POSSIBILITIES OF INTENSIVE FORMATION UNIVERSAL EDUCATIONAL ACTIONS IN PRIMARY SCHOOL

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Abstract. *The article presents a study devoted to the study of the possibilities of a more intensive formation of metasubject results in primary school. The article reveals the features of the content of the author's program "Intellectics", built on non-educational material. In contrast to the fourth-graders in the control group, the pupils of the experimental group participated in 32 lessons (one lesson per week) under the Intellectics program during the academic year. As a result of the study, it was shown that the mastering by children of the basic educational program (BEP) during the lesson time and the program "Intellect" at the inaccessible time is much more conducive to the formation of universal educational actions related to the generalization of the method of solving problems and cognitive content reflection than the development of children BEP only.*

Keywords: *fourth-graders, "Intellectics" program, non-educational tasks, cognitive reflection, general way of solving problems.*

1. Introduction

The requirements of the new Standard of primary general education (PGE) [8] indicate the connection of metasubject results with universal educational actions. It is noted that the meta-subject results of mastering the basic educational program of primary school by children should reflect the formation of universal educational actions in children, including cognitive ones. These include actions associated, in particular, with the construction of methods for solving problems of a search nature and with cognitive reflection aimed at considering the methods and conditions of actions in solving problems.

In the provisions of the Standard, it is noted that the main educational program of primary general education should include a program for the formation of universal educational actions, which should contain, in particular, typical tasks for the formation of universal educational actions, including cognitive ones. In this case, it is meant that such tasks should be developed on the basis of the material of academic subjects, requirements of the new.

Also, according to the Standard, the curriculum should provide for time for extracurricular activities, aimed, in particular, at the general intellectual development of the personality of a younger student.

Taking into account the noted provisions of the Standard, we have developed the program "Intellectics" [2], intended for the formation of cognitive metasubject results in junior schoolchildren. The development of the program can be carried out in a group and individual form, during work hours and after school hours. The content of the program consists of search tasks of various kinds and types, built on non-educational material.

Qualitative and quantitative characteristics of the formation of thinking skills in the program "Intellectics" are the following provisions:

- classes are held in a group form;
- in each academic year, 32 lessons are organized on a regular basis, one per week outside of school hours or, if possible, in lesson hours;
- mental skills are formed that underlie cognitive metasubject competencies and are necessary in solving any problems: the ability to analyze, combine, plan and reason;
- on non-educational material and systematically (according to a program defined for each year), four topics are worked out: "Analysis of the conditions of problems",

"Combination of search actions", "Planning the solution of problems", "Building reasoning and finding a conclusion from these judgments";

- children study with workbooks for grades 1, 2, 3 and 4;

- children do not have activities for the assimilation of subject knowledge, the implementation of educational and control tasks;

- no grades (marks) are given, - a collective check of independent work is carried out;

- home assignments are not given;

- methods of managing the formation of metasubject competencies (actions of the organizer of the classes) are presented in the methodological guide.

Means of forming thinking skills:

- for each year, the notebook contains over 450 search and creative tasks of four kinds, presented in the form of entertaining intellectual games: “for comparison” (for the formation of the ability to analyze), “for transformation” (the ability to combine), “to move” (the ability to plan), “For deduction” (the ability to reason), - the implementation of such tasks does not require educational knowledge, since it obeys the conditional rules proposed in each lesson;

- at each lesson a new topic is given: new game material, new tasks and rules for their solution;

- the solution to each problem is associated with the choice of an answer from several proposed options;

- in the first kind of tasks ("for comparison") there are two types of tasks that differ in the rules, the application of which is required to solve them, in the second kind ("for transformation") and the third ("for moving") - three types of tasks each, the fourth kind ("for breeding") - eight types of tasks;

- in each type of problem of the first three kinds, three options for constructing conditions are presented, each of which is used in a separate lesson on the topics "Analysis ...", "Combination ..." and "Planning ..." conditions, in the third - the final result;

