CONDITIONS FOR THE DEVELOPMENT OF GENERALIZED PROBLEM SOLVING IN PRIMARY SCHOOL

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Abstract. *The aim of the study was to determine the possibilities of forming a generalized method of solving plot-logical problems in fourth-graders. It was assumed that the author's program "Logic 1" provides such possibilities. The program includes 8 types of plot-logical problems of non-educational content. Each type of problem is offered to children in four structural variants: find the answer, find the question, find part of the conditions, change the answer by replacing part of the conditions. The control group consisted of 73 students, the experimental group – 49 students who participated in 32 group classes (weekly, from September to May). Initial and final diagnostics of the generalized method of solving problems were carried out. The study showed that classes according to the school program and the "Logic 1" program contribute to the formation of a generalized method of solving problems to a significantly greater extent than classes only according to the school program. In further studies, it is planned to determine the extent to which the "Logic 1" program contributes to the formation of a generalized method of solving problems in younger adolescents.*

Keywords: *generalized method of solving problems, formation, 4th grade students, the program "Logic 1", plot-logical problems.*

1. Introduction.

The Federal State Educational Standard of Primary General Education contains provisions on the relationship between the meta-subject results of mastering the basic educational program (BEP) of primary grades by children and universal educational activities (UUD). The above results reflect the formation of UUD of various types in schoolchildren, in particular, the mastery of cognitive UUD, which include general educational activities, logical activities and activities related to posing and solving problems. The latter type of cognitive activities includes activities to build effective ways to solve search problems.

The Standard also specifies the requirements for the BEP of Primary General Education, according to which, in particular, one of its sections should be a program for the formation of universal educational activities (including cognitive ones), built on the basis of typical tasks of primary education disciplines. In addition, the Standard prescribes that the curriculum should disclose the content of extracurricular activities, including classes related to the intellectual development of children.

Based on the above requirements of the Standard, we have developed the program "Logic 1", the purpose of which is to create conditions for children to achieve cognitive meta-subject results that are associated with mastering the general method as an effective way to solve problems. This program is built on the material of various plot-logical problems of non-educational content.

The construction of the program "Logic 1" corresponds to our strategy of creating additional conditions for children to master universal learning activities, due to the fact that in classes in extracurricular activities they solve various types and kinds of problems of non-educational content. The implementation of this strategy adds another direction to the work on creating the above-mentioned program for the formation of universal learning activities based on educational material, which is being developed by different groups of teachers and psychologists.

Thus, the methodology of this program and the content of a number of its sections were proposed by the team led by A.G. Asmolov [1], and approaches to the diagnostics of universal educational actions in the acquisition of mathematics by children in grades 1-4 were developed by a group of psychologists organized by V.A. Guruzhapov [5-7].

The first result of our strategy was the development of the program "Intellektika" (grades 1-4)

[10-14], which has been successfully [2] implemented for many years in the extracurricular activities of primary school students in 200 schools in different regions of Russia [18]. The program "Logic 1" is, to a certain extent, a continuation of the program "Intellektika".

1.1. Methodological foundations.

In assessing the effectiveness of the methods chosen to solve problems, we proceeded from the concepts of cognitive activity developed in dialectical logic [18] and implemented in the studies of S.L. Rubinstein [20], V.V. Davydov [8] and his followers (see, for example, [4, 17]).

According to the noted ideas, a person, cognizing the surrounding reality, can in some cases set the goal of studying the connections and relationships of the objects of cognizance that are hidden from direct perception. Such an approach characterizes rational, meaningful cognition. In other cases, when the goal is to describe the connections and relationships of objects given in direct perception, rational, formal cognition is realized.

Meaningful cognition is a manifestation of the effectiveness of cognitive activity, because its result consists in identifying the causes underlying changes in the object of cognizance and establishing the patterns that govern its existence. Formal cognition, as associated with the identification and ordering of external connections and relationships, is not effective enough, since it does not allow one to identify the patterns of existence of the object of study and trace changes in its properties in the past, present and future.

