

DEVELOPMENT OF LOGICAL THINKING OF PRESCHOOL CHILDREN THROUGH
ELEMENTARY MATHEMATICS ACTIVITIES

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Abstract. Logical thinking is a core cognitive competence that supports children's later success in school learning, problem solving, and everyday decision-making. In preschool age, logical thinking develops most naturally when children work with meaningful, hands-on tasks that require comparison, classification, sequencing, pattern recognition, and simple reasoning. Elementary mathematics activities are especially effective for this purpose because they combine concrete materials, language, symbols, and rules in ways young children can explore actively. This article discusses how thoughtfully designed early mathematics experiences—counting and subitizing, sorting and classifying, building patterns, measuring and comparing, working with shapes and spatial relations, and solving age-appropriate “story problems”—can strengthen preschool children's logical thinking.

Keywords: preschool education; logical thinking; early mathematics; problem solving; classification; patterning; numeracy.

INTRODUCTION

Preschool children do not learn logic by listening to long explanations—thankfully for everyone in the room. They learn logic by doing: touching, moving, comparing, arguing (politely, we hope), and trying again after mistakes. Logical thinking at this age includes several interconnected abilities: noticing similarities and differences, grouping objects by a rule, understanding order and sequence, recognizing patterns, estimating and verifying, and explaining “why” in simple language. These are not abstract university-level “proof skills,” but early forms of reasoning that later become the foundation for mathematical thinking, scientific inquiry, and reading comprehension. Preschool education therefore faces a practical challenge: how to build these abilities without turning the classroom into a mini-exam center where curiosity goes to die. Elementary mathematics activities provide a natural solution because they create structured situations where children must use rules and relationships, yet the tasks remain concrete, playful, and meaningful [1].

MATERIALS AND METHODS

Early mathematics is often misunderstood as “learning numbers early.” In reality, the most valuable preschool mathematics is not memorizing numerals but building reasoning habits: comparing quantities, tracking changes, understanding part–whole relations, and forming stable strategies for solving small problems. Research and curriculum standards emphasize that high-quality early math involves learning progressions, rich mathematical language, and purposeful experiences across domains such as number, geometry, measurement, and patterns. When adults design activities where children must justify choices (“Why does this belong here?”), explain steps (“How did you know?”), and test ideas (“What happens if we switch these?”), preschoolers begin to think logically in

developmentally appropriate ways. The goal is not to push formal schooling earlier, but to strengthen thinking through tasks that fit children's age, interests, and ways of learning [2].

RESULTS AND DISCUSSION

One of the strongest ways to develop logical thinking is through classification and sorting, because it forces children to create and follow a rule. A simple activity—sorting buttons by color—can become logically rich when the teacher changes conditions: “Sort by color,” then “Now sort by size,” then “Can you sort by two rules at once?” Children discover that the same set of objects can be organized in different valid ways, which is a big logical step: it introduces flexibility of thought and the idea that rules are human choices, not magic properties hidden inside objects. A teacher can extend this by asking children to name the rule and predict outcomes: “If we sort by shape, where will triangles go?” When children disagree, the classroom gets a free lesson in argumentation: they learn to defend a claim with evidence (“This one is big like the others”) and revise when the rule changes. Even everyday routines can support classification: lining up by shoe color, grouping toys by function, or organizing picture cards into “things that roll / things that slide / things that don't move.” Each time children articulate the rule and check whether items fit, they rehearse logical consistency [3].

Another powerful cluster of activities involves seriation and ordering—arranging objects by length, height, weight, or capacity. Ordering tasks develop logical thinking because children must compare pairs, keep track of results, and maintain a sequence rule (“from shortest to longest”). Young children often start with trial-and-error placement, then gradually shift to more systematic strategies: comparing to the “end” item, using reference points, or grouping “small/medium/large” before fine ordering. Teachers can support this shift by asking process questions: “How do you know this one comes before that one?” and “What would happen if we move it here?” Measurement tools (nonstandard units like blocks or paper clips) add another layer: children learn that comparisons can be made fair through consistent units, which is a logical insight about procedures and validity. A classic preschool moment is when a child insists that a stretched line of objects is “more” than the same objects pushed together. Instead of correcting immediately, adults can turn it into an investigation: “Let's count,” “Let's match one-to-one,” “Did the number change?” That moment is not just about number; it is about invariance, evidence, and justification—the DNA of logical reasoning.

CONCLUSION

Elementary mathematics activities are among the most practical and powerful tools for developing logical thinking in preschool children because they combine structure with play, rules with exploration, and concrete action with emerging explanation skills. Through sorting and classification, children learn to create and apply rules; through ordering and measurement, they learn consistency and relational comparison; through patterning, they learn structure, prediction, and generalization; through number sense tasks, they learn reasoning about quantity and strategy choice; and through geometry and spatial play, they learn defining attributes and transformation thinking. The effectiveness of these activities depends less on expensive materials and more on pedagogical conditions: meaningful contexts, gradual challenge, rich questioning, time for productive struggle, and supportive peer talk. When adults act as guides who invite justification and evidence rather than delivering answers, preschool children develop not only early mathematical competence but also durable habits of logical thinking that will serve them across all areas of learning.

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