school students, depending on how widely they are used.

## 6. Research methodology and sampling

In December 2018, research was conducted to examine learning strategies and motivation in Moscow school students and the teaching methods used by teachers to help develop these strategies. The research involved 1,807 school students from 10 Moscow schools of 8th and 10th grades. All 10 schools were selected at random and ranked from 150 to 200 in the ranking of Moscow schools. At the same time, the delta between the indicators in the context of the rating formation criteria in these schools does not exceed the statistical error, which can be neglected. The greatest weight in the integration indicator was a point for the effectiveness of schools in providing high-quality mass secondary education. Thus, one can talk about relatively equal conditions for their activities. Table 1 provides descriptive statistics per school.

Table 1

Descriptive statistics of the research participants

| School No. (cond.) | 8th grade  |            |             | 10th grade |            |            | Total       |
|--------------------|------------|------------|-------------|------------|------------|------------|-------------|
|                    | Girls      | Boys       | Total       | Girls      | Boys       | Total      |             |
| <b>1</b>           | 77         | 60         | <b>137</b>  | 54         | 32         | <b>86</b>  | <b>223</b>  |
| <b>2</b>           | 7          | 7          | <b>14</b>   | 26         | 16         | <b>42</b>  | <b>56</b>   |
| <b>3</b>           | 71         | 51         | <b>122</b>  | 33         | 22         | <b>55</b>  | <b>177</b>  |
| <b>4</b>           | 45         | 41         | <b>86</b>   | 41         | 36         | <b>77</b>  | <b>163</b>  |
| <b>5</b>           | 10         | 7          | <b>17</b>   | 20         | 14         | <b>34</b>  | <b>51</b>   |
| <b>6</b>           | 96         | 69         | <b>165</b>  | 56         | 43         | <b>99</b>  | <b>264</b>  |
| <b>7</b>           | 86         | 55         | <b>141</b>  | 59         | 29         | <b>88</b>  | <b>229</b>  |
| <b>8</b>           | 81         | 66         | <b>147</b>  | 46         | 29         | <b>75</b>  | <b>222</b>  |
| <b>9</b>           | 147        | 99         | <b>246</b>  | 72         | 52         | <b>124</b> | <b>370</b>  |
| <b>10</b>          | 14         | 15         | <b>29</b>   | 11         | 12         | <b>23</b>  | <b>52</b>   |
| <b>Total score</b> | <b>634</b> | <b>470</b> | <b>1104</b> | <b>418</b> | <b>285</b> | <b>703</b> | <b>1807</b> |

The first part of the assessment tool consisted of questions aimed at examining the general characteristics of the school students. These questions were listed based on the questionnaires of international comparative studies (TIMSS and PISA) for Russia.

To assess the school students' learning strategies, the most popular and frequently used questionnaires, aimed at studying the cognitive and metacognitive characteristics of students were analyzed, including:

- Motivated Strategies for Learning Questionnaire (MSLQ), developed by P.R. Pintrich, C.A. Wolters and G.P. Baxter (2000) and consisting of two large blocks: "Motivation" and directly "Learning strategies";

- Questionnaire by G. Schraw and R.S. Dennison (1994) Metacognitive Awareness Inventory (MAI), which consists of two parts: awareness of their cognitive abilities and their regulation;

- Learning and Study Strategies Inventory (LASSI), created by C.E. Weinstein and D.R. Palmer (2002). The authors focus on thoughts, both latent and explicit, behaviors, attitudes and beliefs associated with successful learning and able to be improved.

- Questionnaire by German authors U. Schiefele and K.P. Wild (1994) Inventarszur Erfassung von Lernstrategienim Studium (LIST). This questionnaire is designed for university students and aiming to study three groups of components: cognitive strategies, metacognitive strategies, and resource management.

Studying the aforementioned questionnaire scales allowed us to dwell on the MSLQ tool as the most suitable for answering the research questions. Through translation, the questionnaire was adapted for school students, taking into account the peculiarities of a Russian school.

The questionnaire was tested on the basis of 10 schools in the Republic of Mari El. In total, 570 school students of grades 8 and 10 were interviewed. The purpose of testing the questionnaire was to check its construct validity.

Factor analysis made it possible to identify 6 groups of variables, including:

1. "Motivation" block:

- value strategies (factor 1, including the goals and objectives that school students set themselves);

- expectations (factor 2, determining the desires and predictions of school students);

- affective strategies (factor 3, characterizing the ability to cope with stress in tests and exams).