Based on the noted provisions on the content and methods of different types of cognition, an understanding of the features of different types of the above-mentioned actions to develop a method for solving problems was formulated. In one case, the action associated with such development is aimed at identifying essential data relationships contained in the conditions of the problem being solved, in the other case this does not happen: essential data relationships objectively contained in the conditions of the problems being solved are not identified.

Thus, a cognitive action associated with identifying essential relationships is implemented as a substantive action, the result of which is an effective, general way of solving problems. A cognitive action not associated with identifying essential relationships is implemented as a formal action, the result of which is a particular way of solving problems.

1.2. General characteristics of the study.

The experimental work was based on the idea that it is possible to develop a program of classes for extracurricular activities that will contribute to the formation of meaningful cognitive action in young schoolchildren studying according to the basic educational program of primary school, associated with the analysis of the conditions of problems and the implementation of a generalized method for solving them.

Based on this idea, the above-mentioned program "Logic 1" was created, which included 32 classes in which children solved plot-logical problems of non-educational content. Our preliminary experiments showed that tasks on non-educational material can be used to develop effective methods for solving logical problems [16].

The goal of our study was to determine to what extent classes according to the "Logic 1" program will contribute to the formation of a generalized method for solving plot-logical problems in children.

We assumed that mastering the school curriculum and the "Logic 1" program by children would contribute to the formation of a generalized method of solving plot-logical problems to a significantly greater extent than mastering the school curriculum alone.

A total of 122 fourth-graders participated in our study: 73 students made up the control group, 49 – the experimental group. The study consisted of three stages. At the first stage, children from both groups solved plot-logical problems using the “Combination” method to determine the development of a generalized solution method. At the second stage, 32 lessons were held with children from the experimental group using the Logic 1 program (from September to May, one lesson per week). At the third stage, children from both groups again solved the same problems as at the first stage.

2. Materials and methods.

2.1. General content of the “Logic 1” program.

The “Logic 1” program includes 4 groups of lessons with 8 lessons in each group – 32 lessons in total. In all classes, it was proposed to solve plot-logical problems associated with the implementation of deductive reasoning, since it was

necessary to make a conclusion based on general (major premise) and specific (minor premise) information.

In each group of classes, children solved eight types of plot-logical problems. In odd classes, it was proposed to solve problems with attributive judgments: in the first group in classes 1, 3, 5, 7, in the second group – in classes 9, 11, 13, 15, in the third group – in classes 17, 19, 21, 23, in the fourth group – in classes 25, 27, 29, 31. In the remaining classes, children solved problems with relative judgments.

In all classes of the first group, children solved standard problems, where it was necessary to find an answer to the proposed conditions and question. Moreover, in each class it was required to complete tasks of two types: A and B. When completing task A, the student had to find the answer. When completing task B, the student had to check the proposed solution. The purpose of such a task for developing a generalized method of solving problems is that by finding out whether someone's answer was correct or incorrect, the student has the opportunity to understand the solution to the problem "from the outside". This creates favorable conditions for a more complete and accurate understanding of the relationships of judgments in the problem when searching for a solution.

In each lesson of the second to fourth groups, after solving several standard problems, nonstandard problems were given. Thus, in the lessons of the second group, it was necessary to find a question for the proposed conditions, in the lessons of the third group – to find part of the problem condition based on this question and another part of the condition, in the lessons of the fourth group - to find (taking into account this part of the condition and the question) such a variant of another part of the condition that the answer to the problem would change.

2.2. Examples of tasks from the program "Logic 1".

Group 1.

Lesson 1. Tasks with attributive judgments.

Task A: "Find the answer." For example: "Alik, Borya, and Vova studied music. Someone played the trumpet, someone played the accordion, someone played the violin. Alik played the accordion, Borya played the trumpet or the accordion. Who played the violin?"

a) Borya, b) Nina, c) Alik, d) unknown.

Task B: "Check the answer." For example: "One student was solving the problem: "Dima, Lenya, and Borya kept animals at home. Someone had a dog, someone had a cat, someone had a turtle. Dima had a cat. Lenya had a cat or a dog. What animal did Borya have?" The student answered: "A turtle."

a) the answer is correct, b) the answer is incorrect

Group 2.

