



METHODOLOGY FOR FORMING CHILDREN'S LOGICAL THINKING THROUGH MONTESSORI MATERIALS IN PRESCHOOL EDUCATION

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ABSTRACT

This thesis explores the methodology for forming children's logical thinking through Montessori materials in preschool education. Logical thinking in early childhood develops through comparison, classification, sequencing, analysis, synthesis, generalization and the establishment of cause-and-effect relationships. Montessori pedagogy provides a scientifically organized educational environment where children acquire these skills through independent activity, sensory experience and purposeful manipulation of didactic materials. The purpose of this thesis is to determine the pedagogical and methodological opportunities of Montessori materials in developing logical thinking among preschool children. The study is based on theoretical analysis of Montessori pedagogy, preschool didactics and cognitive development theories. The findings show that Montessori materials support gradual intellectual development by connecting concrete practical actions with elementary forms of abstract reasoning. The methodology is effective when the teacher organizes a prepared environment, presents materials consistently, observes the child's activity and creates conditions for self-correction and independent discovery.

KEYWORDS: Montessori materials, preschool education, logical thinking, cognitive development, didactic methodology, sensory education, prepared environment, independent activity.

INTRODUCTION

Preschool education plays a decisive role in the formation of a child's intellectual, emotional and social development. During this period, children begin to understand relationships between objects, compare their properties, classify them according to specific features and draw simple conclusions from practical experience. Logical thinking is not formed only through verbal explanation; it develops primarily through activity, observation and direct interaction with the surrounding environment. Therefore, preschool education requires methods that correspond to the child's natural need for movement, exploration and independent discovery. Montessori pedagogy is one of the most effective approaches for developing logical thinking in preschool children because it is based on the idea that a child learns best through purposeful activity in a specially prepared environment. Montessori materials are designed to stimulate the senses, develop concentration, encourage independent choice and provide opportunities for self-correction. These materials help children move from concrete perception to elementary reasoning. A child who arranges cylinders by size, matches geometric shapes, compares lengths or classifies colors is not only playing, but also performing important mental operations.

The relevance of this topic is connected with the modern requirement to develop children's readiness for school through active, child-centered and developmentally appropriate methods. Logical thinking is necessary for mastering mathematics, speech, environmental knowledge and social communication. For this reason, the use of Montessori materials in preschool education can be considered an important methodological direction for improving the quality of early childhood learning.

The study is based on theoretical and methodological analysis of scientific sources devoted to Montessori pedagogy, preschool education and child cognitive development. The works of Maria Montessori, Jean Piaget, Lev Vygotsky and modern researchers of early childhood education were used as the conceptual foundation. The research applies methods of analysis, comparison, generalization and pedagogical interpretation.

The object of the study is the process of forming logical thinking in preschool children. The subject of the study is the methodology of using Montessori materials for developing logical thinking in preschool education. Special attention is given to sensory materials, practical life exercises, mathematical materials and language-related didactic tools. The methodological position of the thesis is based on the view that logical thinking develops gradually when children are given opportunities to observe, compare, act independently, correct mistakes and express their conclusions through speech.

The analysis shows that Montessori materials develop children's logical thinking through several pedagogical mechanisms. The first mechanism is sensory differentiation. Montessori sensory materials help children identify differences in size, color, shape, texture, weight and sound. When children work with the pink tower, brown stairs, cylinder blocks or color tablets, they learn to distinguish essential features of objects and arrange them according to a logical order. These actions form the basis of comparison, classification and sequencing.

The second mechanism is self-correction. Montessori materials are constructed in such a way that the child can independently recognize an error and correct it without constant adult intervention. For example, if a cylinder is placed in the wrong hole, the remaining cylinders will not fit properly. This situation encourages the child to analyze the result, find the cause of the mistake and search for a correct solution. Such activity develops independence, attention and elementary problem-solving skills.

The third mechanism is the gradual transition from concrete action to abstract thinking. Preschool children understand concepts more deeply when they can see and touch them. Montessori materials make abstract relations visible and practical. Mathematical materials, such as number rods, sandpaper numerals, spindle boxes and golden beads, help children understand quantity, order, number composition and simple mathematical relationships. These materials prepare children for logical reasoning because they connect visual perception, motor activity and mental operation.

The fourth mechanism is concentration and consistency. Montessori activities require children to choose a task, complete it step by step and return the material to its place. This order teaches children to follow a sequence, control their actions and complete tasks independently. Logical thinking is strengthened because the child learns that every action has a place, purpose and result.

The methodology of forming logical thinking through Montessori materials requires a carefully prepared educational environment. Materials should be placed at the child's level, arranged

from simple to complex and presented in a clear sequence. The teacher should not overload the child with explanations, because the main value of Montessori pedagogy lies in independent activity. The teacher's task is to demonstrate the material briefly, observe the child's work and provide support only when necessary.

Effective use of Montessori materials also depends on the principle of gradual complexity. At the initial stage, children work with materials that develop sensory perception and practical coordination. Later, they move to tasks that require classification, comparison, sequencing and mathematical reasoning. This gradual movement corresponds to the child's cognitive development and prevents unnecessary difficulty.

Speech development is closely connected with logical thinking. After working with Montessori materials, children should be encouraged to name objects, describe their actions, explain differences and express simple conclusions. For example, a child may say that one tower block is larger than another, one rod is longer, or one shape belongs to a certain group. Such verbalization helps transform practical experience into conscious thinking.

The teacher's observation is also an important part of the methodology. Observation allows the teacher to determine which materials are suitable for the child, what difficulties appear during the activity and how the child's thinking is developing. Assessment should not be based only on correct answers. It should include attention, independence, ability to compare, persistence, self-correction and the child's effort to explain actions.

Montessori materials are especially valuable because they create conditions for independent discovery. Children do not simply memorize ready-made knowledge; they discover relationships through activity. This makes learning meaningful and strengthens intellectual confidence. In preschool education, such confidence is essential because it prepares children for future academic learning and independent problem solving.

Montessori materials have significant pedagogical potential for forming logical thinking in preschool children. They develop comparison, classification, sequencing, analysis, concentration, self-correction and independent decision-making. The effectiveness of this methodology depends on the prepared environment, correct presentation of materials, gradual complexity, teacher observation and the connection between practical activity and speech.

The use of Montessori materials in preschool education supports the natural development of children and creates favorable conditions for intellectual growth. Through concrete actions with didactic materials, children gradually acquire the foundations of logical reasoning. Therefore, Montessori-based methodology can be considered an effective way to improve preschool education and prepare children for successful learning at the next stages of education.

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