



METHODS OF DEVELOPING LOGICAL THINKING IN STUDENTS

Sharipov Eshqobil Ismatovich

TerDPI, senior teacher

Urakova Sharofat Saidhkul kizi

TerDPI, senior teacher

Abstract. *This article discusses the specific principles and pedagogical and psychological foundations of developing logical thinking in students. Logical thinking in the educational process - the ability to correctly solve a problem through mental operations such as analysis, comparison, generalization, reasoning, and drawing conclusions - is an important competency that determines the professional and intellectual maturity of a student. The article discusses in detail the ways to develop student thinking through problem-based learning, critical thinking strategies, interactive methods, logical tasks, debates, and analytical exercises.*

Keywords . *Logical thinking, critical thinking, analysis, drawing conclusions, problem situations, debate, algorithmic thinking, interactive methods, creativity, student thinking.*

Introduction . The development of logical thinking in the modern education system requires independence, responsibility, and an analytical approach from the student. Being competitive in the labor market, making the right decisions in each situation, and being able to clearly solve professional problems - all of this directly depends on the level of logical thinking of a student. Therefore, developing educational strategies aimed at developing students' logical thinking in higher education institutions is an urgent task. The essence of logical thinking

is that logical thinking is the process of drawing correct conclusions based on facts, evidence, and reasoning, analyzing a problem, and finding a rational solution. It includes the following skills: compare and contrast; defining abstract concepts; understanding cause-and-effect relationships; use of evidence; develop several options for solving the problem; logical justification of conclusions. These skills help students make effective decisions in mastering any subject, in scientific research, and in life situations. ¹**Problem-based learning technologies are such that** creating a problem situation activates the student's thinking, encourages him to think independently. For example: - "What consequences will occur if this process stops?" , - "What conclusion can be drawn if the information provided is insufficient?". This approach deepens the student's analytical thinking.

Critical thinking is the main tool for logical thinking. Effective strategies: **"Insert"** - reading information, identifying and analyzing it; **"T-shaped table"** - comparing "yes" and "no" options; **"Fishbone"** (Cause and Effect Diagram) - identifying the root of the problem; **"Debate"** - developing the ability to justify an idea, respond to objections. **Logical problems and mental training are such that to** strengthen students' analytical thinking: logical issues, combinatorics tasks, role-playing games, "resourcefulness" tests, exercises such as Such assignments student's cause and effect their connections see to obtain , to prove and logical sequence storage ability develops . By working in groups, students: clearly expresses his/her thoughts; looks at the problem from different perspectives; conducts an analytical discussion;

¹ Jabborova, O. (2023). Methodology for Training Primary Education Managers Based on Individual Approach Technology (Monograph). Zebo Prints.

participates in the process of drawing a general conclusion. This process further strengthens logical thinking through mutual exchange of ideas.

Formation of algorithmic thinking. The algorithmic approach is a process of step-by-step analysis and systematic thinking. It is formed through: drawing schemes and diagrams; drawing up a process sequence; graphic-analytical tasks; programming elements (design, code blocks). These methods develop students' organized, logical thinking. Scientific research is the most effective source of logical thinking. Students: deeply master logical thinking in the processes of identifying a problem; analyzing theoretical literature; conducting experiments; making scientific conclusions. **Analyzing real-life situations** . Through case studies, students: see the problem in a real context, ask the right questions, develop solution options, and draw conclusions. This method forms a practical view of logical thinking. **Criteria for assessing logical thinking** . The level of a student's logical thinking is determined by the following: consistency and clarity of thought; ability to correctly apply evidence; analytical thinking; drawing logical conclusions; ability to offer several options for solving problems; ability to distinguish between facts and opinions.

Mathematics plays a special role in the development of logical thinking. Because mathematics is not only a science of numbers and formulas, but also a science that sharpens thinking by analyzing the problem, understanding cause-and-effect relationships, hypothesizing, and concluding. Each one math problem solver to search , to think , to question to give and answer to find encourages . Therefore despite , in practice many students mathematics mechanic solution to find directed process as acceptance They do . This is their independent thinking ,

creative approach and analytical skills enough to not form reason It will be . That's why for mathematics in their classes interactive methods , innovative technologies and analytical approaches application through students his/her thinking activation necessary . This in the article mathematics lessons through in students logical thinking develop roads , advanced pedagogical approaches , effective methods and practical recommendations scientific basically analysis Logical thinking in formation the most important from factors one — lesson process how organization Traditional to memorize based approaches instead of analysis to do , question and answer to do , to search instigator methods in students thinking activity Especially the mathematician issues different roads with to solve them vital to situations tie through students the topic deeper understands and independent to think learns . Also , logical thinking in development problematic from situations use effective from tools is one . Lesson during to the students directly solution no , but different approaches demand to do assignments to be given them independent search , reason and consequences on idea to conduct , to guess to do forced will reach . This is thought activity increase knowledge mechanic not conscious to master help gives . Modern in education interactive methods and technologies logical thinking in formation important tool as to the field For example , " **Thoughts " map** " , " **Sinkwain** " , " **Cluster** " , " **Venn diagram** " methods through students own thoughts systematizes the problem analysis does and logical to the conclusion comes ². From this except , digital technologies – virtual laboratories , online testing platforms , logical games and from

² Toshtemirovna, R. G., & Butayorova, M. (2022). Methodological bases for the use of modern teaching technologies in native language lessons in primary grades. *International Journal of Pedagogics*, 2(11), 88–91.