- in each type of problems of the fourth kind, three construction options are also presented: in one version, the desired is an answer that satisfies the conditions of the problem, in the other, the missing part of the problem condition is the desired one, in the third, the question of the problem is the desired one, it is important that all these options are used at each lesson on the topic "Building a Reasoning ...";

- in each of the variants of the tasks of the marked species and genera, tasks of four levels of complexity are presented (for grades 1, 2, 3 and 4);

- each level of difficulty includes tasks of three degrees of difficulty;

- additional tasks are presented in the methodological guide: one part of these tasks (for those children who find it difficult) is easier than the tasks of the first degree of difficulty, the other part (for those children who find it easy) is more difficult than the tasks of the third degree of difficulty;

- in the methodological manual, gradually becoming more complicated diagnostic tasks of non-educational content are presented to determine the degree of development of the formed mental skills by children.

The conditions for the formation of thinking skills in solving problems of various kinds and types are the actions of the student, which are related:

- with the comparison of these answer options with the conditions of the problems;

- with the selection in a visual-figurative plan of elements of objective and abstract images with variable features when comparing these images with each other, - in case of difficulties, this selection is performed by children in a substantively effective plan by circling the named elements with a pen;

- with the definition in a visual-figurative plan of possible movements of imaginary characters, - in case of difficulties, such a definition is performed by children in a substantively effective plan by designating the named movements with lines;

- with the identification in a visual-figurative plan of possible options for transforming a given arrangement of geometric figures into the required one, - in case of difficulties, such identification is performed by children in a substantively effective plan by designating possible options with arrows;

- with the implementation of the conclusion from the proposed judgments in the verbal plan, - in case of difficulties, this conclusion is made using a visual plan: by drawing the diagrams of relations between the characters of the problem;

- with the compilation (orally or in writing) of tasks similar to those solved.

The methods of managing the formation of thinking skills are the actions of the teacher (or psychologist) associated with the organization:

- collective analysis of tasks, during which a rule for solving problems and an example of its application are introduced - at the beginning of each lesson;

- independent work of students, - in the middle of each lesson;

- collective verification of the solution of problems, during which the mistakes of children are analyzed, at the end of each lesson;

- additional (in case of unsuccessful solution of problems) search actions of children: by correlating each of these answers with the conditions, by examining images, by determining possible movements of imaginary characters and possible transformations of the arrangement of geometric figures;

- independent compilation of tasks by children, similar to those solved, - with successful solution of tasks.

2. Materials and methods

The purpose of this study was to determine the nature of the influence of the “Intellectics” program [3] on the formation of cognitive meta-subject results in fourth-graders. The study involved 117 students, - 46 of them made up the experimental group, 71 - the control group. Pupils of the experimental group studied according to the program "Intellectics" for one academic year (once a week for one hour, - a total of 32 lessons). It was assumed that the development by children of the basic educational program (BEP) of the fourth grade in class time and the program “Intellectics” outside of class time will contribute to the formation of cognitive meta-subject results to a greater extent than the development of BEP alone.

The stated hypothesis was based on two main points. The first of them is associated with the diversity of the content of the “Intellectics” program: in 32 classes, children are solved problems of four genera, each of which includes several types of problems, and each type is given in several versions.

The second basis of the hypothesis is associated with the peculiarities of classes in the "Intellectic" program. Each lesson consists of three parts. In the first part, the teacher, together with the students, analyzes the solution of the sample problem, i.e. tasks typical of the type that is mastered in this lesson. Such a discussion is necessary so that children understand what needs to be found in problems of a given type and how it can be done. Children are given the means of parsing tasks (this contributes to the formation of cognitive action associated with the construction of methods for solving problems of a search nature) and methods of managing the search for a solution and controlling their actions (this contributes to the formation of a cognitive action associated with the reflection of methods of action to solve problems).

In the second part, children independently solve 12-15 problems of this type. Here, favorable conditions are created for using the tools for analyzing the conditions of the problem and methods for finding a solution, presented in the first part.

