

## FEATURES OF THE DEVELOPMENT OF LOGICAL THINKING IN CHILDREN OF PRESCHOOL AGE

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**Abstract.** *The economy of most countries needs specialists who can quickly adapt to innovations; for this, it is necessary to develop in children from an early age a universal culture of thinking, the ability to think creatively, and be able to independently analyze information. The basis of the above skills is the ability to operate basic logical operations. The article discusses age-related features of the formation of scientific concepts in children, as well as the ability to operate basic logical operations in certain age groups.*

**Keywords:** *theory of J. Piaget, formation of scientific concepts, logical operations, Obukhova L.F., Galperin P.Ya., age-related features of development, epistemology, preschool educational institutions.*

The modern approach in education system strives to create a universal culture of student thinking. Much attention is paid to the development of knowledge in the field of humanities and exact sciences; in addition, the child must be able to think creatively, independently, and use critical thinking skills. At what age should you start developing the above-mentioned skills? A sufficient level of preparation for mental activity in preschool age is the foundation for good performance at school and helps reduce the psychological stress experienced by a first-grader. If we talk about the timing of the beginning of human perception of scientific concepts, then we cannot ignore the research of the outstanding Swiss psychologist and philosopher Jean Piaget. Under his leadership, a number of scientists conducted various experiments and studied the thought processes of children from 0 to 13-14 years old. As a result, the following theory of periods and subperiods of child intelligence development was developed and proposed. In his work "The Genesis of Elementary Logical Structures," J. Piaget examines the conditions or reasons for a child's readiness for classification and seriation. The author does not deny that the language in its syntax already contains the structures of classification and seriation. This statement may lead us to believe that a child who has mastered the skill of speaking already has the ability to classify. This conclusion is not false, but J. Piaget asks the question: is speech the main and only factor in developing a child's ability to operate with logical structures? As a result of the conducted research and experiments, it becomes obvious that children in certain age categories make similar logical errors in reasoning. This leads the scientist to the conclusion that in addition to speech, biological factors are also an essential condition for the development of thinking, for example, the maturation of the nervous system [6]. Throughout his scientific career, J. Piaget supplemented and specified his hypothesis. As a result, the scientist identified the following periods and subperiods of the development of a child's intelligence: Sensorimotor intelligence (from 0 to 2 years), representative intelligence and specific operations (from 2-3 to 11-12 years), representative intelligence and formal operations (from 11-12 years up to 13-14 years old). The scientist divided each of the three periods into subperiods, in which he identified stages of development [5]. The sensorimotor period (from 0 to 2 years) is characterized by the performance of actions with material objects, practical intelligence is formed. This period has two subperiods. The first is focusing on one's own body

(from 0 to 8-9 months). Practicing reflexes, mastering the first coordination skills, coordination of vision, grasping, etc. The second is the objectification of practical intelligence (from 8-9 months to 18-24 months) - the child already distinguishes between a means and a goal, and through deduction can interiorize some schemes and solutions [5]. The second stage - representative intelligence and specific operations (from 2-3 to 11-12 years) - is characterized by the appearance in the child of operations performed in the mind, but based on external, material data. It is also divided into two sub-periods. The first - pre-operator intelligence (2-3 years to 7-8 years) is characterized by the beginning of internalization of action patterns, intuitive thinking based on perception. The second sub-period is the sub-period of specific operations (8-10 years to 11-12 years). Only by the age of 8-9 years does the child's nervous system reach maturity and it becomes possible to operate with simple logical concepts. The child can already perform specific logical operations (classification, seriation, etc.) [5]. A distinctive feature of the third period - representative intelligence and formal operations (from 11-12 years old to 13-14 years old) - is the child's ability to operate with concepts that are not based on material objects; hypothetical-deductive reasoning appears in speech. This period includes two sub-periods. The sub-period of the formation of formal operations (11-12 years to 13-14 years) and the sub-period of achieving formal operations (from 13-14 years) [5].

It is important to note that it is impossible to develop a more complex stage without going through a simpler one. Development is linear. Also, J. Piaget does not implore the influence of social factors on the development of children's intelligence. Socialization begins from the moment the child is ready to interact with other people, when the egocentric approach is overcome and the child is ready to share his point of view with others. Moreover, according to the scientist, this period begins quite late - at 7-8 years. This age is a "turning age" in which, due to social influence, the transformation of nervous structures occurs. It should be added that J. Piaget admitted that the age of achieving balance may vary depending on the physical or social environment. There are children who are more or less physically active, and their spontaneous experience depends on this. The school and cultural environment should not be excluded from the field of influence. In addition to the listed factors, J. Piaget noted that the degree of influence of ethnic and cultural factors on intellectual development should be studied [3].

As part of our article, we will look in more detail at how J. Piaget's research was carried out in the field of intellectual development of children aged 5-6 - 7-8 years. What changes occur at this age in the child's thinking and perception?

Experiments were carried out by J. Piaget and B. Inhelder in order to identify ways of forming mathematical and physical concepts in children of preschool and primary school age. The research was aimed at studying the process of formation of such scientific concepts as: the concept of number, the idea of shape, size, weight and time. On the advice of A. Einstein, a number of experiments were carried out to study the formation of the concept of speed in childhood.