Lesson 9. Problems with attributive judgments.

Task 1. "Find the question". For example: "Alla, Galya and Vera jumped high. Someone jumped 1.5 meters, someone – 1.4 meters, someone – 1.3 meters. Alla jumped 1.5 meters, Galya jumped 1.3 meters or 1.5 meters." What question can be answered based on the conditions of this problem?"

a) Where did the girls jump high? b) Who jumped 1.6 meters? c) Who jumped 1.5 meters? d) How high did Vera jump?

Group 3.

Lesson 17. Problems with attributive judgments.

Task 1. "Find part of the condition". For example: "Oleg, Gena and Vitya went on a trip: someone by plane, someone by train, someone by ship. Oleg traveled by ship. [.....]. Who traveled by train?" What do you need to know to answer the question?"

a) [Gena traveled on a horse], b) [Vitya traveled on foot], c) [Gena traveled by plane or by ship], d) [Igor traveled by plane].

Group 4.

Lesson 25. Problems with attributive judgments.

Task 1. "Change the answer". For example: "Dasha, Zhenya and Katya drew birds. Someone drew an eagle, someone – a parrot, someone – a sparrow. (1) Zhenya drew an eagle. (2) Dasha drew a sparrow or an eagle. Who drew a parrot?" (answer: Katya drew a parrot). What sentence should replace sentence (2) so that the correct answer is "Dasha was drawing a parrot?".

a) Katya was drawing an eagle, b) Katya was drawing a parrot, c) Katya was drawing a sparrow or an eagle, d) Zhenya was drawing a sparrow.

2.3. Developmental activities.

The lessons according to the "Logic 1" program consist of three parts.

During the first part (about 15 minutes), the teacher and the students analyze ways to solve a problem of the type specified in the program for this lesson. The children must understand the problem, identify the purpose of the search in problems of this type and find a way to achieve this goal. The children are provided with tools for analyzing the conditions of problems and methods of reasoning based on the correlation of judgments.

In the second part (about 30 minutes), the children independently solve 10 to 15 problems, applying the knowledge gained in the first part.

In the third part (about 15 minutes), the teacher and the students check the solved problems and examine incorrect solutions in detail to show the children once again how to analyze the conditions of problems and how to reason in order to make the right conclusion.

It is important to note that the variety of problems for independent solution is ensured by a number of conditions. Firstly, problems with affirmative and negative judgments are offered, secondly, problems of varying complexity (with one, two and three judgments in the conditions), thirdly, problems where the correct answer is "it is not known who", fourthly, problems with extra judgments.

2.4. Diagnostics.

Before and after 32 lessons on the "Logic 1" program, a group diagnostic lesson was held with children from both groups using the "Combination" method. Its development was based on the above-mentioned ideas about two ways of solving search problems: theoretical, general, and empirical, particular. In accordance with these ideas, an experimental situation was developed [9], where it was proposed to solve a series of problems built on the basis of a single principle. In our studies, this experimental situation was modified and implemented on different specific material [15-17].

The "Combination" method includes 12 problems. Problems 1-4 were intended to introduce children to the material of plot-logical problems, the solution of which requires correlating the proposed judgments and drawing the necessary conclusion.

Problems from 5 to 12 are the main ones. They are built on a single principle: three objects with pairwise coinciding properties correspond to three other objects. For example, three boxes – No. 1 (large and red), No. 2 (large and white), No. 3 (small and white) correspond to three stickers (triangle, square and circle) as follows: the triangle and circle are glued to the large box, the circle and square - to the white one. Conclusion: the circle is glued to box No. 2, the triangle is glued to box No.1, the square is glued to box No. 3.

The group lesson on the material of the “Combination” method was conducted as follows.

At the beginning of the lesson, the children are given sheets of blank paper on which they write their last names. Then the organizer of the lesson hands out forms with the conditions of the problems and gives explanations, drawing the children's attention to the total number of problems on the form and the need to solve them in a row, in order, starting with the first. Then he emphasizes that in order to solve the problem correctly, you need to read it several times - silently ("to yourself"), so as not to disturb your neighbors, then think (also silently) and, when the answer is clear, write it on the sheet of paper on which the last name is written. In conclusion, he points out that the problems must be solved only "in your head", you cannot write anything or make any notes.

