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INFORMATIONAL LITERACY DEVELOPMENT CONTROL OF A JUNIOR SCHOLAR IN CLASS

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Abstract

The information literacy is seen as an integrated feature of a primary school learner. It includes the orientation in the informational tools, the assessment of data and the application of such data to solve everyday problems and educational tasks. The article highlighted the group of skills and actions whose development in the elementary school ensures the competent work of a school learner with the information in a variety of life situations and further training. It also described the model of the control of the informational literacy of the fourth graders, including four stages: indicative, preparatory, diagnostic, control, and provided examples of the work based on mathematics materials. For each stage the article described the results of certain tasks performed by younger school learners, that were included in the regional studies of 2016-2018, the international comparative TIMSS (Trends in Mathematics and Science Study) test of 2015 and in the experimental work at the pilot sites led by the Institute for Strategy of Education Development of the Russian Academy of Education. The methodological comments to the stages described the main difficulties faced by schoolchildren in the work with information. Finally, the article provides for the recommendations on the development of the informational literacy in the lesson.

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1. Introduction

The priority task of the elementary school is the education of a student who is capable "to act independently and be responsible for his actions in front of his family and the society..., justify his position, express his opinion", and is prepared "to the organization of his own activities" (Federal'nyj gosudarstvennyj obrazovatel'nyj standart nachal'nogo obshhego obrazovanija, 2017, p. 6-7). The modern school learner should differ from peers of past years by the greater autonomy in the training and cognitive activities, find the way in the information space, use the proposed digital learning tools and study up the new ones. The substantive skills that a child develops on a particular lesson, are not limited any more to their use to solve the model single-step and multistage training tasks. According to the standard requirements, the proportion of tasks on the playback of knowledge gradually goes down in textbooks, while the proportion of productive tasks, illustrating the knowledge and methods of its application in various situations of learning and in everyday life, increases. Productive tasks include exercises focused on the work with a text (for example, mathematical or instructional), a simulation of a training situation, a search for a solution, a design or a test of an algorithm, an assessment of a response. The authors of textbooks offer to learners those tasks which help children to extend the experience in the use of training skills and understanding in practical situations, for the study of new course content, including that in other lessons. Whereas previously, for example, children worked with tables mainly on mathematics lessons to solve tasks, and used mostly prepared tables, now the learners may select a table as a form of the presentation of the task text, work with this form of the presentation of information in other lessons (of the Russian language, literature reading), because it is convenient for the presentation of aggregated knowledge, the classification of learned subjects, the search for a solution idea or an answer.

The aggregate of substantive skills and universal educational actions, the experience in solving educational and cognitive tasks, the willingness to interact with children and adults, to apply the learned rules and norms constitute the functional literacy of a junior school learner. Its key component, "responsible" for the work of a student with information, is the informational literacy. This component is integrative, it describes and is described by the success of a child in the search, selection, evaluation and application of data, the ability to orient in the information media.

A special feature of the modern system of monitoring and evaluation of knowledge is the increased attention to the development of not only the substantive knowledge, but also of the universal actions, which are the components of metasubject results of learning. Actions that characterize the informational literacy of a student are monitored and evaluated, amongst others. They include the following: "the use of signs and symbolic means of presenting information for creating models of the studied objects; the use of different ways for searching, collecting, processing, analysing, organizing, transmitting and interpreting the information" (Federal'nyj gosudarstvennyj obrazovatel'nyj standart nachal'nogo obshhego obrazovanija, 2017, p. 9). The feature of the modern school is the change of the focus from an assessment of final achievements to the ongoing control of the development of educational actions and skills, including informational (Kuznetsova, Rydze, Soldatov, & Fomenko, 2016; Vinogradova, 2017). Upon that many researchers of modern secondary school draw attention to the importance of preparing teachers to the use of improved and new forms and methods of monitoring and evaluation of the achievements of students (Fook, 2010; Kellaghan, Greaney, & Murray, 2014).

2. Problem Statement

In recent years, a comprehensive approach to the control of the development of functional literacy by a student has got the increasing prevalence. It was proposed by scientists of the Primary General Education Laboratory (head - prof. N.F. Vinogradova) of the Institute for Strategy of Education Development of the Russian Academy of Education (Vinogradova, 2017). According to authors, the progress of the development of the substantive (for example, mathematical, literary) and integrative (for example, informational, reading) components of the literacy could be described using tasks proposed in the training tools or tasks specially tailored by the pedagogue. The control should be carried out over the application by a student of either substantive skills, which are a part of the integrative component of the literacy (informational), or general training (universal) skills. The student either shows, for example, informational literacy when working with any information (mathematical, linguistic), presented in different forms (a text, a picture, a table, etc.) to respond to a training or life question, or not. The study in question describes the informational literacy considering the achievements of fourth-graders in solving the model tasks on the application of knowledge in the new training or practical situations. The following information skills are considered as major substantive:

- "read" the information provided in a text, a table, a diagram or in another form;

- capture data in the intelligible form (for 4 grade students the forms intelligible for fixing the information include a text, a table, a diagram, a picture, a drawing, an icon);

- build or supplement statements on the basis of data or received information.