In the third part, the teacher and the students check the solved problems. Wrong decisions and their reasons are analyzed, which is useful for all children - both for those who made a mistake and for those who made the right decision: the children are once again explained the methods of analyzing the conditions and analyzing the solution of problems. This creates favorable conditions for the development of cognitive actions by children, associated with the construction of methods for solving search problems and with reflection on the methods of action to solve problems.

Before and after 32 lessons with children of both groups, a group diagnostic lesson was conducted based on the "Substitution" methodology, which includes two tasks. Task 1 is intended to determine the formation of a cognitive action associated with the construction of methods for solving search problems, task

2 - to determine the formation of a cognitive action associated with the reflection of methods of action when solving problems.

The construction of task 1 was based on those presented in the works of S.L. Rubinstein [7] and V.V. Davydov [1] provisions on two ways of solving search problems: theoretical, general and empirical, particular. In accordance with these ideas, an experimental situation was developed [4], where it is proposed to solve a series of problems based on a single principle. In our studies, this experimental situation was modified and implemented on a different specific material [5].

The correct solution to all four problems of this task indicates the implementation of the general method, the successful completion of task 1 and the formation of a cognitive action associated with the construction of methods for solving search problems. The correct solution of only three, two or one problem indicates the implementation of a particular method, the unsuccessful performance of task 1 and the lack of formation of this cognitive action. The lack of a solution to all tasks also indicates the unsuccessful performance of task 1 and the lack of formation of this cognitive action.

Assignment 2 was based on the provisions on two types of cognitive reflection in solving problems (substantive and formal) presented in the works of V.V. Davydov [1]. In accordance with these provisions, we have developed a two-part experimental situation [4].

In its first part, it was proposed to solve three problems of two classes (the first and third problems were built and solved on the basis of one principle, the second problem - on the basis of another principle). In the second part, with the correct solution of all problems, it was proposed to group them.

If the grouping was based on the external features of the conditions of the tasks, then it was assumed that formal reflection was carried out in solving problems. If the grouping was based on the internal kinship of problems (a single principle of their construction and solution), then this testified to the implementation of meaningful reflection.

In this task, at first it was necessary to solve three problems: two of them, - problems 7 and 9, - were built according to the same principle, one, - problem 8, - in other. Then it was required to choose one opinion on these three problems from the five proposed.

With the correct solution of problems, the choice of the fourth opinion ("Katya's opinion") characterizes the implementation of meaningful reflection and indicates the sufficient (in relation to the proposed tasks) formation of this cognitive action. In this case, task 2 is considered successful. An incorrect solution to at least one problem of a given task characterizes the absence of reflection of any kind and indicates an insufficient formation of this cognitive action and unsuccessful performance of the task.

At the beginning of the lesson, the teacher wrote down on the blackboard the conditions for a simple task of the Substitution methodology, for example: TM + K = TS. Then he analyzed it together with his students: he explained that in this problem it is necessary, firstly, that different letters are replaced with different numbers, and the same letters - with the same numbers, and, secondly, that after the replacement a correct arithmetic example should be obtained. After discussing the correct and incorrect solutions proposed by the students, one of the proposed options was recorded: 23 + 4 = 27.

Then each student was given a form with problems and a blank sheet for answers.

Task 1

Training problems

1)F P + D = F F 2) W + R Q = R R

Main problems

3) F N Z
+ Z N F
N K N

4) X K X Г X
+ X Г X K X
F X F X F

5) K T F T K T F
+ F T K T F T K
T P T P T P T

6) V M V J V M V J
+ V J V M V J V M
Q V Q V QV Q V

Task 2

7) EU + O = E E 8) K K+ K = K C 9) Z W + X = Z Z

Opinions about problems
Several 4th grade students solved these problems and exchanged views.
Tanya said: "Problems 7, 8 and 9 are similar."
Kolya disagreed: "Problems 7, 8 and 9 are different."
Vika: "Problems 7 and 8 are similar, but problem 9 is different from them."
Katya: "No, problems 7 and 9 are similar, but problem 8 is different from them."
Nina: “I think that problems 8 and 9 are similar, but problem 7 is different from them”.
Which student is right?