2. "Learning strategies" block:

- cognitive and metacognitive strategies (factor 4, explaining how school students work with educational material);

- collaborative learning strategies (factor 5, showing how school students interact with classmates, teachers and themselves);

- resource management strategies (factor 6, demonstrating how school students allocate their time and regulate their efforts).

The quality of the model mentioned above made it possible to evaluate the KMO test, whereas values exceed the required minimum of 0.6. The reliability of the questionnaire was verified on the basis of the obtained  $\alpha$ -Cronbach score.

Therefore, the structure of the original questionnaire was preserved. The total number of questions also remained the same: 31 questions in the Motivation block and 50 questions in the Learning Strategies block, which, in turn, are divided into 31 questions about cognitive and metacognitive strategies and 19 questions about resource management. The final version of the assessment tool additionally included open-ended questions about the learning strategies used by school students and the teaching methods used by teachers, as well as several closed questions about modern educational environment and future plans.

Simultaneously, 13 focus groups were held with teachers teaching these grades. The composition of each group varied from 5 to 10 people. A total of 91 teachers took part in the research. The groups were formed from class teachers and subject teachers, teaching in parallel classes of 8th and 10th grades, i.e. among the surveyed school students. The duration of each focus group was from 25 to 50

minutes, depending on the openness and predisposition of the respondents. The interview included 13 questions about the methods used by teachers and aimed at developing school students' universal learning activities, learning strategies and motivation, as well as about the use of modern educational environment resources in their practice.

Based on the interviews with teachers, schools were divided into 3 categories: first, schools where teachers report that they are not developing learning strategies; second, schools where teachers have little understanding of learning strategies but are confident that they are developing them in school students; third, schools where teachers are proficient in learning strategy terminology and believe they are paying sufficient attention to its development in school students.

## 7. Research results

Regression analysis was made to test the hypotheses. All variables included in the regression models were broken down into dummy variables. The development of final models was preceded by a phased and alternating inclusion of parameters in the analysis, which made it possible to trace the absence of significant changes in the identified relation when considering several dummy variables within one model.

The models built tested the hypotheses that: 1) learning strategies are more developed in school students of those schools where teachers possess knowledge of learning strategies and purposefully develop them in school students, forming their skills in the conscious application of strategies in the learning process; 2) teachers, directing their teaching methods primarily towards the development of school students' cognitive strategies, do not contribute to the development of metacognitive strategies, value strategies, expectations strategies, affective strategies, collaborative learning strategies, and resource management strategies as higher order strategies.

Table 2

Relation of the development of learning strategies with the characteristics of school students and school categories

| Variables  | Factor 1. Value strategies | Factor 2. Expectations | Factor 3. Affective strategies (reverse scale) | Factor 4. Cognitive and metacognitive strategies | Factor 5. Collaborative learning strategies | Factor 6. Resource management strategies | Value strategies and expectations | Cognitive and metacognitive strategies, resource management |
|--|----------------------------|------------------------|--|--|---|--|-----------------------------------|---|
| <b>Gender:</b><br>ref.: girls;<br>boys   | 0.06<br>(0.05)             | -0.05<br>(0.05)        | 0.47***<br>(0.07)                              | 0.08<br>(0.06)                                   | -0.10*<br>(0.06)                            | 0.12***<br>(0.04)                        | 0.02<br>(0.05)                    | 0.05<br>(0.05)  |
| <b>Grade:</b><br>ref.: 8;<br>10  | 0.17***<br>(0.05)          | 0.04<br>(0.05)         | 0.15**<br>(0.07)                               | 0.01<br>(0.06)                                   | 0.04<br>(0.06)                              | 0.27***<br>(0.04)                        | 0.12**<br>(0.05)                  | 0.08<br>(0.05)  |
| <b>Book format:</b><br>ref.: paper;<br>e-books   | 0.11*<br>(0.06)            | 0.11*<br>(0.06)        | -0.09<br>(0.08)                                | 0.06<br>(0.06)                                   | 0.08<br>(0.07)                              | 0.08<br>(0.05)                           | 0.11*<br>(0.06)                   | 0.07<br>(0.05)  |
| <b>Long-term goal:</b><br>ref.: no;<br>yes   | 0.51***<br>(0.06)          | 0.44***<br>(0.06)      | 0.11<br>(0.08)                                 | 0.46***<br>(0.06)                                | 0.33***<br>(0.07)                           | 0.33***<br>(0.05)                        | 0.40***<br>(0.06)                 | 0.40***<br>(0.05)   |
| <b>Schools:</b><br>ref.: where teachers have little understanding of learning strategies but are confident that they are developing them in school students;<br>where teachers report that they are not developing learning strategies                     | 0.05<br>(0.06)             | 0.07<br>(0.07)         | -0.27***<br>(0.09)                             | 0.13*<br>(0.07)                                  | 0.11<br>(0.07)                              | 0.10*<br>(0.05)                          | 0.06<br>(0.06)                    | 0.12**<br>(0.06)  |
| <b>Schools:</b><br>ref.: where teachers have little understanding of learning strategies but are confident that they are developing them in school students;<br>where teachers are proficient in learning strategy terminology and believe they are paying | 0.05<br>(0.06)             | 0.00<br>(0.06)         | 0.11<br>(0.08)                                 | 0.05<br>(0.07)                                   | 0.12*<br>(0.07)                             | -0.05<br>(0.05)                          | 0.03<br>(0.06)                    | 0.04<br>(0.06)  |