The following informational actions are regarded as major universal:

- choose, evaluate and present data;

- evaluate the information (reliability, validity, completeness, compliance with the training task);

- use the obtained information to solve diverse tasks in class and in everyday life, as well as supplement information in the process of a search (organized autonomously or from outside).

These universal learning activities were chosen as major ones, considering the theory of developmental education (Davydov, 1996), because they accompany all stages of solving training tasks by a student.

3. Research Questions

The study of the problem of control in relation to the process of development of the information literacy by a junior student included obtaining answers to the following questions:

•What are the steps that could be pointed out for the control of the development of the informational literacy in class?

•What skills are controlled at different stages?

•How to help the student to correct shortcomings in the work with the information?

4. Purpose of the Study

The answers to the questions provide for the opportunity to get a picture of one of the approaches, as well as of the forms and objects of control of informational literacy of elementary school learners.

Therefore, the purpose of the study is the description of phases of the control of the development of this important characteristic of a student.

5.   Research Methods

The research used data of the experimental work on the development of informational literacy of scholars of the Gymnasium of Troitsk town (directors - V.Ya. Gurova, N.A. Verigina), observations by teachers and experts during lessons, for which informational actions were a priority. Also, the research used results of the regional studies the quality of education: final screening and diagnostic tests on mathematics. The materials were prepared by the General Primary Education Laboratory (led by Professor N.F. Vinogradova), the Center of Evaluating the Quality of Education (led by G.S. Kovaleva) of the Institute for Strategy of Education Development of the RAE. The tasks demonstrated were developed by the author of the article and K.A. Krasnyanskaya. Stages of control of the informational literacy were characterized also using the materials of the international TIMSS test conducted in Russia in 2015 (Mezhdunarodnoe issledovanie po ocenke kachestva matematicheskogo I estestvennonauchnogo obrazovanija, 2017). The task groups on the development of informational skills (substantive, and of general training) were tested on the experimental platform "Gymnasium of Troitsk town" by the staff of the Laboratory of General Primary Education.

6.   Findings

The qualitative change of the control and evaluation system of a modern elementary school at the level of the educational organization are as follows: a pedagogue has received greater freedom in the choice of forms and means of the test; a student, as a subject of the activity, has been more involved in the analysis and acknowledgement of own achievements. The selection by the teacher of forms and means of control, and their rational use in the educational process help to obtain data on the process of the development of informational literacy as integrative component of the functional literacy. "The Informational Literacy - a broad concept, which includes the contents linked not only with the medialiteracy and the use of modern information tools. Informational literacy includes also the ability to work with the real published sources, works of art, ethnic and national cultures, historical documents" (Vinogradova, 2017, p.34). Pointing out of substantive and universal action, the development of which is monitored during the work in class, allows to describe the informationally literate student.

What the informationally literate student is capable to do? Firstly, he unmistakably finds the information in the text of the textbook task, orients in the traditional training manuals (textbooks, workbooks, dictionaries) and technical means for training used by the teacher (an electronic textbook, a mediafile, a smartboard). Secondly, he acquired basic substantive (mathematical, linguistic) information skills: to work with text, read and fill in the table, chart, to compile and verify the allegations on the basis of data. Thirdly, he uses mastered basic substantive skills as directed by the teacher (for example, a pedagogue says: "Guys, tell me, how does this diagram"), or in accordance with the wording of the task (for example, "fill in the table with data from the text"), or on his own ("Make a model and the strong task to the movement"). The development of skills that characterize the information literacy of a student, can

be monitored at any lesson. The experimental pilot study, based on the experimental sites of the Laboratory of the Primary General Education, revealed that the most effective types of control of the informational literacy in the lessons of mathematics are as follows:

mathematical dictation. May include an issue or issues on the understanding of tables, diagrams, a work with the text of instructions;

mathematical workout. As exercises preceding the multistage tasks in the lesson, this could help to see whether the student is ready to work with information: to search for data, or fill up or make a table, assess the truth of the allegations, compare and interpret the information;

mini-work with the information object. For instance, a few one-two phase tasks (2-3 in total) may be offered, where upon their accomplishment a student demonstrates only the capability to work with a table (a picture, a diagram), to make a statement or to verify the truth of the allegations, to choose the source of information;

test work for the assessment of the substantive or general training information skills. It can be carried out during the whole lesson or a part of it, the student must demonstrate the ability to navigate the information in the text of the task, select the data, represent them and apply them to solve daily and educational problems, to exercise autonomy.