* * *

Further, the teacher explained the tasks to the children on the form, pointing out that in the first task, you first need to solve problems No. 1 and 2, and then problems No. 3, 4, 5 and 6. Then the children were instructed that in the second task you need to solve problems 7, 8 and 9, then read the students' opinions on these three problems and on the answer sheet indicate the name of the student who said the most correctly. After that, you need to briefly explain why this student's opinion is the most correct.

3. Results.

Table 1. The results of the children in the control and experimental groups performing task 1 in September and May (in %)

Characteristic problem solving	Control group		Experimental group	
	September	May	September	May
No decision	11,3	5,6	15,2	0,0
Partial solution	56,3	52,1*	54,5	36,9*
General solution	32,4	42,3**	30,4	63,1**

*Note: * - p < 0.05; ** - p < 0.01.*

The data in Table 1 indicate that the number of children who solved problems in a general way increased from September to May in both groups. In the control group, the increase was 9.9% (from 32.4% to 42.3%), in the experimental group - 32.8% (from 30.4% to 63.1%). In September, the difference in the results characterizing the solution of problems in a general way by the children of the control and experimental groups was 2.0% and was statistically insignificant (the Fisher * test was used to determine the significance of the differences), and in May the difference in such results was 20.8% and became statistically significant (p <0.01).

This table also reflects data that the number of children who solved problems in a private way decreased from September to May in both groups. In the control group, the decrease was 4.2% (from 56.3% to 52.1%), in the experimental group - 17.6% (from 54.5% to 36.9%). Thus, in September, the difference in the results characterizing the solution of problems in a private way by children of the control and experimental groups was 1.8% and was statistically insignificant, and in May the difference in such results was 15.2% and became statistically significant (p <0.05).

In addition, the table also contains data on the subjects of both groups who did not solve any problem. In September, there were fewer such subjects in the control group than in the experimental group - respectively: 11.3% and 15.2%; in May, such subjects remained in the control group, although their number decreased by half, and in the experimental group they were not remained completely - respectively: 5.6% and 0.0%.

The noted facts indicate that classes under the program "Intellectics", in which the children of the experimental group participated, significantly contribute to the formation of metasubject results in fourth-graders, associated with the development of actions to build methods for solving search problems.

Table 2. The results of the children in the control and experimental groups performing task 2 in September and May (in %)

Characteristic reflection	Control group		Experimental group	
	September	May	September	May
Absence reflection	8,5	0,0	10,9	0,0
Formal reflection	81,7	87,3*	80,4	73,9*
Substantial reflection	9,8	12,7*	8,7	26,1*

Note: ** - p < 0.05*

The data in Table 2 indicate that the number of children who carried out meaningful reflection in solving problems increased from September to May in both groups. In the control group, the increase was 2.9% (from 9.8% to 12.7%), in the experimental group - 17.4% (from 8.7% to 26.1%). In September, the difference in the results characterizing the implementation of meaningful reflection by children in the control and experimental groups when solving problems was 1.1% and was statistically insignificant, and in May the difference in such results was 13.4% and became statistically significant ($p < 0.05$).

This table also reflects data on the fact that the number of children who carried out formal reflection in solving problems from September to May changed in both groups in the opposite way: in the control group, the number of such children increased from 81.7% to 87.3%, and in the experimental group - decreased from 80.4% to 73.9%. Thus, in September, the difference in the results characterizing the number of children who performed formal reflection in solving problems was 1.3% and was statistically insignificant, and in May the difference in such results was 13.4% and became statistically significant ($p < 0.05$).

On the one hand, the facts noted (as well as with respect to the formation of metasubject results associated with the development of cognitive actions to build methods for solving search problems) indicate that classes under the Intellectics program, in which children of the experimental group participated, significantly contribute to the formation of metasubject results in fourth-graders, associated with the development of cognitive reflection.

