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PEDAGOGICAL- PSYCHOLOGICAL ASPECTS OF STUDENTS' LOGICAL THINKING DEVELOPMENT

Sultanov Mukhtarali Mamadalievich
Senior teacher of Tashkent State Pedagogical University
Tashkent, Uzbekistan

Sultanova Ulbosin Mamadalievna
Senior teacher of Tashkent State Pedagogical University
Tashkent, Uzbekistan

Saydalieva Lazzat Mukhtarali's daughter
Teacher of Tashkent State Pedagogical University
Tashkent, Uzbekistan

Abstract. In world educational and scientific research institutions, scientific researches are being carried out to improve the theoretical and methodological aspects of extracurricular activities, to create a model of the process of developing students' logical thinking, and to clarify the didactic-pedagogical possibilities and methods of educational situations aimed at developing students' logical thinking. In this regard, attention is being paid to scientific research on the development of logical thinking of 5th-9th graders, improving the effectiveness of the educational process based on logical thinking, and expanding pedagogical opportunities in extracurricular activities.
Key words: Pedagogy, methodology, primary education, pedagogical-psychological aspects, thinking, student.

Thinking is a high form of human mental activity; the process of reflection of objective reality in the mind. Thinking is considered a tool for knowing the environment, social phenomena, reality, as well as the main condition for the implementation of human activity. It is a higher cognitive process that reflects reality more fully and accurately than intuition, perception, and imagination. Thinking is a special function of the human brain. Its neurophysiological basis is the interaction of the first and second signal systems. In the process of thinking, thoughts, opinions, ideas, assumptions, etc. arise in a person, and they are expressed in the mind of a person in the form of concepts, judgments, conclusions, and are closely related to language and speech. Thinking activity is manifested in the form of speech. In the process of speech communication, the range of emotional observation of a person does not expand, and the acquired experience is given to other people. Man is distinguished from other creatures by his thinking, speech and conscious behavior. He determines the reality of the things and events that he reflects, perceives, and imagines in the activity of thinking, determines whether the formed judgments, concepts, conclusions are true or not. Through human thinking, it summarizes reality and indirectly

(indirectly) reflects, realizes the most important connections, relationships, characteristics between things and events. Therefore, a person has the ability to foresee the emergence, development and consequences of social events and phenomena based on certain laws, regulations and rules. Thought is the object of research in many fields of science (philosophy, logic, sociology, pedagogy, physiology, cybernetics, biology). In psychology, thinking is divided into several types according to the degree of generalization of reality, the nature of a problem-solving tool, the novelty of situations for a person, and the level of activity of a person (visual action, visual image, practical, theoretical, voluntary, involuntary, abstract, creative, etc.). Communication and relationships between people in social life, educational process and production are also manifested with the help of thinking. In the team, qualities of thinking such as critical view, self-criticism, assessment, verification, control, and group reasoning emerge. The perception of a person by a person, creative works, discoveries, inventions, proposals are the product of thinking. It is important to know the reality of the external world through the processes of intuition, perception and imagination, but these are still not enough for a deep reflection of the studied things and events. Because there is no possibility of direct observation of their mutual relations, qualitative and quantitative changes, complex internal connections, properties of interaction or determination with the help of sensory images. As this is the case, there is a need to move from the stage of emotional cognition to the mental stage, that is, thinking, due to the limitation of the ability to divide the subject's interaction with the object to be known into parts through direct reflection. With the help of thinking, the in-depth knowledge of the environment, the determination of the internal relations and connections between things, events and phenomena are manifested in a problematic way. As long as a problem does not arise in front of a person, then the process of thinking cannot be formed. Therefore, when a person cannot reflect the complex aspects of reality with the help of the emotional stage in his cognitive activity, he turns to thinking and thinking.

In the cognitive activity of a person, intuition, perception, images of imagination and thinking continuously enrich each other. Accordingly, there are emotional and mental stages of the cognitive process.

Thinking differs from intuition and perception and has several characteristics.

1) is a generalized reflection of reality.

2) the second important feature is the direct display of connections. Thanks to this feature, we will be able to explain the connections between various phenomena and events in nature and society.

3) consists in reflecting complex relations between things and events. Human thinking is expressed through one or more words and concepts. Therefore, when a person is thinking, it seems as if he is expressing his opinion, and when he is speaking, he seems to be thinking. This process is carried out as follows.

