

**PSYCHOLOGICAL AND PEDAGOGICAL ASPECTS OF DEVELOPING LOGICAL
THINKING OF STUDENTS IN MATHEMATICS LESSONS**

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Annotation: The article examines the key approaches and principles for diagnosing and developing students' logical thinking. It emphasizes the importance of creating favorable psychological and pedagogical conditions that enable students to perform analytical, synthetic, and abstract operations. The study introduces three major diagnostic approaches—personality-oriented, dynamic, and prognostic—and outlines principles for evaluating logical thinking through behavior analysis, teaching methods, and psychodiagnostic tools. Logical thinking is classified by type of activity, level of development, form of manifestation, domain of activity, and age-related developmental characteristics. The article also differentiates between actual and potential, open and hidden, as well as general and specific types of logical thinking. The diagnostic process, structured around a seven-stage method, includes observation, surveys, peer and self-assessments, and analysis of students' creative work. Two main groups of diagnostic criteria are presented, which determine the level of logical thinking—high, medium, or low—based on the presence of motivational, emotional-volitional, and intellectual-active components.

Keywords: Logical thinking, diagnostic approaches, student development, intellectual abilities, educational psychology, personality-oriented education, dynamic assessment, prognostic evaluation, levels of thinking, creative cognition, cognitive development.

To form and develop logical thinking, it is often necessary to create suitable conditions that help the student learn, abstract, compare, generalize, analyze and synthesize scientific methods to obtain new knowledge.

Today, based on the results of our observations and these principles, we have identified the following key approaches to diagnosing the development of logical thinking:

- a) personality-oriented approach. The study is interconnected in the development of personality in connection with the periods of youthful development, the relationship and interaction of intellect and affect, the uniqueness of self-awareness, the levels of development of the emotional-volitional and communicative spheres focused on learning. integrated system of qualities;
- b) dynamic approach (long-term research, periodic observations with the aim of studying the behavior of subjects in various 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 paradigm of transition from diagnostic choice to diagnostic development;
- v) a prognostic approach based on the study of 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 a prognostic approach based on the study of the issue of predicting the development of personality, aimed at determining its potential capabilities.

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

- the presence of a comprehensive description of the assessment of various aspects of the student's behavior and activities, based on the use of various sources of information and covering a wider range of his abilities;
- long-term identification (meaning periodic observations to study the behavior of subjects in various situations);
- analyze the student's behavior in the area of activity that is most compatible with the student's abilities and interests (involve the student in specially organized subject-based play activities, various forms of work that are appropriate for the area of activity);
- the use of teaching methods that have a pronounced developmental effect, protecting the student from psychological obstacles;
- involving experts and highly qualified specialists to assess the development of logical thinking in relation to the field of activity;
- reliance on psychodiagnostic methods that allow achieving effective results in assessing student behavior in real situations.

Develop logical thinking According to the general system of criteria for analyzing the qualitative characteristics of a person, it is possible to determine its various types in connection with the manifestation of a certain type of development of a person's mental abilities and his logical thinking.

develop logical thinking The following criteria can be named as criteria for identifying types:

- in connection with the type of activity and area of mental development;
- development of logical thinking by level;
- develop logical thinking by form of manifestation;
- according to the sphere of manifestation of various types of activities;
- in accordance with the characteristics of the age period.

1. By type of activity, five types of development of logical thinking can be distinguished: practical, theoretical (associated with cognitive activity), artistic-aesthetic, communicative and spiritual-ethical. Also, by the area of mental development, the development of logical thinking can be divided into intellectual, emotional and motivational-volitional types. The intellectual sphere is manifested at the sensorimotor, spatial-visual, conceptual-logical levels. The development of logical thinking in connection with the emotional sphere is reflected at the levels of emotional impact and emotional experience. The development of logical thinking in the motivational-volitional sphere expresses the levels of desire, purposefulness and imagination.

Developed logical thinking methods of student activity allow to ensure its quality and efficiency. For this reason, three main levels of efficiency of activity are distinguished:

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

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

Development of actual logical thinking is a description of the mental characteristics of a student, which is manifested in mastering the activity and field of science at a high level compared to age and social norms. At the same time, we are talking not only about the educational sphere, but also about a wide field of various types of activities.