For example, two identical vessels filled with a colored liquid were placed on the table in front of the children. Children aged 4-6 years, according to experiments, recognized that the amount of liquid in two vessels was the same. Next, the liquid from the large vessel was poured into two smaller vessels, but their shape was such that visually the liquid level was higher than in the large vessel. In addition, there were two small vessels. The question was asked: will the volume of liquid be the same in two small vessels taken together and in a large one? The children's answers show that they think that there is more liquid in small vessels because the water level is higher and

sometimes the answers expressed the opinion that there are two small vessels, therefore there is more liquid in them than in one large one. Even at 6-7 years of age, some children gave similar answers. J. Piaget draws the following conclusions from the results of this experiment - children do not master logical operations. He cannot reproduce the action in the opposite direction, he cannot perform a logical technique - the reverse operation. There is no logical operation of compensation - what was lost in one dimension can be restored in another. At the age of 7-8 years, children can already understand that as the form changes, the amount of substance is maintained.

There were many similar experiments conducted by J. Piaget and B. Inelder, and all of them were aimed at studying the presence of certain mathematical or physical concepts in children's mind. From the data obtained as a result of numerous experiments, Piaget draws the following conclusion: scientific ideas about the world are formed on the basis of children's mastery of logical operations.

Consequently, we can conclude that to begin scientific knowledge it is necessary to master elementary logical operations. Without using them, knowledge is intuitive.

J. Piaget's theory aroused great interest in the scientific world of the 20th century. It was studied, tested, and sometimes criticized by his contemporaries, scientists working in the Soviet Union. Among them were: Vygotsky L.S., Obukhova L.F., Galperin P.Ya., Davydov V.V., Zankova L.V. and others.

In the 60-70s of the 20th century, many studies were carried out by Soviet psychologists on the basis of various experimental institutions. Of particular interest to us are the experiments conducted by Galperin P.Ya and Obukhova L.F. The purpose of these studies was to refute the theory of J. Piaget and its main provisions.

Galperin P.Ya. and Obukhova L. conducted a number of similar experiments with children of the same age group that was in the experiments of J. Piaget. The result also showed their lack of understanding about conservation of quantity. But then special training was carried out with the same group of children, during which the children learned to compare objects by weight, length, volume. After training, the same group of children was again asked to solve "tasks of Piaget". The children completed the proposed tasks. The results of the study showed that it is possible to form a concrete operator level of thinking in children. They can be taught to compare groups of objects by quantity and, moreover, they can be taught to use various established rules for this (labels, measures, diagrams, etc.) [4]

What conclusions can we draw from a number of experiments we considered conducted by J. Piaget, P.Ya. Galperin and Obukhova L.F.? Can we not take into account age-related developmental characteristics when introducing any educational process? Does a certain level of physiological development of the nervous system influence a child's thought process? At what age can one begin learning formal logical thinking? Taking into account the results of the studies presented above, we can conclude that the senior preparatory group in a children's educational institution (6-7 years old) is optimal for starting to master basic logical concepts. Because if we adhere to the theory put forward by J. Piaget and a number of other Western scientists, at a given age the nervous system of children reaches a certain level of maturation and the child is ready to perform specific operations. If we take into account the results of experiments obtained by Galperin P.Ya. and Obukhova L., this age will also be optimal because Children begin their preparation for starting school, where they will be faced with a large amount of information and work with it independently. And the basic skills of formal logical operations and dialectical

thinking laid down in the older groups of kindergarten will be a good foundation for the beginning of the upcoming studies in primary school. The famous Soviet psychologist and teacher L.S. Vygotsky wrote about this approach to teaching methodology—working proactively—“pedagogy, he wrote, should focus not on yesterday, but on tomorrow’s child development” [2] J. Piaget's experiments were carried out at the beginning of the 20th century i.e. almost 100 years ago. Scientific research Galperin P.Ya. and Obukhova L. were carried out about 80 years ago. Work on the article prompted the author of the article to check what the state of development of children's intelligence is these days. Have any changes occurred under the influence of accumulated knowledge and improved methodologies for teaching children? For this purpose, experiments were conducted in two preschool educational institutions in Tashkent city. One state kindergarten was purposefully selected, the second one was selected from the private education system. The experiment involved 10 children from each preschool educational institution in the age group from 5 to 7 years.

The children were given two “tasks of Piaget” to solve. In the first, children were given two pieces of clay with the same shape and weight. The question was posed: do the two pieces have the same weight? Or is one of them lighter and one heavier? The children stated a fact - they are the same in weight. Then, in front of the child, the shape of one of the pieces changed and the same questions were asked again. The children's answer in 19 out of 20 cases was the same - the weight had changed, now one piece became lighter, the other heavier. Therefore the conclusion was reached that children have not yet formed the concept of weight and do not have the skill of operating an inverse logical operation. An experiment was also conducted with blocks. The children built two towers of the same shape and number of blocks. It was fixed that the towers were equal and the number of blocks was the same. Then, with the child, the shape of one of the towers changed in such a way that one of them visually became higher. And again the question was asked: did the quantity remain the same? Here the results of the experiment were not so clear. For clarity, we present the results in the following table:

Age group	Correct answer (yes, the number of cubes remains the same)	Incorrect answer (no, there are more cubes in the tower that is higher)
5-6 years	40%	60%
6-7 years	100%	-

I would like to note that when giving the correct answer, children of both age groups counted the number of cubes. That is, they operated with counting skills, but did not use the reverse logical operation. None of the children reproduced the action in reverse order in their imagination to give the answer.

Therefore, we can conclude that children of the tested age group have the skill of counting, but do not yet master basic logical operations.

The results of the experiments show the relevance of research in the field of epistemology and pedagogy today. It is necessary to carry out work to improve children's mastery of logical operations.

I would like to note that at the moment there is an abundance of teaching aids for the development of children’s thinking, but at the same time there is a lack of methodological aids for systematic lessons in the development of logical skills with children of preschool age.

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