1. Analysis and synthesis.
2. Comparison.
3. Abstraction.
4. Generalization.
5. Concretization.
6. Classification.
7. Systematization.

Let's touch on each of them.

The development of logical thinking skills in students requires the use of certain thinking operations. These are: analysis, synthesis, comparison, abstraction, judgment, conclusion, etc.

Analysis is a process of thinking, with the help of which we mentally or practically divide things and events, analyze some of their parts and characteristics, study them in parts.

Synthesis is such a thinking process that we mentally or practically unite some parts and fragments of things and events divided in the analysis and make them whole with the help of synthesis.

Analysis and synthesis are two sides of a single process that are closely related to each other. If things and events are not analyzed, it cannot be synthesized, any analysis should be done on the basis of knowledge of objects and things as a whole.

Comparison is such a process of thinking that by means of this process it is determined whether things and events in the objective world are similar to each other or different from each other.

Abstraction is such a thinking process that with the help of this process, we distinguish the important features of things and events in the material world, and mentally separate from these features the secondary, unimportant features of things and events.

In psychology, Generalization means finding properties, signs, characteristics, symptoms in things and events and combining them on the basis of this generality.

Concretization refers to the application of general, abstract signs and characteristics to single, isolated objects, and the connection of abstract concepts to concrete objects. In science, it is accepted to call the reasoning based on a certain sign representing the nature of things and events as Classification.

Systematization is the end of classification. An example of systematization is the arrangement of books in the library. For example, in the library, literature on pedagogy is located on one side and psychology on the other, which makes human work easier. As a result, one knows what to look for. In life, we can see systematization at every step.

Many complex issues of contemporary science require a more in-depth study of logical processes in thought.

Thinking differs from other mental processes in that it emphasizes the existence of a problem situation, solving it, and the characteristics of deciding which person to distract from emotional experience and draw certain practical or theoretical conclusions, to expand the boundaries of knowledge. Thinking is often considered as a product of historical development of social practice, a separate theoretical form of human activity. Thinking reflects reality not only as simple images, but also as various relations and laws obtained theoretically. In this regard, A. V. Brushlinsky wrote: "the true nature of thinking is that it always discovers something new independently, always openly. First of all, thinking, as an unknown product of conscious activity, cannot be immediately reached. On the other hand, it is very necessary for further activities. Contradictions between these situations are expressed in the process of formation of new psychic formations, which seek a specific task or problem and then find ways to solve them. That is why thinking is considered as a process, not ready and presented in advance, but a formative process [41]

Visible-active thinking is characterized by an integral relationship with things and information received by human perception, acting on direct connections; directly related to

manipulated objects; in fact, it consists in solving the tasks set before it, without practical actions that are impossible.

This form of thinking is primarily focused on performing practical tasks. Actions performed gradually according to its complexity are manifested in external demonstration conditions. In this, the creation of the internal environment of the movement takes place, the relationship between the elements takes the form of a schematic view.

It is the first practical activity in the process of mental development of the student, in which children's thinking develops first. Before preschool age (up to three years), thinking is mainly visual-motor. During this period, the child practically grasps objects with his hands, separates, divides and re-combines them, compares, matches, connects, analyzes and understands one or another perceived object.

Children of preschool age (4-7) develop a visual-image way of thinking. Figurative thinking is a form of thinking based on modeling and solving problem situations in the imagination. In children of preschool age, visual-figurative thinking is completely subject to perception, and they are not distracted and cannot abstract. L.S. Vygotsky in one of his last lectures on the mental development of students [46] emphasized that it is the period of active development of thinking in students of junior school age. Junior school age (7-10) has a great opportunity to develop all cognitive processes, including thinking. In order to form and develop logical thinking, it is often necessary to create suitable conditions that help the student learn, abstract, compare, summarize, analyze and synthesize scientific methods to acquire new knowledge. , that is, during formal operations, the student is freed from the feeling of being clearly attached to objects, and at the same time, he has the opportunity to think deeply. Students of 5-9th grade are characterized by high intellectual activity, they know how to think and research. The independence of students by age requires that the teacher offers them general methods of intellectual activity, helping students to perform tasks independently. The study of indicators of cerebral hemisphere asymmetry at different levels of psychomotor activity in different age groups showed that the observed 10-11-year-old students begin to think more not only with images, where abstraction becomes possible. In particular, it is necessary to use the modeling of educational tasks, using them in the lesson, collecting images related to the feeling of this or that particular educational task. was found to be different from students of other age groups at almost all levels. The lateralization of psychomotor movements at this age compared to other ages is emphasized by the reconstruction of the relations between the cerebral hemispheres at this age.