simulators use training process interesting and interactive to form brings. In the students logical thinking in formation teacher's position important importance has . Teacher only knowledge giver not , maybe guiding , thinking instigator and problem right setter person as movement to do The student must every one his/her opinion appreciation, questions attention with approach and to them consistent , logical based answers return by itself thinking culture Mathematics lessons logical thinking develop to the tool in rotation interdisciplinary integration is also important role For example , biology , physics or computer science sciences with connected mathematician assignments students knowledge circle expands , various sciences between dependency to understand help gives and this through analytical thought Also , group work , role games , debates The methods are also logical. thinking activates . Students own his/her opinion based on give to take , to others his/her opinion analysis to do and conclusion to release They learn . This is not only intellectual , maybe communicative It also develops skills . From this perspective from the point of view in general , students logical thinking formation only theoretical knowledge with not , maybe practical exercises , creative assignments and to real life related issues through further more efficient develops . Especially , every one mathematician the task simple from the solution according to , different roads with to solve encourage , student thought circle to expand service Also , the student 's himself/herself independent in a way questions to create opportunity to give — logical thinking in development effective For example , the lesson during only teacher question giving , reader answer repulsive style not , maybe student's himself/herself search through to the question reason to be , to be learned out conclusion release more benefit This gives in them not

only analysis to do , maybe to the question different from the corners look

It also forms the ability . Another one important aspect — students mistakes analysis to do is to teach . Most people the mistake finds it wrong and him/her opportunity until to hide movement does . Actually and , the mistake is the most good Teacher . Mathematician in classes every one the mistake one opportunity as see why exactly this mistake face given on together analysis take to go students deep to think , cause and effect their relationship to understand teaches . From this outside , in groups work through students each other's his/her opinion listening , different approaches to compare and own point of view his/her opinion protection to do They learn . This is in communication logicality , logic , evidence to bring such as thought elements strengthens . Group in the works roles distribution (e.g. , analyst , evidence) conclusion (through the issuer) every one student 's logical thinking in the process participation is provided . Another effective approach – “ question and answer” chain ” what This is the method . every one student other student's to the question answer gives and next the question himself/herself In this process of the students attention in the center to be , every one the answer hearing and analysis as to go , to go his/her opinion to inform for ready to stand demand is done . As a result their activity , reflection to conduct ability increases . Also , algorithmic approaches critical thinking with together application For example , the problem in solution traditional from the algorithm outside again how roads the existence analysis to do through student independent accordingly the most effective the way choose This is in them creative thinking and innovative approach It also develops digital technologies during digital from tools use is also for students logical thinking skills in

development important factor become service For example , GeoGebra , Desmos such as interactive programs through graphs drawing , algebraic expressions visualization , dynamic problems see opportunity is created . Like this digital approaches not only the lesson interesting does , maybe in students reason consequence their dependencies solid to understand help gives . Mathematics in science logical thinking in development important from aspects again one – metacognitive The student 's approach own his/her opinion to observe , how solution their ways chosen realizing where to reach mistake what he did understand and him/her to correct movement to do is processes through thought deepens .

In the lessons, "I am the solution why " Did I choose ?" , " What else?" methods to be possible " What was it ?" for this method more efficient " Is it over ? " questions to give through in students thought reflection develops . Another important method — guess based on (hypothesis) thinking is to teach . Every how before a difficult issue from the student before approximate the result to say ask , then and that assumption justification or reject through to the conclusion to come on the road to put , to think process This methodical style often light it seems , but in the student strategic thinking , forethought analysis to do and evidence based on decision acceptance to do skill strengthened goes . From now on outside , to real life related issues lesson to the process integration It also makes sense to do thinking in development very is effective . For example , financial to literacy related mathematician issues , environmental , transport or health storage in the fields digital analyses based on assignments through in students practical thought It is formed like this. assignments the student vital problems solution about to think encourages and logical analysis to do teaches . In **conclusion**, it can be

said that the development of logical thinking in students is one of the most important tasks of modern higher education. Through problem-based learning, critical thinking strategies, group analysis, study of real situations, algorithmic approach and scientific research, students acquire analytical, independent and creative thinking. This increases their professional competence, serves to form mature specialists who can effectively solve problems. The development of logical thinking in students is not just the formation of a separate skill, but a complex process that serves to deepen the intellectual potential of a person, decision-making culture and professional maturity. A student with developed logical thinking can critically evaluate any information, examine its scientific basis, and approach it with evidence, rather than simply accepting an idea. This makes it possible to prepare specialists who are independent, free-thinking, and who can deeply analyze the situation and draw rational conclusions, one of the main requirements of modern education. The methods considered in our article - problem-based learning, debate, analytical exercises, algorithmic approach, group discussion, logical questions and case-study technology - expand the scope of students' thinking, teach them to analyze the problem in different situations through a series of solutions, identify the advantages and disadvantages of each option, and choose the most optimal one. At the same time, the process of developing logical thinking also includes elements of creativity, initiative and an innovative approach, since any logical solution simultaneously requires new thinking. Also, the formation of logical thinking improves the student's communicative culture: he can justify his opinion, prove it with logical arguments in the process of discussion, analyze the opinions of others and express his

objections in a civilized manner. This is of great importance in future professional activities, when working with a team, conducting negotiations, and conducting scientific research. In general, a systematic pedagogical approach aimed at developing logical thinking in students allows them not only to deeply master subjects, but also to make independent and correct decisions in life situations. Therefore, it is crucial for higher education institutions to systematically use methods and tools that form logical thinking in the teaching process, to constantly update and improve them.

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