| Variables  | Factor 1. Value strategies | Factor 2. Expectations | Factor 3. Affective strategies (reverse scale) | Factor 4. Cognitive and metacognitive strategies | Factor 5. Collaborative learning strategies | Factor 6. Resource management strategies | Value strategies and expectations | Cognitive and metacognitive strategies, resource management |
|--|----------------------------|------------------------|--|--|---|--|-----------------------------------|---|
| sufficient attention to its development in school students |                            |                        |  |  |   |  |                                   |   |
| Constant   | 4.31***                    | 4.79***                | 3.86***  | 3.94***  | 3.89***                                     | 3.98***                                  | 4.51***                           | 3.94***   |
|  | (0.09)                     | (0.09)                 | (0.12)   | (0.09)   | (0.10)                                      | (0.07)                                   | (0.08)                            | (0.08)  |
| Observations   | 1807                       | 1807                   | 1807   | 1807   | 1807  | 1807                                     | 1807                              | 1807  |
| R <sup>2</sup>   | 0.05                       | 0.03                   | 0.04   | 0.03   | 0.02  | 0.05                                     | 0.05                              | 0.04  |
| Standard errors are given in brackets                      |                            |                        |  |  |   |  |                                   |   |
| *** p<0.01, ** p<0.05, * p<0.1                             |                            |                        |  |  |   |  |                                   |   |

The results of the regression analysis showed a positive relation between learning strategies (with the exception of affective ones) and the presence of a long-term goal in school students. As reported by teachers, in schools with a significant emphasis on the development of learning strategies, a negative relation of this characteristic with the development of cognitive and metacognitive strategies, as well as resource management strategies in school students, was found. In contrast, school students are less susceptible to stress at tests and exams (negative relation with affective strategies, inverse scale) in schools that do not seek to develop motivation and learning strategies. Collaborative learning strategies are more developed among school students in schools that consistently develop them. Gender characteristics are related with collaborative learning and resource management strategies. Boys prefer to unite in groups for joint problem solving, but girls' resource management skills are more developed. Girls, on the other hand, are much more likely to experience stress in exam conditions (positive relation with affective strategies, inverse scale).

A more meticulous analysis of the teachers' focus group responses had to be conducted to develop recommendations. The first question all teachers were asked was "What do you mean by universal learning activities and which group of educational outcomes do they belong to?". Two main blocks of answers to this question were identified when processing the answers of the interviewees:

1) Relation to information: universal learning activities are skills of work with information.

2) Relation to life skills development: universal learning activities are a set of skills applicable across all school subjects and in everyday life.

However, there were also radically different answers. Some teachers have interpreted universal learning activities as:

- 1) An attempt to cover all other subjects in one.
- 2) Designed for the "average" school student.
- 3) General actions of teachers in the educational process.

After discussions on what UEA are, teachers did not have any difficulties in classifying them as a group of metasubject educational outcomes. Despite this, the question about the methods of the UEA development in school students baffled many teachers. With a general idea of what UEA are, some teachers did not have an understanding of how to develop them. Another share of the interviewees did not see any sense in the UEA development. But there were also those who, in their opinion, clearly understood what methods do develop UEA.