From the point of view of philosophy, thinking is a higher form of active reflection of the objective existence, which consists of the purposeful means and generalization of objects and events in the subject of existing connections and relations in the creative creation of new ideas, the prediction of events and actions" [137]. J. Piaget in his studies logical thinking defined as the result of the implemented processes or their results and the grouping of secondary processes [105]. that is, it first divides the perceived world into separate elements, and then builds new derivatives from these elements that help to understand the surrounding world" [46].

In psychology, it is defined as follows: "Thought is based on words and logic - concept, which is one of the types of thinking that uses logical constructions. It operates on the basis of language tools and represents the last stage of the historical and ontogenetic development of thinking. Types of generalizations are formed and applied in the structure of verbal-logical

thinking" [115]. Researcher-scientist N.A. Podgoretskaya refers to the skill of building one's actions in accordance with the laws of logic: "The skill of logical thinking: the skill of orientation to the signs of existing objects and events, obedience to logical laws , includes the ability to build one's behavior in accordance with them, perform logical operations and describe them consciously, build hypotheses on this basis and draw conclusions about their consequences, etc. The ability of logical thinking includes a number of components: orientation to the signs of existing objects and events gets the qualification" [116].

Also, the following specific features of logical (verbal-logical) thinking are defined: "the initial criterion that distinguishes this type of thinking is the development of a specific logical thinking, which means becoming increasingly free from a large number of specific constituent elements in the real object world" [118]. In this regard, one of the scientists N.N. Pospelov and I.N. Pospelov thought as follows: "The development of logical thinking in students is to give them knowledge on logical requirements and develop skills using these requirements in educational and practical activities." [117]. Some researchers approach the definition of logical thinking not only from the functional-operational point of view, but also in a broader sense. They considered logical thinking as a kind of "productive process that includes heuristic, intuitive logical concepts" [135].

Pedagogical aspect of development of students' logical thinking consists in developing and testing the necessary didactic conditions for organizing the educational process. This, - writes A.D. Getmanova, - the science of pedagogy studies logical thinking through the implementation of cognitive processes in the process of education and upbringing of the growing generation [51]. Many pedagogues and Methodist scientists' researches emphasized the need to teach students logical thinking methods. Some pedagogues understand the development of logical thinking as students' acquisition of knowledge and the formation of skills and abilities in them and their use in educational and practical activities. (N.N. Pospelov and L.S. Khadartseva [117, 149]).

A logical method is a logical operation or action, as well as a combination of them used to solve a number of tasks [102, 31]. Logical operation is a method of designing, establishing connections and relationships between them [42]. In many studies, such a phenomenon is found in the study of all disciplines, which directly contributes to the characteristics of each of them, as a logical culture is formed. Logical culture is defined as "a system of thinking skills that allows you to express existing thoughts in a clear and understandable form and acquire new thoughts only in such a form" [39, 29]. they enter It can be explained as follows: only such theoretical thinking, which participates as logical thinking, can represent its real subject, because only thinking in a logical form can move in the content of things, in their existing relations [51]. Psychologists of other directions (P.P. Blonsky, L.S. Vygotsky, V.V. Davidov, L.V. Zankov, D.B. Elkonin [36, 46, 54, 67, 156]) paid attention to education, made a great contribution to the mental development of students and their education by developing a psychological-pedagogical theory. The mental development of students of grades 5-9 has a common feature that unites all the listed theories of education and development: developmental influences on the student, various processes of educational change, on the student in relation to its direct activity, it is carried out with the help of external influence, content change, educational methodology, etc.

Based on the analysis of the results of psychological-pedagogical research on the formation and development of logical thinking in 5-9th grade students during extracurricular

activities, the following conclusions can be drawn: it is directly related to the educational process; the formation of initial logical skills can take place under certain conditions; the formation process of general logical skills as a component of intellectual culture should rely on goal-oriented, continuous and continuous school subject teaching process at all levels. One of the reasons for the difficulties that students face in this regard is the fact that the development of the student's mind in general secondary schools does not correspond to the general rules, low interest in learning, students' unwillingness to attend classes, and lack of cognitive and intellectual activity. It is impossible to overcome these difficulties without taking into account the individual and psychological characteristics of the students.

