CHARACTERIZATION OF THE FORMATION OF COGNITIVE REFLECTION IN SECOND GRADE SCHOOLCHILDREN

ОПРЕДЕЛЕНИЕ ХАРАКТЕРИСТИК СФОРМИРОВАННОСТИ ПОЗНАВАТЕЛЬНОЙ РЕФЛЕКСИИ У ШКОЛЬНИКОВ ВТОРОГО КЛАССА

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Abstract

The article presents the content of a study aimed at developing a method for determining the characteristics of cognitive reflection in second grade schoolchildren. It was found that the use of two tasks of varying complexity allows us to obtain more accurate and more complete information about the formation of cognitive reflection in children seven to eight years old.

Аннотация

В статье представлено содержание исследования, нацеленного на разработку метода определения характеристик познавательной рефлексии у школьников второго класса. Было установлено, что применение двух заданий разной сложности позволяет получить более точные и более полные сведения о сформированности познавательной рефлексии у детей семи – восьми лет.

Keywords: cognitive reflection, diagnostics, children of seven to eight years old, tasks of non-educational content.

Ключевые слова: познавательная рефлексия**,** диагностика, дети семи – восьми лет, задания неучебного содержания.

1. Introduction

The new FGOS FSES of primary general education [7] indicates that the result of the development of primary school by primary school students should be not only the formation of educational results in different studied subject areas, but also the formation of metasubject results, the components of which are cognitive competencies, in particular, cognitive reflection.

The same fundamental document notes the need to monitor the formation of metasubject competencies (in particular, the formation of cognitive reflection in junior schoolchildren) not only after graduation in primary grades, but also as they study in grades 1, 2, 3 and 4. This will make it possible to identify children with insufficient development of cognitive reflection in time and carry out the appropriate correction.

The purpose of our study was to develop an effective method for determining the formation of cognitive reflection in second graders. This will provide a means of ensuring control over the formation of cognitive reflection in primary school students. It was also accepted that this method should be based on the use of such means of working with children as solving problems based on non-educational material. In this case, the role of academic subject knowledge in the search for solutions to the proposed problems is minimized (note that the experience of using problems of this kind is reflected in our works [2], [3], [4], [5]). As noted by the outstanding Russian psychologist VV Davydov, "... in psychology it is generally accepted that with the help of this material it is possible to reveal the general features of the child's mental actions, regardless of their specific subject content" [1, p.334].

The present study was based on the assumption that a more effective method for determining the formation of cognitive reflection would be one that would make it possible to obtain the necessary information in a more accurate and more complete form. This should not be one task, but a complex of two tasks. It was assumed that

tasks in the complex should be selected in such a way that the tasks included in one task would be more difficult than the tasks included in another task.

With this combination of two tasks, real opportunities are created for obtaining more complete and more specific knowledge about the formation of cognitive reflection in a particular contingent of second-graders. Such opportunities are due to the fact that with the specified methodological approach, a clear differentiation of younger schoolchildren participating in the diagnostic lesson is possible: some children will be able to successfully complete both tasks, some children will only be able to complete one task (with easier tasks), and some children will not be able to complete either one. tasks.

Thus, we can say that carrying out diagnostics based on a complex of two tasks of different complexity will allow us to characterize students with a relatively high and relatively low level of formation of cognitive reflection. At the same time, which is very important and is a consequence of the new approach, students with a relatively low level of formation of cognitive reflection will be characterized not only negatively, but also positively.

In the first case, this means that it will become known in what conditions - when solving what kind of tasks and in what form of action - they cannot carry out cognitive reflection. In the second case (positive characteristic), this means that it will be clear when solving problems of what kind and in what form of action they can carry out cognitive reflection.

In the works of domestic philosophers and psychologists (see, for example, [1], [6]) it is shown that the purpose of human cognitive activity can be the study of internal connections and relationships between objects and phenomena of the objective and subjective world and the study of their external connections and relationships. In the first case, knowledge is qualified as theoretical, meaningful, rational, in the second case - as empirical, formal, rational.

Based on the characteristics of meaningful and formal cognition, cognitive reflection is characterized as follows.