Form

1. Masha and Tanya each had a dog: one was called Zhuchka, the other - Polkan. What kind of dog did Tanya have if Masha had Zhuchka?

2. Borya and Vova were picking mushrooms: some were picking russula, some were picking porcini. What mushrooms did Borya pick if Vova wasn't picking russula?

3. Katya, Lena and Marina were drawing animals: some were drawing a hare, some were drawing a bear, some were drawing a fox. Lena was drawing a bear, Katya wasn't drawing a bear or a hare. Who was drawing the fox?

4. Vova, Seva and Kolya were watching films: some were about sports, some were about space, some were about the sea. Seva didn't watch a film about the sea and sports. Kolya didn't watch a film about sports. Who was watching a film about space?

5. Liza, Galya and Nina lived in different houses. House No. 1 was tall and stone, No. 2 was tall and wooden, No. 3 was low and stone. Who has what kind of house, if Galya and Nina

have a tall one, and Nina and Lisa have a stone one?

6. Kolya, Vasya and Misha competed to see who was stronger. The one who lifted a heavy weight many times was first, the one who lifted a light weight many times was second, and the one who lifted a heavy weight few times was third. What place did each take, if Vasya and Kolya lifted the weight many times, and Vasya and Misha had a heavy weight?

7. The Wolf, the Fox and the Bear lived in three houses. The first was white with a large window, the second was green with a large window, and the third was green with a small window. The Wolf and the Fox had a house with a large window, and the Wolf and the Bear had a green house. Who had what kind of house?

8. Katya, Marina and Nina had boots. Some are tall red, others are short blue, and others are short red. Katya and Nina's are short, and Nina and Marina's are red. What kind of boots do you have?

9. Misha, Seryozha, and Vova each had one notebook. One notebook was thin and lined, the other was thick and lined, and the third was thick and squared. Misha and Vova had a thick notebook, and Vova and Seryozha had a lined notebook. What kind of notebook did you have?

10. The weather was different on four days in August: August 2, 5, and 10. One day it was cold and rainy, the next day it was warm and rainy, and the third day it was warm and dry. It was warm on August 2 and 10, and rainy on August 5 and 10. What was the weather like on each of the three days?

11. Katya, Lisa, and Nina read different books. One book had poems about nature, another had stories about sports, and the third had stories about nature. Nina and Katya read about nature, Nina and Lisa read stories. Who read what?

12. Misha, Kostya, and Vova each had a ball. One ball was big leather, the other was small leather, and the third was small rubber. Misha and Kostya had a small ball, Misha and Vova had a leather ball. What kind of ball did each boy have?

* * *

When processing the results of solving the problems of the "Combination" method in the control and experimental groups, four subgroups of subjects were identified. The children who solved all the problems correctly formed subgroup A. The subjects of this subgroup solved problems 5-12 in a generalized way, which was based on a single principle for their construction.

The children who correctly solved problems 1 - 4 and some of the problems 5-12 formed subgroup B; those who solved some of the problems 1-4 and some of the problems 5-12 correctly – subgroup C; those who solved some of the problems 1-4 correctly and all of the problems 5 - 12 incorrectly – subgroup D.

Thus, the children of the last three subgroups were unable to find a single principle for solving problems 5 through 12 and solved them in a particular way: some of the problems were successful, and some (or even all) were unsuccessful.

3. Results

Table. The number of students in subgroups A, B, C and D of the control (C) and experimental (E) groups (proportional to the total number of students in the control and experimental groups), in September and May.