Content analysis showed that most often, according to school students, school teachers use visual teaching methods, including video lessons, presentations, MES (Moscow Electronic School).

Table 3

The methods that, according to school students, teachers use in the educational process

| Methods   | Qty of school students who indicated the method | Percentage of school students who indicated the method |
|---|---|--|
| <b>Video lessons</b>                                | <b>250</b>                                      | <b>13,8%</b>   |
| <b>Presentations</b>                                | <b>205</b>                                      | <b>11,3%</b>   |
| Games   | 139   | 7,7%   |
| Personal experience                                 | 116   | 6,4%   |
| <b>MES (Moscow Electronic School)</b>               | <b>92</b>                                       | <b>5,1%</b>  |
| Humor   | 76  | 4,2%   |
| Interactive   | 73  | 4,0%   |
| Experiments   | 61  | 3,4%   |
| Systematization (tables, diagrams, figures, graphs) | 34  | 1,9%   |
| Internet-lessons                                    | 22  | 1,2%   |
| Group work  | 17  | 0,9%   |
| Excursions  | 16  | 0,9%   |
| Projects  | 15  | 0,8%   |
| Using gadgets                                       | 15  | 0,8%   |

Answering open-ended questions, many school students emphasized that their teachers do not pay due attention to the development of learning strategies and increasing children's interest in the educational process in general. Therefore, it was critical to understand how well the teachers understand this topic themselves.

A large number of teachers interpreted learning strategies as specific steps that must be taken to achieve a goal. Opinions on the criteria for the effectiveness of learning strategies, however, were often fundamentally different. Some teachers believed that control and examination scores were an indicator of the successful mastery of learning strategies. The others considered the issue deeper, from the perspective of reflective thinking. Some teachers noted that learning strategies are something individual and not applicable to all areas of knowledge. While others,

on the contrary, were convinced that learning strategies are universal.

Arguing about the methods of developing universal educational activities, almost all teachers concerned only one aspect – working with educational material, which is in fact one of the most vital components of the cognitive learning strategies development: repetition, clarification, organization. This includes how school students work in the classroom and at home: whether the teachers ask again if they did not understand something at the lesson, whether they look for additional information on the Internet, in textbooks, whether they draw up schemes, tables, diagrams to process information better, etc. When it comes to developing learning strategies, the range of methods used by teachers turned out to be much wider, with such methods as role-playing games, project activities, search techniques and others aiming, according to teachers' responses, at developing skills and goal-setting, planning, reflection, and with a few respondents mentioning self-regulated learning. Despite the variety of methods teachers indicated, many interviewees stressed that long-term goal-setting and the development of other strategic skills are not very common for modern school students of grades 8-10.

Contrary to the opinion of teachers, the majority of school students (almost 60%), answering open-ended questions, could clearly state what strategies they use in the process of learning. The content analysis showed that the main emphasis of the school students is placed on the application of cognitive strategies (repetition, clarification, organization). Goal-setting (planning, goal-setting, tasks) and time strategies (schedule, breaks) also play an important role for school students. At the same time, very few school students are familiar with waiting strategies, whereas school students generally ignore affective strategies.

Table 4

Strategies that school students use in educational activities

| Strategies                                    | Qty of school students using the strategy | Percentage of school students using the strategy |
|---|---|--|
| <b>Value strategies</b>                       |   |  |
| Planning                                      | 265                                       | <b>14,7%</b>                                     |
| Motivation                                    | 11  | 0,6%   |
| <b>Waiting strategies</b>                     |   |  |
| Control                                       | 40  | 2,2%   |
| <b>Cognitive and metacognitive strategies</b> |   |  |
| Repetition                                    | 313                                       | <b>17,3%</b>                                     |
| Organization                                  | 159                                       | 8,8%   |
| Clarification, information search             | 94  | 5,2%   |
| <b>Resource management strategies</b>         |   |  |
| Breaks, change of activity                    | 262                                       | <b>14,5%</b>                                     |
| Asking for assistance                         | 135                                       | 7,5%   |
| Schedule                                      | 73  | 4,0%   |
| Cooperative learning                          | 33  | 1,8%   |
| Learning environment                          | 29  | 1,6%   |

It should be stated that the majority of school students are guided precisely by those strategies the teachers pay special attention to in the process of building their educational activities – the cognitive ones. Thus, the main problem is that many school students use strategies intuitively or based on personal experience, and therefore there is no comprehensiveness and cyclicity in their activities.