Cognitive reflection as a child's awareness of the ways of his actions is associated with their consideration. Depending on the purpose for which this consideration is carried out, what is supposed to be established in this case, it is advisable to distinguish between two types of awareness of the mode of action, or two types of reflection as a person's turning to his own actions.

So, if the consideration of the mode of action is carried out in order to find out what operations need to be performed, what needs to be done specifically in order to obtain the required result, then in this case the child pays attention in his actions only to their external characteristics. This level of consideration of the mode of action is characterized by the awareness of its features, given in perception, in direct observation, is called external, or formal reflection. Here, thus, the dependence of the method on the random and single conditions of its implementation is reflected.

In this case, with the successful solution of problems that have an objectively general principle of construction, the child, when focusing on external similarities and the observed coincidences of the features of the conditions of different problems, can group these tasks formally. At the same time, he will not analyze the content of the tasks. In addition, when focusing on the external difference in the characteristics of the conditions of the tasks, the child can generally refuse to group them, considering the tasks to be different.

In another case, the consideration of the method of action is carried out in order to find out why a given action is performed in this way, and not in another way, and to clarify the question of what is in this action the reason for its successful execution under different conditions (in particular, when solving different problems). With this approach, the child is aware of and considers the mode of his actions, relying on his hidden, not directly observable characteristics - essential relationships. Therefore, he can summarize his actions to solve these problems meaningfully. This level of consideration of the method of action is called internal, or meaningful reflection, since it reflects the dependence of the method on the necessary and essential conditions in the content of tasks.

In this case, with the successful solution of problems that have a general principle of construction, the child, when oriented towards the internal, essential unity of these tasks, can group them meaningfully. Therefore, the understanding of the proposed tasks as belonging to the same type or class, which is based on the generalization of the method for their solution, can serve as an indicator of the awareness of the connection between the method and essential relations, i.e. an indicator of the implementation of meaningful reflection.

Reflection as an appeal to a method for solving problems is formed in schoolchildren, mainly when they perform actions of control and assessment. In the event that the teacher organizes these actions in relation only to particular, situational conditions, the children form predominantly a formal approach to the generalization of tasks and external reflection.

However, if the teacher specifically makes sure that the students control and evaluate how much their actions are related to the necessary and essential conditions for performance, then, as a rule, a meaningful approach to the generalization of tasks and internal reflection is formed as an understanding of the reasons for successful actions.

2.Materials and methods

The study included three stages. At the preparatory stage, second-graders were selected to participate in two main stages associated with determining the type of reflexive action that second-graders carry out when solving problems. At the first main stage, children solved problems by acting with images of things, at the second - by acting with cards.

During the selection, two sessions were held, where 57 second-graders in a group form solved the problems of the "Exchanges" methodology. Each lesson was conducted as follows. At the beginning of the lesson, sheets of paper were distributed, on which the children first wrote down their names, and then the solution of problems. Then the organizer of the lesson depicted on the board the condition of the problem:

SRP --- RSP

Then he said: “The letters on the left are the initial position, the letters on the right are the final position required. It is necessary to change the position of the letters on the left in one action so that they are placed as on the right. One action is the mutual exchange of places of any two letters. In this problem, the solution is to swap the letters "S" and "R".

Then the solution was written:

SRP --- RSP

1) RSP

After that, the organizer of the lesson depicted on the board the conditions of the second problem, where the required location must be obtained from the initial one in two actions:

VNLK --- NVKL

The solution to this problem was collectively analyzed (first the letters B and H change, and then L and K) and it was written on the board:

VNLK --- NVKL

1) NVLK, 2) NVKL

At the same time, the organizer of the lesson specifically drew the attention of the children to the fact that only two letters change places in one action, and the rest are rewritten without changes.

After that, the children were given forms with two training and six main tasks.

FORM

Training tasks

1.NKP --- KNP (one action).