Subgroups Subjects	September		May	
	К group, n(%)	Э group, n(%)	К group, n(%)	Э group, n(%)
Subgroup A	23 (31.5)	15 (30.6)	29 (39,7)**	30 (61.2)**
Subgroup B	34 (46.6)	22 (44.9)	39 (53.5)	19 (38.8)
Subgroup C	9 (12.3)	7 (14.3)	3 (4.1)	0 (0.0)
Subgroup D	7 (9.6)	5 (10.2)	2 (2.7)	0 (0.0)

$^{**}p < 0.01$

The data presented in the table show that in the first two subgroups of the control group in May, compared to September, there were more children: in subgroup A – by 8.2%, in subgroup B – by 6.9%, and in the remaining two subgroups – fewer: in subgroup C – by 8.2%, in subgroup D – by 6.9%.

The above data indicate that, on the one hand, the number of children solving problems in a generalized way (subgroup A) and the number of children solving all problems 1 through 4 and

some problems 5 through 12 correctly (subgroup B) increased, and, on the other hand, the number of children solving some problems 1 through 4 and some problems 5 through 12 correctly (subgroup C) and the number of children solving some problems 1 through 4 correctly and all problems 5 through 12 incorrectly (subgroup D) decreased.

In general, based on the above results, we can say that children's classes only according to school programs did not have a significant impact on the success of repeated problem solving using the "Combination" method in May.

With regard to changes in the number of subgroups of the experimental group from September to May, the data in the table indicate the following.

First, as in the control group, the number of subgroup A increased in the experimental group – by 21.5%. This means that if in September a smaller proportion of children in the experimental group (30.6%) solved the problems of the "Combination" method in a generalized way, then in May the majority of children (61.2%) solved these problems in a generalized way. The number of children in subgroup A has thus doubled. This fact allows us to assert that classes according to the school program and the "Logic 1" program had a significant impact on the formation of a generalized way of solving plot-logical problems in children, in particular, problems of the "Combination" method.

Comparing the growth of the number of subgroup A in the control group and in the experimental group, it is necessary to pay attention to the following. In the control group, the number of children solving the problems of the "Combination" method in a generalized way increased by 8.2% and became 39.7%, and in the experimental group, the number of such children increased by 21.5% and became 61.2% (the difference between the indicators of 39.7% and 61.2% is statistically significant, at $p < 0.01$).

It is important to note the multidirectional changes (in May compared to September) that occurred in the number of children who correctly solved all problems 1-4 and some problems from 5 to 12 (subgroup B) in the control and experimental groups. Thus, in the control group, the number of such children increased – from 46.6% to 53.5%, and in the experimental group - decreased: from 44.9% to 38.8%.

In the first case, the increase in the number of children who correctly solved all problems from 1 to 4 is associated with classes according to the school curriculum.

In the second case, the decrease in the number of such children is due to the fact that, as the analysis of the protocols showed, 15 people from subgroup B moved to subgroup A (i.e. began to solve problems in a generalized way), and 7 people from subgroup C and 5 people from subgroup D came to subgroup B. As a result of such movements, subgroup B became 19 people, and there were no children left in subgroups C and D.

Analysis of the protocols of problem solving by children in the experimental group will allow us to note the following fact: 5 children who in September correctly solved part of the problems from 1 to 4 and incorrectly all problems from 5 to 12, in May correctly solved all problems from 1 to 4 and part of the problems from 5 to 12. This means that they did not move to the neighboring subgroup (from subgroup D to subgroup C), but "jumped" over a subgroup - from subgroup D they got straight to subgroup B. Analysis of the protocols of problem solving by children in the control group did not reveal such facts.

Thus, in May, only children who had correctly solved all problems from 1 to 4 remained in the experimental group. At the same time, most children solved all problems from 5 to 12 correctly, and a minority did not solve all problems. It can be argued that the noted changes demonstrate the influence of classes not only according to the school program, but also according to the "Logic 1" program.

In general, the results presented in the table indicate the features of the formation of a generalized method for solving plot-logical problems in fourth-graders during one year of study in primary school. The data describing changes in solving problems of the "Combination" method at the end of the school year (relative to its beginning) show that classes according to school programs make a significantly smaller contribution to improving reasoning than classes according to school programs in unity with classes according to the "Logic 1" program.