Monitoring can also be carried out sporadically, depending on what information (obtained from a textbook or other sources, new or familiar) is processed by a student, how important it is to use it to obtain the correct answer, what is the contribution to the development of the autonomy of the child. The developers of materials on the national assessment and analysis of the achievements of students (Greaney & Kellaghan, 2014; Goldstein, 2015; Mullis, Martin, Foy, & Hooper, 2016; Kovaleva, Krasnyanskaya, & Rydze, 2018) note the importance of tracking changes in dynamics, the need for ratings on the main subjects studied for long periods of time, the appropriateness of the control of the same parameters on the content of different subjects. The comparison of the difficulties faced in the course of the current work and at the stage of the evaluation of achievements is no less significant (Lompscher, 1999; Zuckerman, Kovaleva, & Kuznetsova, 2013).

Each of the above four forms of control could make a stage of monitoring of the formation of the information literacy of young students in the lesson.

Stage 1. Indicative. It includes the accomplishment by a student of short oral tasks. When responding to a specific question of the teacher in the course of oral work, the student demonstrates understanding of a certain information skills or steps. For example, the question "Continue the statement. If the minuend is increased by 5, and the subtract does not change, then the difference is…" helps to check whether the fourth graders is able to work with a statement. The universal ability to "evaluate the information (reliability, validity, completeness, compliance with the training task)" the fourth grader could demonstrate, for example, when replying to the question: "Can the tourist go at a speed of 20 km/h?"

Stage 2. Preparatory. In includes the control of substantive informational skills indicated above. It could be carried out as a math workout. The pedagogue organizes a dialog or a collective discussion of methods of finding information, ways to check the correctness of the answer (for example, reliability, consistency), the truth of the allegations (the calculation, the use of a textbook, a dictionary or a

handbook, making the statement). It is important that all students have participated in the discussion. If this is not possible, for example, because of the different levels of substantive training, then a part of the class (which is more prepared) may proceed to the written accomplishment of the task, while another part will act in the mathematical workout.

Stage 3. Diagnostic. The student is provided with the task to work with one information object. It could be a text, a table (a scheme, a diagram), a statement, a source of information (for example, a textbook, a dictionary, a specific website - "gramota.ru", etc.). As an example, consider a mini-work, developed on the basis of a task that has been suggested in the final work on mathematics within the framework of regional monitoring of the evaluation of the elementary education quality (Kovaleva et al., 2018). Only 23% of schoolchildren managed to accomplish the task. The task said: "For 10 identical textbooks they paid by 480 rubles more, than for 8 such textbooks. What is the price for one book? Make a numeric expression to answer to the question." It is clear that the reasons for the difficulties are not only mathematical in nature but are also a consequence of the inability to work with the information in the mathematical task. The mini-jobs may be presented as follows.

Task 1. Read the task. Not solving it, answer the questions.

For 10 identical textbooks they paid by 480 rubles more, than for 8 such textbooks. What is the price for one book? Make a numeric expression to answer the question.

Questions:

Is it true that the price for 10 identical textbooks is not indicated in the task? (No)

Is it required to write down in the response the price of one textbook in rubles? (No)

Task 2. Read the task. Supplement the model (see Figure 01).

For 10 identical textbooks they paid by 480 rubles more, than for 8 such textbooks. What is the price for one book? Make a numeric expression to answer the question.
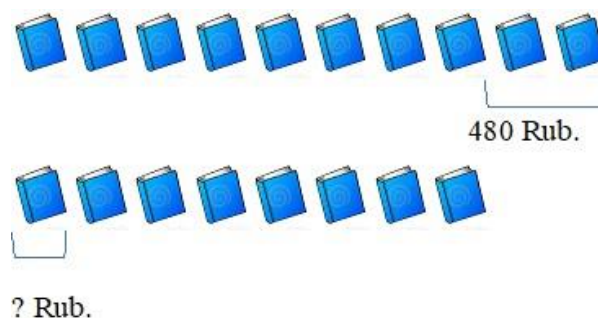

Figure 01. Illustration for Task 2

Task 3. Make a numeric expression to answer the question of the task.