2. R K M TV - - - K R V TM (two actions).

Main goals

1. M G V S T N K --- M V G T S K N (3 actions).

2. P L G V R S D --- G V P L D S R (3 actions).

3. L B N T --- N T B L (3 actions).

4. S R K B --- K B S R (3 actions).

5. T N L P M --- M T P L N (3 actions).

6. R D V K W --- R W D V K (3 actions).

The organizer of the lesson explained the content of the form - indicating two training tasks and six basic ones in three actions - and suggested solving the training tasks.

Then he checked the solution of these problems, taking into account that the most common mistake is moving (mentally) in one action only one letter, and not two.

After correcting errors, it was proposed to solve the main problems. The children were reminded that the condition of the problem from the form is not rewritten, and on the sheet with the surname it is necessary to write only the number of the problem and next to it the result of the first exchange of letters, the second and the third. (The fact is that, as practice has shown, when rewriting the conditions of problems from the form, on the one hand, children often make mistakes, on the other hand, such cheating becomes a special task for some children).

As a result of two sessions of problem solving, it was found that 46 people solved all six main problems correctly, 11 children were able to solve correctly from two to five main problems. Children who solved all the problems correctly participated in the main stages of the study, where they were offered combinatorial problems: 23 people solved these problems in a visual-figurative form, 23 people - solved problems by acting with cards.

To determine the type of reflection in solving problems, we used a scheme for constructing a two-part experimental situation, developed by us in previous studies (see, for example, [2], [3], [4], [5]). In its first part, the subject was asked to solve several problems. The selection of tasks in the first part must meet the following requirements. First, tasks must belong not to one, but to two classes (or subclasses).

This means that some tasks are solved on the basis of one principle, and some tasks are solved using another principle. Secondly, the conditions of the tasks should differ in external, directly perceived features. In the second part, in the case of a successful solution of the problems in the first part, it was proposed to group them.

(It should be noted that the instruction to group tasks only in the case of their correct solution refers to the conduct of experiments in an individual form). By the nature of the grouping, the presence or absence of meaningful, internal reflection was determined when solving them.

If the generality of the method of solving problems was taken as the basis of the grouping, then, in the process of solving, meaningful reflection was carried out. If, however, the external similarity of the features of the conditions was taken as the basis, then, consequently, meaningful reflection - as the child's comprehension of the connection of his actions with essential relations in the content of tasks and the generalization of the solution method based on them - was absent.

At the first main stage of the research, a group diagnostic lesson was carried out, where 23 schoolchildren solved combinatorial problems of the "Permutations" method in a visual-figurative form. This lesson was built according to the following scheme:

1) the organizer of the lesson distributes blank (working) sheets of paper on which the children write their names;

2) on the blackboard, the conditions of a simple problem of the type on the material of which the lesson is conducted are depicted;

3) children are explained the formal rules of action for solving combinatorial problems and the form of recording the solution using the example of one problem;

4) the second problem of the same type is collectively solved;

5) children are given forms with the conditions of the tasks and the organizer of the lesson draws the attention of the children to the training and main tasks, points to five opinions about the main tasks, notes the number of required actions in each task, says that after solving the main tasks, you need to choose only one opinion from those that are on the form (by circling its number), and briefly substantiate it, writing why this opinion is the most correct;

6) children are asked to solve training problems: it is indicated that the answers must be placed on sheets with names, indicating the number of the problem and writing down its solution next to it;

7) the organizer of the lesson checks the result and the form of recording the solution of training problems, correcting mistakes, and reminds that after solving the main problems, you need to choose only one opinion, circling its number, and briefly justify it in writing;

8) children solve the main tasks, choose and justify one of the opinions about the main tasks.

The specific implementation of this scheme was as follows.

The organizer of the lesson depicted on the blackboard the condition of the first problem:



Fig. 1. Condition of the first task.

The children were told that the left arrangement of the letters is the initial, the right - the final, required. It must be obtained in two steps. One action is considered to mentally move any letter to an empty space. The children were told that in this problem the letter "S" is moved first, because it should not be in the middle, but in the extreme cell:



Fig. 2. The first step in solving the first problem.

Then the letter "G" is moved so that after the second action the required arrangement is obtained:



Fig. 3. The second step in solving the first problem.