4. Discussion

The conducted study confirms the initial hypothesis, according to which the solution of eight types of plot-logical problems in four structural variants during classes according to the “Log-

ic 1" program really acts as a condition for the formation of a generalized method for solving plot-logical problems in fourth-graders.

4.1. Experimental conditions

The obtained results are related to the characteristics of the problems contained in the "Logic 1" program.

First, children are asked to solve eight types of problems: four types with attributive judgments and four types with relative judgments. Second, each of the eight types of problems is given in four structural variants: find the answer, find the question, find part of the condition, change the answer by changing part of the condition. Third, children are asked to check the finished solution to the problems. Fourth, children solve problems with affirmative and negative judgments. Fifth, children solve problems of varying complexity (with one, two and three judgments in the conditions). Sixth, children are asked to solve problems where the correct answer is "it is not known who". Seventh, children are given problems with extra judgments.

The characteristics of the classes are of great importance for the results of the study. First, 32 classes were held (one per week) throughout the school year from September to May. Secondly, each lesson included three parts: preliminary discussion (approximately 15 minutes); independent problem solving (approximately 30 minutes); final discussion (approximately 15 minutes).

The purpose of the preliminary discussion is to introduce children to the structural version of the problem that corresponds to the content of the lesson. At the same time, there is a collective discussion of how to reason in order to successfully solve this structural version of problems of this type. Such a discussion serves as a condition for the formation of a generalized method of solving problems, since the features of constructing problems and the results of correlating different judgments are analyzed.

The purpose of the final discussion is to show children how to control their actions when solving problems and which results of the solution can be assessed as correct or incorrect.

In general, conducting preliminary and final discussions is aimed at ensuring that children gradually master the methods of solving plot-logical problems and can apply this in independent work in each lesson.

4.2. Scientific significance of the study

The study allowed us to obtain new knowledge about the conditions for the formation of a generalized method for solving plot-logical problems in fourth-graders. This knowledge expands and clarifies the ideas of developmental psychology about the possibilities of intellectual development of children at this age.

The results of the study serve as an additional argument in favor of the position of L.S. Vygotsky [3] in his polemic with J. Piaget [19]. Considering the problem of the relationship between learning and development, L.S. Vygotsky argued: "... Only that learning in childhood is good which runs ahead of development and leads development behind itself..." [3, p. 449]. Our study showed that learning with the help of a teacher (i.e. within the zone of proximal development) contributes to a significantly more intensive (compared to the control group) formation of a generalized method of solving problems.

One of the important problems of educational psychology is the intellectual enrichment of the educational environment of primary school: so that children solve more mental problems. The study showed a possible direction for intellectual enrichment of the learning environment, which is associated with the inclusion of a course of non-academic content (in particular, classes on the "Logic 1" program) in the teaching in elementary grades.

4.3. Limitations of the study

The obtained results should be considered taking into account the following limitations.

The main limitation is associated with the composition of the students in the control and experimental groups. The results of solving the problems of the "Combination" method in September showed that in the control group, 31.5% of children were able to solve all 12 problems correctly, and in the experimental group – 30.6%. It can be assumed that with a different composition of students, when all the problems could be solved by 20% or 10% of children in each group, the results of the classes would be different – most likely worse.

It should also be noted that the study did not take into account possible assistance from parents: its content and form, its quantity and frequency. Although, according to teachers, parents were actively interested in the successes of their

children and may have provided assistance in some way.

4.4. Impact of developmental activities.

Observations during lessons allowed us to note a number of changes in children's behavior over the course of 32 lessons.

First, children began to participate more actively in preliminary discussions and come up with more solutions to problems. They stopped being afraid of mistakes when they offered their own solutions to problems, since in these cases the teacher did not evaluate the children and their suggestions. Together with the students, he analyzed the effectiveness of each solution option.

Second, the children's attitude to the lessons changed, especially among those who were able to solve only the easiest problems in September. In the first four to six lessons, they showed increased anxiety: they were afraid that they would not succeed. Gradually, they calmed down and began to participate in the discussion of problems, offering certain solutions.