A number of questions asked to teachers were also aimed at identifying the degree of school students' engagement in the educational process with the help of IT resources that teachers use. The respondents' answers showed that many teachers in Moscow schools have a negative attitude towards the use of electronic devices by school students, including educational purposes.

The opinions of teachers regarding the use of modern gadgets in the educational process were fundamentally different. Just a small share of teachers was in favor of IT resources. These are teachers who try to teach the correct use of gadgets and instill a culture of using modern technologies. However, the prevailing number of teachers still believe that a modern school can do just fine with traditional teaching tools.

Similarly, teachers cited a lot of negative reasons for using IT in education such as:

1. IT resources affect health.
2. They interfere with the educational process.
3. They do not allow to prepare for the MSE/USE.
4. They blur the boundaries between reality and the virtual world.
5. They slow down the development and hinder thinking.

Within the framework of this research, it was impossible to ignore the fact that the Moscow Electronic School (MES) project was launched in Moscow schools in 2017, designed to become an indispensable tool for the school of the future. Teachers also had different opinions on the use of the MES.

For some, the first experience was successful at once. Most often, young teachers spoke positively of the MES. The teachers of the older generation emphasized the shortcomings of the MES content. Thus, despite the obvious need to involve school students in the use of modern gadgets for educational purposes and the development of their culture and functional literacy of using these devices, teachers are not keen to pay attention to these aspects.

It was important to understand how effective the use of technological gadgets for educational purposes is. To answer this question, the results of the international comparative study (PISA) results for 2018 were analyzed. The sample included school students from Moscow schools of grades 8-10. A hypothesis was put forward about a positive relation between the use of modern technologies for educational purposes by school students and their academic results.

Table 1

## The results of regression analysis (reading)

| Variables / Models   | (1)               | (2)                | (3)                | (4)                | (5)                | (6)                | (7)                | (8)                |
|--|-------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| <b>Factor 1.</b> The use of IT for learning purposes                       | 0.23***<br>(0.03) |                    | 0.22***<br>(0.03)  |                    | 0.20***<br>(0.03)  |                    | 0.20***<br>(0.03)  |                    |
| <b>Factor 2.</b> The use of IT to meet the need for games / game addiction |                   | -0.09***<br>(0.03) |                    | -0.04<br>(0.03)    |                    | -0.04<br>(0.03)    |                    | -0.03<br>(0.03)    |
| <b>Gender:</b><br>ref.: girls;<br>boys                                     |                   |                    | -0.32***<br>(0.05) | -0.30***<br>(0.06) | -0.27***<br>(0.05) | -0.24***<br>(0.06) | -0.27***<br>(0.05) | -0.25***<br>(0.05) |
| <b>Number of books at home:</b><br>ref.: 26-100;<br>0-25                   |                   |                    |                    |                    | -0.24***<br>(0.06) | -0.27***<br>(0.06) | -0.23***<br>(0.06) | -0.27***<br>(0.06) |
| <b>Number of books at home:</b><br>ref.: 26-100;<br>101-200                |                   |                    |                    |                    | 0.23***<br>(0.08)  | 0.26***<br>(0.09)  | 0.23***<br>(0.08)  | 0.26***<br>(0.08)  |
| <b>Number of books at home:</b><br>ref.: 26-100;<br>201 and more           |                   |                    |                    |                    | 0.23***<br>(0.06)  | 0.24***<br>(0.06)  | 0.23***<br>(0.06)  | 0.23***<br>(0.06)  |
| <b>Mother's higher education:</b><br>ref.: no;<br>yes                      |                   |                    |                    |                    |                    |                    | 0.15***<br>(0.04)  | 0.16***<br>(0.04)  |
| Constant   | 0.09**<br>(0.04)  | 0.09*<br>(0.05)    | 0.25***<br>(0.05)  | 0.24***<br>(0.05)  | 0.19***<br>(0.05)  | 0.18***<br>(0.05)  | 0.12**<br>(0.05)   | 0.11**<br>(0.05)   |
| Observations   | 1580              | 1580               | 1580               | 1580               | 1578               | 1578               | 1573               | 1573               |
| R <sup>2</sup>   | 0.05              | 0.01               | 0.08               | 0.03               | 0.11               | 0.07               | 0.12               | 0.08               |
| Standard errors in brackets  |                   |                    |                    |                    |                    |                    |                    |                    |
| *** p<0.01, ** p<0.05, * p<0.1   |                   |                    |                    |                    |                    |                    |                    |                    |

