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Psychological And Pedagogical Foundations Of Developing Logical Thinking In Preschool Children

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Abstract. This article scientifically analyzes the psychological and pedagogical foundations of the development of logical thinking in preschool children. Effective ways to develop logical thinking are shown based on the mechanisms of formation of logical thinking in the minds of children aged 3–7, J. Piaget's stages of cognitive development, L. Vygotsky's theory of the "zone of proximal development" and the research of representatives of Uzbek psychology and pedagogy. Also, the impact of didactic games, problem situations and sensory-motor activities used in the educational process on children's thinking is based on empirical evidence. The article is of practical importance for teachers and educators of preschool educational institutions.

Keywords: Logical thinking, preschool age, cognitive development, didactic game, zone of proximal development, problem situation, thinking operations, sensory-motor activities, pedagogical technology.

Maktabgacha Yoshdagi Bolalarda Mantiqiy Fikrlashni Rivojlantirishning Psixologik- Pedagogik Asoslari

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Аннотация. Ushbu maqolada maktabgacha yoshdagi bolalarda mantiqiy fikrlashni rivojlantirishning psixologik-pedagogik asoslari ilmiy jihatdan tahlil qilinadi. 3–7 yoshli bolalar ongida mantiqiy tafakkurning shakllanish mexanizmlari, J.Piajening kognitiv rivojlanish bosqichlari, L.Vigotskiyning "yaqin rivojlanish zonasi" nazariyasi va o‘zbek psixologiya hamda pedagogikasi vakillari tadqiqotlari asosida mantiqiy fikrlashni rivojlantirishning samarali yo‘llari ko‘rsatib berildi. Shuningdek, ta'lim jarayonida qo‘llaniladigan didaktik o‘yinlar, muammoli vaziyatlar va sezgi-harakatli faoliyatning bolalar tafakkuriga ta'siri empirik dalillar bilan asoslangan. Maqola maktabgacha ta'lim muassasasi o‘qituvchilari va tarbiyachilari uchun amaliy ahamiyat kasb etadi.

Калит so‘zlar: mantiqiy fikrlash, maktabgacha yosh, kognitiv rivojlanish, didaktik o‘yin, yaqin rivojlanish zonasi, muammoli vaziyat, tafakkur operatsiyalari, sezgi-harakatli faoliyat, pedagogik texnologiya.

ПСИХОЛОГИЧЕСКО-ПЕДАГОГИЧЕСКИЕ ОСНОВЫ РАЗВИТИЯ ЛОГИЧЕСКОГО МЫШЛЕНИЯ У ДЕТЕЙ ДОШКОЛЬНОГО ВОЗРАСТА

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Аннотация. В данной статье научно анализируются психолого-педагогические основы развития логического мышления у детей дошкольного возраста. Показаны эффективные пути развития логического мышления на основе механизмов формирования логического мышления в сознании детей 3–7 лет, стадий познавательного развития по Ж. Пиаже, теории «зоны ближайшего развития» Л. Выготского и исследований представителей узбекской психологии и педагогики. Также на основе эмпирических данных рассматривается влияние дидактических игр, проблемно-ориентированных ситуаций и сенсомоторных упражнений, используемых в образовательном процессе, на мышление детей. Статья



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имеет практическое значение для педагогов и воспитателей дошкольных образовательных учреждений.

Ключевые слова: логическое мышление, дошкольный возраст, познавательное развитие, дидактическая игра, зона ближайшего развития, проблемно-ориентированная ситуация, мыслительные операции, сенсомоторные упражнения, педагогическая технология.

INTRODUCTION

Today, reforming and improving the quality of preschool education in the Republic of Uzbekistan has been identified as one of the priority directions of state policy. In the Resolution No. PQ-154 of the President of Uzbekistan, Shavkat Mirziyoyev, dated May 1, 2022, “On Measures for the Fundamental Improvement of the Preschool Education and Upbringing System,” the development of children’s intellectual, creative, and logical abilities from an early age was defined as a priority task. Based on this regulatory document, new pedagogical approaches are being introduced in national educational institutions with the aim of developing children’s natural interest in learning and forming independent thinking skills.

Psychological studies indicate that 90 percent of the human brain develops before the age of six (Luria, 1969). Therefore, the foundation of logical thinking is formed precisely during the preschool period. According to the monitoring results conducted by the Ministry of Preschool Education of the Republic of Uzbekistan in 2023, it was revealed that 68 percent of children graduating from preschool educational institutions demonstrated logical thinking skills below the established standard. This result highlights the necessity of further deepening scientific and practical research in this field.