After that, the organizer of the lesson depicted on the board the conditions of the second problem, where the required location must be obtained from the initial one in two actions:

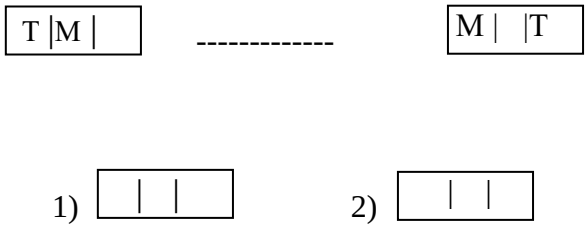


Fig. 4. Conditions of the second problem.

The solution to this problem was collectively considered and the organizer of the lesson recorded the results of the first and second actions:

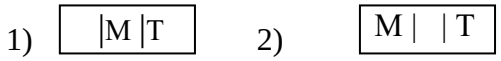


Fig. 5. Solution of the second problem.

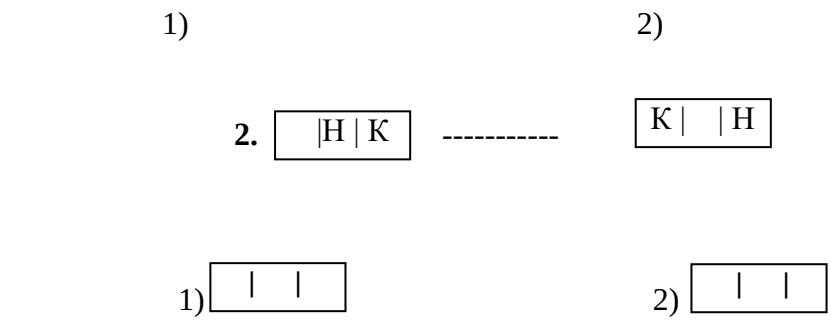
At the same time, the attention of the children was specially drawn to the fact that in one action only one letter changes its place, while the rest are rewritten without changes in the same place where they were. After that, students are given forms with two training and three main tasks.

FORM

Training tasks

(two steps)





Main goals

(three steps)

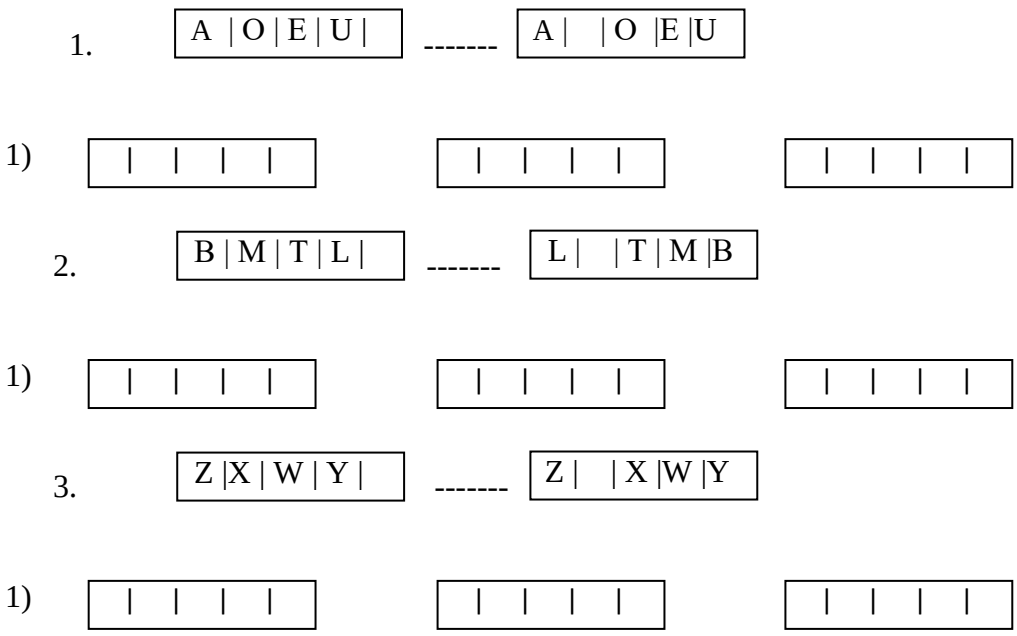


Fig. 6. Form with the conditions of problems for a group solution.