A numeric expression: _____ (480 : (10 - 8))

The proposed mini-work helped to see if the child is able to work with the text of the task, the instruction (the substantive information skill - the ability to "read" the information provided in a text, a table, a diagram or in another form"), to mark the data in the picture (the substantive ability to "fix the data in the intelligible form"). In the process of performing this work the actions associated with the selection of data in accordance with the situation were also demonstrated (the number 480 had to be put

in the picture), as well as the presentation of information according to the specified format (in the third task the solution was a numeric expression).

It should be noted that the success of the performance of tasks (first, second, third) in the experimental classes was 85%, 76%, 70% respectively. This shows that such format of work can positively influence the success of the performance of tasks, based on the correct perception and application of the information, when carrying out final test work for the course of the elementary school.

Stage 4. Control. The test work for this phase of control of information skills of young students is made from several tasks of different content and checks one or two informational universal actions. Let's look at an example of such work. It is based on two tasks of the international comparative study TIMSS-2015, available for the use by member countries.

Task 1. (Mullis, Martin, Ruddock, O'Sullivan, & Preuschoff, 2014a). Rule: to calculate the number in Column B, multiply the number from Column A by 4, then add 1.

Use this rule to complete the following Table 1.

Table 01. The application of the rule

Column A	Column B
2	
5	

Task 2. (Mullis, Martin, Ruddock, O'Sullivan, & Preuschoff, 2014b). Look at the numbers presented in Table 2.

Table 02. The search of the rule.

Column A	Column B
1	2
2	5
3	10
4	17

What is the rule that allows to get the numbers recorded in Column B? Indicate.

☐ Multiply the number of the Column A by itself, then add 1.

☐ Multiply the number of the Column A by 3, then subtract 1.

☐ Multiply the number of the Column A by itself, then subtract 1.

☐ Multiply the number of the Column A by 2.

Task 3. (Mullis et al., 2014a). In the table there is data about big snakes.

Table 03. Big snakes

Type of snakes	Weight (kg)	Length (m)
Boa-constrictor	27	4
Burmese python	90	From 5 to 7
Green anaconda	227	From 6 to 9
Royal cobra	9	4

Dima saw a snake of the length of 8 m.

What kind of snake could it be? _____

The work is intended to last for 15 minutes. Let's describe the results of each of these tasks, received in the framework of the TIMSS study, since for the time being results of the experimental work in schools are under consolidation.

All three tasks check the ability to work with a table. In the first case, the fourth-grader, who successfully coped with the task (filled in empty cells of the column with numbers 9 and 21), demonstrated the ability to understand the structure of the table, to put the data obtained in the corresponding boxes. The result of the performance of this task by Russian schoolchildren - 80% in 2015 (70% in 2011). The most common errors arose due to the inability to work with the information - filling in only one column, recording numbers against the rule. For the latter case, it can be said that the following training actions were not developed: interpret, apply, supplement the table data with data obtained independently. The second task is closely linked with the first substantive mathematical content - the establishment and application of the rules of actions with numbers. The choice of the correct answer was determined by the ability to read and compare the information in the rows of the table and the text containing the answers. The success of this task performance is low - 63% (in 2011 - 58%). Almost 33% of students made errors because they did not check the statement, selected by them to be a rule, against data of all rows of the table. The third task allows to determine whether the student could find in the table and specify two correct answers, corresponding to the question of the task. Students of Russian schools cope successfully with the third task (80% in 2015). However, there are very few such tasks, as well as those like the first two, in the mathematics textbooks. The use of such tasks in class helps to find out and mitigate difficulties in the work with information timely.

Each of the presented phases of control of the development of the information literacy provides insight to achievements of students and difficulties faced by them.

The study revealed that the following specifics of a student's activities point out the insufficient level of development of the informational literacy:

(1) substantive or general training (universal) informational action is used partially;

(2) there is selectivity in understanding and applying formats of the presentation of information. For example, a scholar successfully reads a table, but cannot cope with the reading of a diagram, made on the same material;

(3) a student is not ready to choose independently the format for the presentation of information (waits for assistance or confines himself to textual records).

7. Conclusion

In conclusion let me present some recommendations to a teacher, that have been proposed and successfully implemented in the experimental work of the pilot sites.

First. Intentionally point out the study of specific informational actions, corresponding to the content of the studied subject, in the lesson tasks and fix in the end of the lesson. For example, put a special task for the study of tasks on the movement at mathematics lessons – teach to model: transfer text

data of tasks to a scheme, a table. At the end of this lesson discuss what model is considered by students as the most convenient to illustrate the mathematical essence of tasks on the movement and why.