When independently solving problems, the activity of these children was supported, especially in the first five to eight lessons. The teacher reminded them of the features of the type of problem being solved and pointed out those elements of the conditions that needed to be taken into account.

For some time, such children could not independently solve problems with incomplete conditions, with missing questions, or complete tasks that required checking ready-made solutions. The teacher helped them understand the fallacy of incorrect choice options.

Thirdly, the activity of children who successfully solved all the problems in September was also supported. They usually quickly coped with independently solving problems, and the teacher offered them creative tasks for composing problems similar to those solved. As our research has shown [16], such tasks contribute to the formation of a generalized method of solving problems.

Conversations with teachers made it possible to identify the influence of developmental classes on the intellectual behavior of students. Firstly, children began to reason more consistently and more accurately analyze the conditions of problems in mathematics lessons. Secondly, they began to come up with more examples of applying grammar rules in their native language lessons.

Thirdly, children showed increased activity in discussing educational material in lessons of various subjects and a decrease in negative emotions when studying complex phenomena in natural science lessons.

Fourthly, students who solved all the problems in September, after two or three months of classes often asked for additional material to solve problems at home.

At the same time, teachers noted changes in their work. In particular, in mathematics lessons they began to offer children more problems of an unusual structure: with an incomplete condition or a missing question. In addition, in various disciplines they began to practice tasks to check the finished solution of problems.

4.5. Objectives of further research

The results of the conducted research made it possible to formulate a number of problems for further study.

Firstly, it is planned to conduct a similar study with 11-year-old children in order to more fully and accurately characterize the influence of the "Logic 1" program on the formation of a generalized method of solving problems in fifth-graders.

Secondly, it is necessary to find the optimal composition of plot-logical problems included in the program "Logic 1" for students of different grades - from the third to the sixth. In particular, the effectiveness of a different (than in this study) number and content of types of plot-logical problems is of research and practical interest.

Thirdly, it is necessary to evaluate the effectiveness of such tasks for the formation of a generalized method for solving problems that are associated with independent compilation of problems by children, as well as tasks where it is necessary to check ready-made solutions to problems with an incomplete structure, when it is necessary to find a question or part of the condition.

Fourthly, it is necessary to find more effective options: a) the ratio of time of the three parts of the lesson (mentioned above); b) the duration of a separate lesson (it is possible to combine two lessons of 40-45 minutes into one lesson with a short (15-20 minutes) break); c) the regularity of the lessons: not 4 lessons per month, as in this study, but 6 or 8 lessons.

5. Conclusions

The study examined the features of the formation of a generalized method for solving plot-logical problems in fourth-graders in different

conditions. It was found that as a result of classes according to the school program and, simultaneously, according to the "Logic 1" program, the formation of a generalized method occurs significantly more intensively than as a result of classes only according to the school program.

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УСЛОВИЯ РАЗВИТИЯ ОБОБЩЕННОГО РЕШЕНИЯ ЗАДАЧ В НАЧАЛЬНОЙ ШКОЛЕ

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Аннотация. *Целью исследования было определение возможностей формирования обобщенного способа решения сюжетно-логических задач у учащихся четвертого класса. Предполагалось, что авторская программа «Логика 1» предоставляет такие возможности. Программа включает 8 видов сюжетно-логических задач неучебного содержания. Каждый вид задач предлагается детям в четырех структурных вариантах: найти ответ, найти вопрос, найти часть условия, изменить ответ, заменив часть условия. Контрольную группу составили 73 ученика, экспериментальную группу – 49 учеников, которые приняли участие в 32 групповых занятиях (еженедельно, с сентября по май). Проводилась первичная и итоговая диагностика обобщенного способа решения задач. Исследование показало, что занятия по школьной программе и программе «Логика 1» способствуют формированию обобщенного способа решения задач в значительно большей степени, чем занятия только по школьной программе. В дальнейших исследованиях планируется определить, в какой степени программа «Логика 1» способствует формированию обобщенного способа решения задач у младших подростков.*

Ключевые слова: *обобщенный метод решения задач, формирование, учащиеся 4 класса, программа «Логика 1», сюжетно-логические задачи.*