Opinions

1. All basic tasks are similar.

2. All main tasks are different.

3. The main tasks of the 1st and 2nd are similar, and the 3rd is different from them.

4. The main tasks of the 1st and 3rd are similar, and the 2nd is different from them.

5. The main tasks of the 2nd and 3rd are similar, and the 1st is different from them.

After distributing the forms, the organizer of the lesson made the necessary explanations: “Look at the sheet. Above are the training tasks 1 and 2, in the middle - the main tasks 1, 2 and 3. Now solve the training tasks. Write down the solution as we did on the board - put the letters in the empty cells. "

Walking through the class, the organizer of the lesson checked the solution of the training problems, given that children often make mistakes, moving two letters in one action.

After finishing the test, the organizer of the lesson said: “Now solve the main problems. After solving them, choose one of five opinions about these problems, which you think is the most correct, and circle its number. Write down why you chose this particular opinion about the problems. "

It should be noted that among the main tasks, the first and third are built according to the same principle: not all, but only three letters in the required position are placed in other cells in relation to their placement in the initial position (one letter does not move at all).

The second problem is built on a different principle: all four letters in the required arrangement are placed in other cells in relation to their placement in the initial arrangement. Therefore, the fourth opinion about tasks is correct.

If the children, having correctly solved the three main problems, chose the fourth opinion about the problems, this indicates that when solving them, they carried out meaningful reflection, generalizing the method of solving the first and third problems as built on a single principle.

It should be noted that in previously performed preliminary individual experiments on approbation of this technique, it was found that the choice of the fourth opinion about successfully solved basic problems was always justified precisely by the fact that the second problem does not fit the other two, because in it all letters change their places.

The choice of any other opinion about the successfully solved basic problems - the first, second, third or fifth - testifies to the lack of meaningful reflection in the student when solving them. So, for example, justifying the first opinion “all tasks

are similar", children mark "... because there are three actions everywhere ...", and when justifying the second opinion "all tasks are different" indicate "… because all letters are different…".

When substantiating the third opinion ("the main tasks of the first and the second are similar, and the third is different from them"), it is indicated: "... because in the third problem contains the last letters of the alphabet ...", and when substantiating the fifth opinion ("the main tasks of the second and third are similar, and the first differs from them ") says:" ... because in the first problem the vowels are ... ".

In both cases, as you can see, the tasks are grouped according to the insignificant points of the ways to solve them, i.e. by the external features of their conditions, in particular, based on the characteristics of the letters that are given in the tasks.

At the second main stage of the research, individual diagnostics was carried out, where children (23 people) solved the same combinatorial tasks of the "Permutations" method, but by moving cards with letters. This diagnosis was built according to the same scheme as the group one: analysis of two tasks (with one and two actions), solution of training problems with subsequent verification, solution of basic problems and choice of opinions about these tasks.

3.Results

Carrying out group and individual diagnostics showed that, regardless of the form of action in which it was proposed to solve problems, one part of the children carried out meaningful reflection in solving it, the other part of the children - formal reflection. The third part of the children did not carry out any reflection, because they could not solve all the main problems correctly (usually there were mistakes in the second problem).

Data on the manifestation of types of reflection in second-graders who solved combinatorial problems of the "Permutations" methodology are presented in the table.

Table.- *The number of second-graders who showed the presence of reflection (substantive and formal) and its absence when solving problems at the first and second main stages.*

Basic Stages	Reflection		
	Substantial	Formal	Absence
First	4 (17,4%)*	16 (69,5%)	3 (13,1%)
Second	9 (39,1%)*	13 (56,6%)	1 (4,3%)

Note: * p <0.05.

The data presented in the table indicate that when solving problems in a visual-figurative form (the first main stage of the study), 17.4% of children carried out meaningful reflection, and when solving problems by moving cards (the second main stage of the study) - 39 , 1%, - the difference in these indicators is statistically significant (at p <0.05).