Second. Include in the lesson tasks for the self-control. The fixation of the obtained solution and the answer, their comparison with the standard will help the student to be included in the discussion of his achievements, in the work with information; increase the interest in the results of the development of skills needed not only in the lessons, but also in everyday life.

Third. Continue teaching to orient in training means. The student should be able to refer to contents of the textbook, read the symbolic signs used in different textbooks, understand reductions of words. Periodically they must be reminded of the availability of paper and electronic dictionaries and handbooks.

Fourth. It is important to discuss with the student his achievements and difficulties in working with information, agree to work together to resolve the difficulties.

Monitoring of the progress of the development of the information literacy by a junior student and taking into account results in the educational process improve the quality of the training activities of the student: the completeness of understanding and the proper use of data, information, prevent the emergence of new errors, allow to restrain errors at hand. The ad hoc work with information (reading, presentation, interpretation) reduces the risk of disorientation in the information flow (including the Internet). Consideration of the information skills as a component of mathematical literacy contributes to the search and the implementation of the new focus areas for improving the quality of the mathematical training of students.

The developed model of control can be applied by pedagogs of the elementary school as presented, in order to characterize the informational literacy. The stages of the model – indicative, preparatory, diagnostic and control – can be used for the study of the progress of the development of other components of the functional literacy.

Acknowledgments

References

Davydov, V.V. (1996). *Teorija razvivajushhego obuchenija* [Theory of developmental training]. Moscow: INTOR. [in Rus.].

Federal'nyj gosudarstvennyj obrazovatel'nyj standart nachal'nogo obshhego obrazovanija (2017) [Federal state educational standard of the primary general education]. *M-vo obrazovanija i nauki Ros. Federacii*. Moscow: Prosveshhenie. [in Rus.].

Fook, J. (2010). Beyond reflective practice: reworking the 'critical' in critical reflection. In Bradbury H., Frost N., Kilminster S. and Zukas M. (Eds.), *Beyond reflective practice: new approaches to professional lifelong learning* (pp. 37-51). Abingdon, U.K.: Routledge.

Goldstein, H. (2015). Validity, science and educational measurement. *Assessment in Education: Principles, Policy & Practice, 22*(2), 193-201. http://dx.doi.org/10.1080/0969594X.2015.1015402

Greaney, V., & Kellaghan,T. (2014). *Implementing a National Assessment of Educational Achievement* (Volume 3). Washington, DC: The World Bank.

Kellaghan, T., Greaney, V., & Murray, T.S. (2014). *Using the Results of a National Assessment of Educational Achievement* (Volume 5). Washington, DC: The World Bank.

Kovaleva, G.S., Krasnyanskaya, K.A., & Rydze, O.A. (2018). *Rezultaty` vypolneniya diagnosticheskix rabot po matematike, russkomu yazyku i chitatelskoj gramotnosti uchashhimisya 5-x klassov* [Results of performance of diagnostic tests on mathematics, Russian language course and reading literacy by 5th-graders]. Moscow: ISRO RAO. [in Rus.].

Kuznetsova, M.I., Rydze, O.A., Soldatov, V.F., & Fomenko I.A. (2016). Itogovaja diagnostika mladshih shkol'nikov: procedura ocenki i analiz rezul'tatov [Final test of junior scholars: the procedure for assessment and analysis of results]. *Upravlenie nachal'noj shkoloj*, *3*, 44-53. [in Rus.].

Lompscher, J. (1999). Motivation and activity. *European Journal of Psychology of Education, 1*, 11-21.

Mezhdunarodnoe issledovanie po ocenke kachestva matematicheskogo I estestvennonauchnogo obrazovanija (2017). [International study on the assessment of quality of education in mathematics and science]. Retrieved from: http://www.centeroko.ru/timss15/timss15_pub.htm [in Rus.].

Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O'Sullivan, C.Y., & Preuschoff, C. (Eds.) (2014a). *TIMSS-2015. G4_Booklet_1*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Ruddock, G.J., O'Sullivan, C.Y., & Preuschoff, C. (Eds.) (2014b) *TIMSS-2015. G4_Booklet_5*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Mullis, I.V.S., Martin, M.O., Foy, P., & Hooper, M. (2016). *TIMSS-2015: International Results in Mathematics.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Vinogradova, N.F. (2017). *Koncepcija nachal'nogo obrazovanija: "Nachal'naja shkola XXI veka"* [Concept of the primary education: "Primary school of XXI century"]. Moscow: Ventana-Graf. [in Rus.].

Zuckerman, G. A., Kovaleva, G.S., & Kuznetsova, M.I. (2013). Between PIRLS and PISA: The advancement of reading literacy in a 10–15-year-old cohort. *Learning and Individual Differences*, *26*, 64–73.