Development of potential logical thinking is a description of the mental characteristics of a student, which determine only certain mental abilities for achieving success in any field of activity, and is characterized by the fact that he cannot always demonstrate his capabilities. The

development of this potential depends on the presence or absence of favorable conditions (difficulties in the family, lack of motivation).

3. Open and closed types can be distinguished according to the criterion of the form of manifestation of the development of logical thinking.

The development of logical thinking in an open form is clearly manifested in the student's activity even in unfavorable conditions. There is no doubt that the student's success depends on the development of his logical thinking. That is why specialists in the field of development of logical thinking of students with a high degree of probability come to the conclusion about the presence of development of logical thinking or high potential of the student. Accordingly, they adequately assess the "near zone of development" and clearly determine further work with the student. It should also be noted that the development of logical thinking is not always manifested.

The development of hidden logical thinking is not externally manifested in the student's activity. As a result, there is a risk of making an erroneous conclusion about the development of the student's logical thinking. As a result, a student with such hidden development of logical thinking can be assessed as "without a future" and deprived of the necessary help and support for the development of his abilities. Of course, the main reason why the development of spiritual thinking is hidden is the presence of psychological obstacles. They arise in the process of development and integration of abilities and lead to a violation of the form of manifestation of the development of logical thinking.

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

The development of general logical thinking is manifested in relation to various types of activity and is the basis for 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 the understanding of reality and deep emotional and motivational involvement in the sphere of activity.

The development of special logical thinking is expressed in a specific area of activity and serves to determine relationships only in a specific area of activity (music, fine arts, sports, etc.).

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

It is necessary to emphasize the speed of mental development of a schoolchild as a decisive indicator of early or late development of logical thinking. Therefore, the absence of a clear manifestation of the development of logical thinking at school age does not require its denial.

The above criteria indicate that the problem of assessing the development of logical thinking in students is complex and multifactorial, and the diagnostics of the development of logical thinking should have a comprehensive, all-round description and be carried out at different levels and at several stages.

Our conclusion is made by K.K. Platonov, a scientist who conducted research in the field of psychology of the development of logical thinking. The following seven stages of the process of developing logical thinking are confirmed:

- develop logical thinkinga) draw up a list of candidates;
- to identify the manifestation of the development of logical thinking in various types of activities and behavior of students based on observation, an assessment scale, and responses to questionnaires;

- using the questionnaire-interview method, study the history and family conditions of the students' families, information about the interests and aspirations of family members, the early period of the student's development, his hobbies and unusual abilities;

- Based on the questionnaire, the student's peers evaluate the student's abilities, which do not affect his studies and academic performance;

- self-assessment of the student's abilities, motivation and interests using questionnaires and interview methods;

student learning, achievements and creative work

Based on the analysis of scientific views on the levels of manifestation of abilities in students and the procedure for determining it, we divided the criteria for determining the development of logical thinking into two large groups:

Criteria of the first group:

- creative thinking;
- level of self-esteem;
- tolerance;
- acceptable types of activities;
- whether the right or left hemisphere is dominant;
- the level of development of intuition.

Criteria of the second group:

- positive self-image;
- creative interest, desire to learn;
- independence;
- decision making;
- confidence in one's own strengths and capabilities;
- clear target orientation;
- emotionality;
- ability to see things through to the end;
- the ability to see the problem;
- alternative (alternative) thinking;
- divergent thinking;
- research and reconstruction method;
- clarity of thought;
- associativity of memory;
- integrity and independence of perception.

Based on the objective of our study, we used the following three levels to determine the development of students' logical thinking: "high", "medium", "low". Quantitative and qualitative indicators and components (motivational, emotional-volitional, intellectual-active) manifestations of the development of creative-logical thinking as the basis for these levels. If students have motivational, emotional-volitional, intellectual-active components of the development of intellectual thinking and most of their indicators - a high level; if at least two of these components are clearly expressed and at least fifty percent correspond to the indicators, an average level; if the student does not correspond to most of the components of the development of logical thinking and the indicators corresponding to them, it is determined that it represents a low level.

Conclusion Recommendations

In conclusion, it should be said that the development of logical thinking- a qualitative and specific set of abilities that ensure successful performance of an activity; mental abilities or intellect; an individual description of cognitive abilities and learning abilities. A student with developed

logical thinking has individual potential that differs from other students in the level of intelligence, cognitive abilities and abilities.

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