Models 7 and 8 with the largest number of control variables were considered as the main ones. The results indicate that there is a positive relation (coefficient 0.2) at a statistical significance level of 99% between reading success and students' inclination towards using new technologies in order to communicate and obtain new information, i.e. using devices for this purpose increases reading scores by 20% of the standard deviation. At the same time, the relation between a certain form of game addiction and the reading scores of fifteen-year-olds is statistically insignificant. It is worth noting that boys read less than girls by 27% and 25% of the standard deviation, respectively, for the first and second factors at the 99% significance level. A mother's higher education also plays an important role (99% significance level) and increases reading scores by 15-16% SD. The more books there are at home, the more school students read (the base variable is the number of books at home (26-100)).

Table 2

## The results of regression analysis (mathematics)

| Variables / Models   | (1)               | (2)             | (3)               | (4)             | (5)                | (6)                | (7)                | (8)                |
|--|-------------------|-----------------|-------------------|-----------------|--------------------|--------------------|--------------------|--------------------|
| <b>Factor 1.</b> The use of IT for learning purposes                       | 0.17***<br>(0.03) |                 | 0.17***<br>(0.03) |                 | 0.15***<br>(0.04)  |                    | 0.15***<br>(0.04)  |                    |
| <b>Factor 2.</b> The use of IT to meet the need for games / game addiction |                   | -0.00<br>(0.03) |                   | -0.01<br>(0.04) |                    | -0.01<br>(0.04)    |                    | -0.01<br>(0.04)    |
| <b>Gender:</b><br>ref.: girls;<br>boys                                     |                   |                 | 0.06<br>(0.06)    | 0.06<br>(0.06)  | 0.12**<br>(0.05)   | 0.12**<br>(0.06)   | 0.12**<br>(0.05)   | 0.12**<br>(0.06)   |
| <b>Number of books at home:</b><br>ref.: 26-100;<br>0-25                   |                   |                 |                   |                 | -0.27***<br>(0.08) | -0.30***<br>(0.08) | -0.27***<br>(0.08) | -0.29***<br>(0.08) |

| Variables / Models   | (1)    | (2)    | (3)    | (4)    | (5)     | (6)     | (7)     | (8)     |
|--|--------|--------|--------|--------|---------|---------|---------|---------|
| <b>Number of books at home:</b><br>ref.: 26-100;<br>101-200      |        |        |        |        | 0.21**  | 0.23**  | 0.21**  | 0.23**  |
|  |        |        |        |        | (0.11)  | (0.11)  | (0.11)  | (0.10)  |
| <b>Number of books at home:</b><br>ref.: 26-100;<br>201 and more |        |        |        |        | 0.26*** | 0.27*** | 0.26*** | 0.26*** |
|  |        |        |        |        | (0.08)  | (0.08)  | (0.08)  | (0.08)  |
| <b>Mother's higher education:</b><br>ref.: no;<br>yes            |        |        |        |        |         |         | 0.15*** | 0.16*** |
|  |        |        |        |        |         |         | (0.06)  | (0.06)  |
| Constant   | 0.05   | 0.05   | 0.01   | 0.02   | -0.04   | -0.04   | -0.11*  | -0.11*  |
|  | (0.04) | (0.04) | (0.04) | (0.05) | (0.05)  | (0.06)  | (0.06)  | (0.06)  |
| Observations   | 1580   | 1580   | 1580   | 1580   | 1578    | 1578    | 1573    | 1573    |
| R <sup>2</sup>   | 0.03   | 0.00   | 0.03   | 0.00   | 0.07    | 0.05    | 0.08    | 0.06    |
| Standard errors in brackets                                      |        |        |        |        |         |         |         |         |
| *** p<0.01, ** p<0.05, * p<0.1                                   |        |        |        |        |         |         |         |         |

The regression results also indicate that the use of modern technologies for educational purposes is positively related with PISA scores in mathematics (coefficient 0.15, significance at the level of 99%). That is, math scores improve by 15% standard deviation. The relation between a factor based on the latent sign of game addiction and scores in mathematics, as in the case of scores in reading, is statistically insignificant. Unlike reading, boys perform better than girls in this case by 12% standard deviation at the 95% significance level. A significant number of books at home (over 200 pieces) and a mother's higher education are also at a 99% significance level positively related with results in mathematics.