In order to develop logical thinking, it is necessary to use methods and methods that are most suitable for the characteristics of students of this age group. Methodological substantiation of the principles of diagnosis of the development of logical thinking in 5th-9th grade students in the course of extracurricular activities discussed in our study is based on the following:

1) to consider the development of logical thinking as a quality of personality that reflects a high-level integrated psychological system;

2) substantiating the connection with the dynamic theory of the development of logical thinking in the form of personality-developing qualities.

Based on these principles, we identified the following most important approaches to diagnosing the development of students' logical thinking:

1) person-oriented approach. The investigation is aimed at studying the integrated system of interrelated qualities that serve for the development of the personality in connection with the periods of young development, the interrelationship and interaction of intelligence and affect, the uniqueness of self-awareness, the levels of development of emotional-volitional and communicative spheres;

2) dynamic approach (long-term learning, periodic observations to study the behavior of subjects in different situations, studying the dynamics of its development, identifying psychological barriers and means of overcoming them). The dynamic approach is based on the dynamic theory of the development of logical thinking conditioned by the replacement of the paraligma of the transition from diagnostic selection to diagnostic development;

3) a prognostic approach based on the research of the question of forecasting the personal development aimed at determining not only the level of general and mental development of a person, the development of general and special abilities, the level of development of logical thinking, but also the determination of his potential opportunities.

Based on the above, the following are the principles for identifying students with developed logical thinking:

- relying on psychodiagnostic methods that allow to achieve effective results in assessing the student's behavior in real life situations.

- having a comprehensive description of evaluating various aspects of the student's behavior and activity based on the use of various information sources and covering a wider range of his abilities;

- analyzing the student's behavior in the field of activity that is maximally compatible with the student's abilities and interests (engaging the student in specially organized subject-game classes, various forms of work suitable for the field of activity);

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- use of training methods with a clear developmental effect, protecting the student from psychological obstacles;

- attracting experts and highly qualified specialists to assess the development of logical thinking in connection with the field of activity;

- In accordance with the general system of criteria for the analysis of the qualitative description of the development of logical thinking, it is possible to determine its various types in connection with the psychic capabilities of a person and their manifestation in a certain type of development of logical thinking.

The following can be cited as criteria for determining the types of development of logical thinking:

- in connection with the type of activity and the field of mental development;
- according to the level of development of logical thinking;
- according to the form of manifestation of the development of logical thinking;
- according to the scope of manifestation of various types of activity;
- according to the characteristics of the age period.

1. According to the type of activity, five types of development of logical thinking can be distinguished: practical, theoretical (related to cognitive activity), artistic-aesthetic, communicative and spiritual-moral. Also, according to the field of mental development, it is possible to classify the development of logical thinking into intellectual, emotional and motivational-volitional types. The intellectual sphere is manifested at sensory-motor, spatial-visual, conceptual-logical levels. The development of logical thinking in connection with the emotional sphere is reflected in the levels of emotional impact and emotional experience. The development of logical thinking within the motivational-volitional field expresses the levels of desire, goal orientation and imagination. The methods of activity of a student with developed logical thinking allow to ensure its quality and efficiency. For this reason, three main levels of activity efficiency are distinguished:

- finding and using new methods of activity when making decisions about a situation;
- achieving a new peak of activity based on deep mastery of the field of science;
- quickly mastering the activity and successfully completing it.

2. According to the criterion of the level of development of logical thinking, it can be classified into the development of actual and potential logical thinking.

1. Development of actual logical thinking is a description of the mental characteristics of the student's personality, which is manifested in a high level of mastery of an activity and field of science compared to age and social standards. In this case, we are talking about not only the educational field, but also a wide field of various types of activity.

2. Development of potential logical thinking is a description of the student's mental characteristics that determine only certain mental capabilities for success in a field of activity, and is characterized by his inability to demonstrate his capabilities all the time. The development of this potential depends on the presence or absence of favorable conditions (difficulty in the family, lack of motivation).

3. According to the criterion of the form of manifestation of the development of logical thinking, it is possible to distinguish open and closed types.