At the same time, the data given in the table also show that at the second stage in relation to the first, due to the increase in children who carried out meaningful reflection, the number of children who carried out formal reflection in solving problems decreased (respectively, 69.5 %% and 56.6%) and the number of children who lacked reflection (13.1% and 4.3%, respectively).

Thus, the results of the study indicate that when solving problems by moving cards, more favorable conditions are created for the implementation of meaningful reflection than when solving problems in a visual-figurative form.

4. Conclusion

The analysis of the data obtained as a result of the two main stages of the study allows us to draw the following conclusions.

Firstly, in order to more fully characterize the formation of cognitive competence associated with the implementation of cognitive reflection in solving problems (in particular, in order to single out children with different levels of development of this competence, meaningful and formal), it is advisable to offer children to complete two tasks with tasks, solvable in different forms of action: in one task, tasks are solved in a visual-figurative form, in another task, tasks are solved by moving cards.

Secondly, the data of both main stages of experiments with second-graders give grounds to assert that the use of two tasks of different complexity for diagnosing the formation of cognitive metasubject competence associated with the implementation of cognitive reflection creates new opportunities.

These capabilities make it possible to more fully characterize students who have a high (meaningful) level of realization of cognitive reflection when solving problems, and students who have a low (formal) level of realization of cognitive reflection when solving problems.

Third, the approach presented in the study has certain advantages in diagnosing the cognitive competence in question.

The fact is that when diagnosing on the material of one task, the tasks of which need to be solved in a visual-figurative, relatively more complex form of action, only two groups of schoolchildren can be distinguished. One group will be made up of those schoolchildren who carry out meaningful reflection when solving problems, the other group - those who carry out formal reflection when solving problems. With such an organization of diagnostics, children will not be taken into account, who can carry out meaningful reflection when solving problems by moving cards, relatively simpler form.

If diagnostics are also carried out on the basis of one task, the tasks of which must be solved by moving cards, then also (as in the previous case) it will be possible to distinguish the same two groups of schoolchildren: those who carry out meaningful reflection in solving problems, and those who carry out formal reflection when solving problems. However, in this case, schoolchildren who are able to carry

out meaningful reflection when solving problems in a more complex, visual-figurative form can no longer be taken into account.

In general, based on the results obtained, it can be argued that the study made it possible to implement a new approach in determining the type of reflexive action. The meaning of this approach is to offer students two tasks, where the tasks of one task should be more difficult than the tasks of the other task. This approach allows one to obtain more specific, accurate and complete knowledge about the formation of metasubject cognitive competence in second grade schoolchildren, associated with the implementation of cognitive reflection when solving problems.

Reference

1. Davydov VV Theory of developing education. Moscow: Intor, 1996.
2. Zak A. Z. How to determine the level of development of a student's thinking. Moscow: Knowledge, 1982.
3. Zak A. Z. Development of theoretical thinking in younger students. Moscow: Pedagogika, 1984.
4. Zak A. Z. Development of mental abilities of younger students. Moscow: Vlados - Education, 1994.
5. Zak A. Z. Diagnosis of differences in the thinking of younger students. Moscow: Genesis, 2007.
6. Rubinstein S. L. Being and consciousness. Moscow: AN SSSR, 1957.
7. Federal state educational standard of primary general education / Bulletin of education of Russia. - 2010. - No. 2. - p.10 - 38.

Литература

1. Давыдов В. В. Теория развивающего обучения. М.: Интор, 1996.
2. Зак А. З. Как определить уровень развития мышления школьника. М.: Знание, 1982.
3. Зак А. З. Развитие теоретического мышления у младших школьников. М.: Педагогика, 1984.
4. Зак А. З. Развитие умственных способностей младших школьников. М.:

Владос - Просвещение, 1994.

5. Зак А. З. Диагностика различий в мышлении младших школьников. М.: Генезис, 2007.
6. Рубинштейн С. Л. Бытие и сознание. М.: АН СССР, 1957.
7. Федеральный государственный образовательный стандарт начального общего образования / Вестник образования России. 2010. № 2. С.10 - 38.