Consequently, a more frequent use of IT resources for educational purposes can be a critical step towards reducing the risks of academic failure and can help to boost academic success of school students. It is also important to point out that the use of gadgets for gaming purposes, contrary to the opinion of teachers, has no significant relation with the academic performance of school students.

Taking into account the fact that the range of opening opportunities for the use of ICT resources for educational purposes is constantly expanding (this is the interaction of a teacher with school students in the online environment through ICT resources, virtual libraries, educational forums, and web conferences), the main task of modern schools becomes maintain a balance of educational and entertainment components when using ICT resources. Therefore, the effectiveness of using the capabilities of the modern information educational environment largely depends on a format of employing electronic devices school students prefer. The teacher's task is to get school students interested in using gadgets for educational purposes.

## 8. Recommendations

Based on the analysis of focus groups with teachers, a conclusion was drawn that the main problem on the part of teachers is the lack of a complex approach to teaching school students in learning strategies and the use of methods that add to their development. At the same time, the results of the school students' survey revealed the problem of intuitive strategies application due to the lack of knowledge. In this regard, an important component of the thesis research was the development of methodological recommendations for teachers that can be used to build an educational process that contributes to the development of self-regulated learning and learning strategies for school students.

These recommendations are formed on the basis of the scientific works' analysis, as well as on the basis of the study results. The proposed techniques and teaching aids have been demonstrating their effectiveness in many Russian and foreign studies for many years. The techniques and teaching aids are distributed according to the stages of the learning self-regulation spiral process in the methodological recommendations.

The framework for these methodological recommendations was the understanding that designing the educational process is, first of all, building a system where the starting point is not the teaching methods a teacher uses, but the learning strategies that students must master. Learning strategies are the main component of self-regulated learning and represent a set of educational resources and learning techniques used, united by a long-term goal and consciously applied in the process of self-regulation. The process of developing conscious self-regulation in school students is lined up in a spiral: planning – implementation – reflection. Each stage involves a variety of versatile learning activities being shaped in this ongoing process.

Based on the model of teaching formats for school students [McCarthy, 1997] and theories of self-regulated learning [Boekaerts, 1992; Winn, Hadwin, 1998; Zimmerman, Campillo, 2003; Pintrich, 2004; Efklides, 2011], a matrix of teaching methods and school students' learning strategies was developed.

Table 7

Matrix of teaching methods and learning strategies of school students

| Stages         | Method               | UEA   | Strategy groups  | Strategies  |
|----------------|----------------------|---|--|---|
| Planning       | Discussion method    | Regulation UEA<br>Communicative UEA<br>Personal UEA | Value strategies   | orientation of an internal goal; orientation of an external goal; task value  |
| Implementation | Communication method | Cognitive UEA<br>Personal UEA                       | Cognitive and metacognitive strategies;<br>Collaborative learning strategies;<br>Resource management | repetition;<br>clarification;<br>organization;<br>critical thinking;<br>metacognitive self-regulation;<br>time and learning |
|                | Mentoring method     | Communicative UEA<br>Personal UEA                   |  |   |

| Stages     | Method           | UEA                            | Strategy groups                     | Strategies   |
|------------|------------------|--------------------------------|-------------------------------------|--|
|            |                  |                                | strategies;<br>Affective strategies | environment;<br>regulation of applied efforts;<br>cooperative learning;<br>coping strategies |
| Reflection | Discovery method | Regulation UEA<br>Personal UEA | Expectations                        | control of educational expectations;<br>self-efficacy of learning                            |

The developed matrix links the stages of self-regulated learning, universal learning activities, teaching methods and learning strategies. This structure of the educational process reflects the teaching methods aimed at the development of strategies.

A number of tools are proposed for the development of learning strategies in school students, including the use of such techniques as Bloom's Taxonomy, SMART goal, the Eisenhower matrix at the planning stage; knowledge of the Ebbinghaus forgetting curve, the Pomodoro technique, the Pareto principle – at the implementation stage; the use of a working time losses table, etc. – at the reflection stage.