1) The development of logical thinking in an open manner is clearly manifested in the student's activity even in unfavorable conditions. There is no doubt that the success of the

student depends on the development of his logical thinking. It is for this reason that experts in the field of development of logical thinking of students come to the conclusion with a high degree of probability about the existence of development of logical thinking or the high potential of the student. Accordingly, they adequately evaluate the "close zone of development" and clearly determine the future work with the student. It should also be noted that the development of logical thinking is not always evident.

2) The development of hidden logical thinking is not clearly manifested externally in the student's activity. As a result of this, there is a risk of making a wrong conclusion about the development of the student's logical thinking. As a result, a student with such latent logical development may be judged as "no future" and deprived of the necessary help and support to develop his or her abilities. Of course, the main reason why the development of logical thinking is manifested in a hidden form is the existence of psychological obstacles. They arise in the process of the development and integration of abilities and lead to a violation of the manifestation of the development of logical thinking.

4. The development of logical thinking is divided into general and special types according to the scope of manifestation of different types of activity.

1) The development of general logical thinking is manifested in relation to various types of activity and emerges as the basis of its effectiveness. The psychological core of the development of general logical thinking is reflected in mental abilities built on the basis of emotional, motivational and volitional qualities of a person. The development of general logical thinking determines understanding of reality, deep emotional and motivational involvement in the field of activity [37].

2) The development of special logical thinking is expressed in a specific field of activity and serves only to determine relations in a particular field of activity.

5. It is possible to distinguish early and late manifestations of the development of logical thinking according to the criterion of the uniqueness of the development of age periods.

In this case, it is necessary to emphasize the rate of mental development of the student as a decisive indicator of early or late development of logical thinking. Therefore, the lack of a clear manifestation of the development of logical thinking in this period does not require its denial [78]. should have a description and be implemented at different levels and in several stages.

Our conclusion was made by the scientist K.K. The following seven stages of the development process of logical thinking confirmed by Platonov:

- making a list of candidates for the development of logical thinking;
- on the basis of observation, rating scale, responses to questionnaires, to clarify the manifestation of the development of the student's logical thinking in various types of activities and behavior of students;
- using the questionnaire and interview method to study the history and family conditions of the students' family, information about the interests and aspirations of the family members, the early development period of the student, his passions and unusual abilities;
- on the basis of a questionnaire, the student's abilities, which are not reflected in his learning and success, are evaluated by his peers;
- self-assessment of the student's abilities, motivation, and interests using questionnaires and interview methods;

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- assessment of the student's learning, achievements and creative works [114].

Based on the goal of our research, we used the following three levels to determine the development of logical thinking in students: "high", "medium", "low". Quantitative and qualitative indicators and components (motivational, emotional-volitional, intellectual-active) of the manifestation of the development of logical thinking as a basis for these levels. If students have the motivational, emotional-volitional, intellectual-active components of developing logical thinking and most of their indicators, the high level; if at least two of these components are clearly manifested and at least fifty percent correspond to the indicators, the middle level; if the student does not meet the components of the development of logical thinking and the majority of indicators corresponding to them, it is determined that it represents a low level. In addition, the following levels were taken as a basis for clarifying the manifestation of the development of creative and logical thinking in students: stable - a clear need for creativity is formed; situational - the need for creativity has a changeable description depending on the situation; within the possibility - low level of development of creativity. Also, it was found that the development of logical thinking within the framework of the study reflects the dynamic description of personality development, and the development of logical thinking manifested in the student may not be clearly manifested when he reaches the upper class. In the same way, the lack of manifestation of the development of logical thinking in the student during the educational process of a certain period of time does not deny the possibility of its occurrence. In addition, the fact that parents or pedagogues do not notice the student's ability early, even some pedagogues who speak less, require quiet listening, and do not support non-standard thinking, also have a negative effect on this process.

One of the main goals of teaching mathematics in general secondary schools is to form the ability of consistent logical thinking in students, to teach them to consciously master mathematical concepts and relations and to apply them to life. It is important to effectively use all modern information resources, not limited to only approved textbooks, in teaching mathematics to students in accordance with the requirements of the State Educational Standards.

In particular, when dealing with gifted students individually, providing them with additional literature, materials for various contests and competitions, and achieving their mastery by students will have a great effect. For example, in most of the additional literature used to prepare students for the "Knowledge Competition" and Science Olympiad, the problems are not classified by classes, which creates some difficulties for students to study independently.

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