

**METHODOLOGY OF FORMATION OF LOGICAL THINKING IN ELEMENTARY  
MATHEMATICS CLASSES**

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**Annotation:** This work covers a wide range of mathematics teaching methods for elementary school students. The book provides theoretical foundations of mathematics teaching, methods used in the educational process, as well as practical recommendations for the development of logical thinking and analytical approaches in students. The work offers appropriate approaches and methods for teachers to teach effectively in the classroom and master the difficult but necessary aspects of mathematics. The book also covers the importance of motivation in teaching mathematics, the formation of students' thinking and the establishment of a logical dialogue with them through problems.

**Keys words:** Elementary education, methodology of teaching mathematics, logical thinking, mathematics education, educational methodology.

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The methodology for fostering logical thinking in elementary mathematics classes involves strategies that promote critical thinking, problem-solving, and reasoning skills. This process can be broken down into several key steps and approaches, which are designed to engage students at various cognitive levels and make mathematical concepts more accessible. Here are some methodologies to consider:

**1. Concrete to Abstract Progression**

- **Start with concrete experiences:** Introduce mathematical concepts using physical objects (manipulatives like blocks, counters, etc.) to help students understand abstract concepts like addition, subtraction, multiplication, and division.
- **Gradually move to abstract reasoning:** Once students understand the concrete objects, transition to symbols and numbers. This step-by-step progression helps students connect real-world experiences with abstract mathematical operations.

**2. Active Learning and Problem-Solving**

- **Hands-on activities:** Use activities that require students to think critically and apply their reasoning. For instance, solving puzzles, constructing shapes, and working through real-life scenarios involving math can stimulate logical thinking.
- **Collaborative problem-solving:** Encourage group work and discussions. When students share ideas and approaches with peers, it helps them develop different perspectives on how to solve a problem, fostering logical reasoning.
- **Open-ended problems:** Present problems that do not have one correct answer but can be approached in multiple ways. This challenges students to think creatively and logically to reach a conclusion.

**3. Mathematical Communication**

- **Encourage verbal reasoning:** Students should be encouraged to explain their thought processes and justify their answers. Verbalizing reasoning helps solidify understanding and strengthens logical thinking.
- **Mathematical language:** Introduce and emphasize the use of precise mathematical terminology. Using correct vocabulary and notation helps students communicate logically and systematically.

**4. Scaffolded Learning**

- **Provide guided practice:** Offer structured support at first, such as step-by-step instructions or hints, to help students work through problems. As students gain confidence, gradually reduce the level of support, encouraging independent problem-solving.

- **Scaffold complex tasks:** Break down complex problems into smaller, manageable steps. This helps students focus on the individual elements of a problem, making it easier to approach logically.

#### **5. Critical Thinking and Reasoning**

- **Promote logical reasoning through questioning:** Use probing questions to encourage deeper thinking. Questions like "Why do you think that's the case?" or "Can you explain why this approach works?" encourage students to explore their reasoning in a methodical manner.

- **Use inductive and deductive reasoning:** Introduce concepts like patterns, relationships, and generalizations. Encourage students to make observations (inductive reasoning) and then test hypotheses (deductive reasoning) to develop logical thinking skills.

#### **6. Visualization and Representation**

- **Visual aids:** Diagrams, charts, graphs, and other visual tools help students understand relationships and concepts in a clear, structured way. Visual representations of problems support logical thinking by making abstract ideas more tangible.

- **Modeling and diagrams:** Teaching students to create visual models of mathematical problems (e.g., number lines, bar models, geometric sketches) can help them organize their thoughts logically.

#### **7. Reflective Thinking**

- **Self-assessment and reflection:** After completing problems, encourage students to reflect on their solutions and thought processes. Have them assess whether their approach was logical, efficient, and correct, and what alternative strategies could be used.

- **Error analysis:** Present students with problems that contain deliberate errors and ask them to identify and correct the mistakes. This promotes critical thinking and helps students refine their logical reasoning.

#### **8. Real-Life Contexts and Application**

- **Contextualizing mathematics:** Incorporate real-world problems into lessons to make abstract concepts more relatable. Solving problems based on practical situations (e.g., budgeting, shopping, measuring) requires logical reasoning and provides a meaningful context for students.

- **Cross-curricular connections:** Use mathematics in other subjects like science, art, and geography, where students can see the application of logical thinking in diverse areas.

#### **9. Fostering a Growth Mindset**

- **Encourage persistence and resilience:** Reinforce that making mistakes is part of the learning process and that logical thinking develops over time through practice and perseverance. A growth mindset helps students approach challenges with confidence.

#### **10. Technology Integration**

- **Math games and apps:** Digital tools and apps can provide interactive ways for students to practice mathematical concepts while fostering problem-solving and logical thinking skills.

- **Visualization software:** Tools that allow for dynamic visualization of mathematical concepts (such as geometry software or graphing calculators) can help students visualize and reason through problems effectively.

By employing these methodologies, elementary educators can build a strong foundation for logical thinking that will not only support students' success in mathematics but also enhance their overall cognitive development.

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