It is worth noting that the analysis of Moscow's results in PISA-2018 revealed a significant positive relation between the use of modern educational environment resources and the academic results of school students, while interviews with teachers showed that, despite the obvious need to engage school students in the use of modern gadgets for educational purposes and the development of their culture and functional literacy in the use of these devices, teachers feel reluctant to pay attention to these aspects.

Hence, one of the proposed tools for the development of learning strategies is also the "PADagogical wheel" (from iPad) developed by A. Carrington and combining cognitive skills, educational goals and a set of iPad applications that contribute to the development of relevant skills. "PADagogical wheel" is a kind of a guide for integrating education into the world of digital technologies, contributing to the development of higher-order skills and the achievement of educational goals in modern conditions.

Lecture guidelines were developed to help teachers get acquainted with the methodological recommendations for teaching school students in learning strategies. Its bullet points are interaction with the audience throughout the lecture with the help of rhetorical questions for the audience and feasible examples familiar to everyone; "living through" the self-regulation cyclical process: emphasis at each stage of the lecture with reference to the self-regulation stage; self-reflection as an effective analogue of evaluative means: tasks built into the lecture in the format of SELF-evaluative means. The structure of the lecture itself assumes a cyclical format and, using a "live" example, shows how the cyclical

structure of a lesson can both connect lessons within one academic subject and also take on an interdisciplinary nature and allow a comprehensive approach to the process of teaching school students in learning strategies.

## **9. Conclusions**

### **Thesis statements:**

1. Teachers contribute to the development of "simple" strategies in school students, strategies of a lower, cognitive, order. These strategies are most accessible to teachers themselves, they understand how to develop them. At the same time, the development of more complex strategies – metacognitive, value strategies, expectations strategies, affective, collaborative learning strategies, and resource management strategies – is ignored by teachers.

2. The majority of school students, while building their learning activities, are guided by those strategies teachers pay special attention to themselves – the cognitive ones. Thus, the main issue is that many school students use strategies intuitively or based on personal experience, and therefore there is no comprehensiveness and cyclicity in their activities.

3. Selection of learning strategies by school students is carried out based on the presence or absence of a long-term goal. According to teachers, schools paying considerable attention to the development of learning strategies, do not show a positive relation with their development in school students.

### **Scientific novelty of the research:**

1. A classification of cognitive and metacognitive learning strategies depending on the phase of the learning self-regulation cycle, based on the analysis of learning strategies has been developed [Pintrich, 2000] and the tasks of the cyclic process [Zimmerman, 2003].

2. The existing concepts of learning strategies and self-regulated learning have been supplemented, in particular, the study considered teaching methods, universal educational activities, stages of self-regulation and learning strategies in a comprehensive manner, as interrelated elements of a unified system of the educational process.

### **Theoretical significance of the study:**

1. A contribution to the discussion about learning strategies in the Russian scientific community has been made. In particular, the collaboration of cognitive and metacognitive, training, learning and educational strategies interpretations [Ilyasov, 1986; Pligin, 2009; Zaborova, Ozerova, 2013] made it possible to define learning strategies as the main component of self-regulated learning, taking into account its comprehensiveness and cyclical nature.

2. A comprehensive view of the educational process is proposed: not only "from above", on the part of the teacher, but first of all "from below", on the part of school students. This approach makes it possible to link all the elements (teaching methods, universal educational actions, stages of self-regulation and learning strategies) into a single whole and answer the questions: what and how to teach in order to form the most important competence in school students – the ability to learn.

3. It has been proven that the more frequent use of IT resources for educational purposes can be the most important step towards reducing the risks of academic failure and can help to increase academic success of school students, while their use for gaming purposes has no significant relation with school student achievement.

**Practical significance of the study:**

1. The author's questionnaire "Learning strategies for school students", which can be used to determine the set of learning strategies school students use, was developed.

2. The need was identified, first of all, in training teachers in methods that contribute to the development of metacognitive learning strategies in school students, and in the development of appropriate methodological recommendations, as confirmed by both the research results and by the request from the teachers themselves made during focus groups.

3. Methodological recommendations for teachers, which can be used to build an educational process that contributes to the development of self-regulated learning and learning strategies for school students, were developed.

The transfer of the research results is possible to other regions of the country due to a unified educational and methodological base available for general use in the information and telecommunications network Internet and the lack of a widely available measuring tool and the necessary mechanisms to control the development of learning strategies in school students.

The research results and the recommendations proposed are applicable exclusively to the age cohort under study and cannot be referenced to younger school students.

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