On the other hand, the results obtained confirm our data that the formation of cognitive reflection of a meaningful type in primary school age occurs later than the development of an action associated with the construction of a general method for solving search problems [4].

4. Conclusion

So, the results of the study confirmed the initial hypothesis that the development of fourth-grade BEP by children in class time and the program “Intellectics” during extracurricular hours contributes to the formation of cognitive meta-subject results to a greater extent than the development of BEP alone.

This result is related to the characteristics of the problems included in the “Intellectics” program. Firstly, children are offered problems of non-educational content and search nature. Secondly, in the classroom, various kinds of problems are offered: plot-logical, spatial-combinatorial, comparative, route. Moreover, each type of problem includes several types, and each type is offered in several versions. Thirdly, students solve problems of different structures: with a complete condition and a question (find an answer), with an incomplete condition and a question (find a part of a condition), with a complete condition and without a question (find a question). Fourth, the program includes two types of tasks based on problems of each kind and type: solving problems and checking ready-made solutions to problems.

The important conditions for the implementation of the program are the features of developmental classes: their total number, frequency and regularity, duration and structure of each lesson. In total, 32 lessons were held over nine months (September - May), one lesson per week. Each session lasted 60 minutes and included three parts: preliminary discussion (about 15 minutes); independent problem solving (about 30 minutes); final discussion (about 15 minutes).

The study showed for the first time that the solution of non-educational search problems by primary schoolchildren (grade 4) significantly contributes to the formation of universal educational actions associated with the construction of methods for solving search problems and with cognitive reflection. This fact allows us to consider the “Intellectics” program as an important component of the program for the formation of universal educational actions, which, in accordance with the requirements of the Standard, should be part of the main educational program of primary education.

The study also made it possible to gain new knowledge about the conditions for the formation of universal learning actins (ULA) in primary school, in particular, among 9-year-old children studying in the fourth grade of primary school. This knowledge expands the understanding of developmental psychology about the possibilities of intellectual development of children at primary school age and clarifies the provisions of educational psychology about the conditions of mental development in primary school.

At the same time, the results obtained allow us to consider the “Intellectics” program as an important factor in the intellectual enrichment of the educational environment in primary school.

The results of the study give grounds to set the task of performing a number of studies to develop a more effective (than in this study) composition of search tasks by including their new genera and species in the “Intellectics” program. In particular, it is of serious scientific interest to include in the program of tasks for the implementation of the author's thinking (independent compilation of tasks) as conditions for the formation of ULA (see, for example, [6]).

In general, the study showed the effectiveness of using the “Intellectics” program for the formation of cognitive actions in younger schoolchildren (in particular, fourth-graders), associated with the construction of methods for solving search problems and with reflection on the methods and conditions for solving problems.

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ВОЗМОЖНОСТИ ИНТЕНСИВНОГО ФОРМИРОВАНИЯ УНИВЕРСАЛЬНЫХ УЧЕБНЫХ ДЕЙСТВИЙ В НАЧАЛЬНОЙ ШКОЛЕ

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Аннотация. *В статье представлено исследование, посвященное изучению возможностей более интенсивного формирования в начальной школе метапредметных результатов. Раскрыты особенности содержания авторской программы «Интеллектика», построенной на неучебном материале. В отличие от четвероклассников контрольной группы, ученики экспериментальной группы в течение учебного года участвовали в 32 занятиях (по одному занятию в неделю) по программе «Интеллектика». В результате исследования было показано, что освоение детьми основной образовательной программы (ООП) в урочное время и программы «Интеллектика» в неурочное время существенно в большей степени способствует формированию универсальных учебных действий, связанных с обобщением способа решения задач и познавательной содержательной рефлексией, чем освоение детьми только ООП.*

Ключевые слова: *четвероклассники, программа «Интеллектика», неучебные задачи, познавательная рефлексия, общий способ решения задач.*