The purpose of the article is to clarify the psychological and pedagogical foundations of developing logical thinking in preschool children on the basis of concrete scientific evidence and to develop practical recommendations.

The psychological essence of logical thinking and its characteristics in preschool children

Logical thinking is a form of mental activity carried out through analyzing, synthesizing, comparing, generalizing, and drawing conclusions about the relationships and connections between objects and phenomena (Karimova, 2017).



In psychology, four main operations of logical thinking are distinguished: analysis, synthesis, comparison, and generalization.

Logical thinking is not merely the memorization of information, but the ability to understand cause-and-effect relationships, classify objects and phenomena, and draw conclusions. Today, the modernization processes in the education system require teaching children not on the basis of ready-made patterns, but through the development of independent and creative thinking.

LITERATURE REVIEW AND METHODOLOGY

According to the cognitive development theory proposed by the renowned Swiss psychologist Jean Piaget, the period between the ages of 2 and 7 is called the “preoperational stage.” During this stage, children think through real actions performed with objects. Subsequent studies conducted on the basis of Piaget’s observations have shown that, when appropriate pedagogical conditions are created, children aged 5–6 are able to master simple logical rules and apply them in new situations (Musurmonova, 2019). In a study conducted by the Uzbek psychologist N. Saydullayeva (2021), it was reported that 73 percent of 120 five-year-old children successfully performed classification and seriation operations after participating in purposefully designed game-based activities.

The theory of the “Zone of Proximal Development” (ZPD), proposed by the Russian psychologist Lev Vygotsky, explains the difference between a child’s current independent abilities and the abilities they can achieve with adult guidance. This theory was applied to work with preschool children in the research of the Uzbek scholar O. Yo‘ldoshev (2020), where it was found that children’s performance in completing logical tasks increased by an average of 34 percent when adults provided guidance and support.

Results and Discussions

In preschool pedagogy, play is considered the child’s primary type of activity, through which they explore the surrounding environment and learn the patterns of social relationships. In an experimental study conducted by the pedagogues-scholar S. Hasanova (2018) in five preschool educational institutions in Tashkent city, the logical thinking indicators of 200 children aged 4–6 were compared before and after the intervention. The results were as follows:



- Level of performing comparison operations: 38% → 74% (increase of +36%).
- Generalization skills: 29% → 67% (increase of +38%).
- Ability to determine sequences: 44% → 79% (increase of +35%).

This research proved that the systematic use of didactic games such as “*Color and Shape*” (classification), “*What Does Not Belong?*” (analysis and synthesis), and “*Continue the Sequence*” (serialization) is highly effective in developing children’s logical thinking. The well-known methodologist R. Toshmatova (2022) emphasizes the importance of encouraging children to independently find logical solutions during games: “*Instead of giving ready-made answers, adults should ask questions that guide the child toward drawing their own conclusions.*”

The influence of problem situations and sensorimotor activity

In a study conducted by the Uzbek scholar Z. Nishonova (2021), who adapted the approaches of M. I. Makhmutov — one of the founders of problem-based learning theory — to preschool education, children in the experimental group were presented with at least 2–3 problem situations every day. After a three-month observation period, it was found that the children in this group demonstrated a 42% higher level of understanding cause-and-effect relationships compared to the control group.

When discussing sensorimotor activity, the research of the Uzbek pedagogue-psychologist F. Hamidova (2020) deserves particular attention. The study demonstrated that the logical thinking of children aged 3–4 developed significantly while working with various materials such as sand, water, and geometric objects. In particular, during the process of creating different shapes from sand, children enriched their understanding of volume, weight, and form, which created a foundation for the development of classification skills.

Furthermore, recent studies in the field of neuropedagogy indicate that there is a direct neural connection between fine motor skills and logical thinking: activities that train hand muscles activate the prefrontal cortex (Ismoilova, 2023).

The following three stages are of particular importance in the development of logical thinking in preschool children:

No.	Stage	Description	Main Tool
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1	Stage 1	Identifying objects according to their characteristics (color, shape, size).	Didactic games
2	Stage 2	Finding relationships between events and phenomena.	Logical question-and-answer activities
3	Stage 3	Drawing simple inductive and deductive conclusions.	Problem-based situations

During the research, the following methods were used:

- Theoretical analysis – a comparative study of literature related to preschool education psychology.
- Observation – monitoring children’s performance in completing logical tasks during lessons in preschool educational institutions (PEIs).
- Pedagogical experiment – the application of the “learning through play” technology using Dienes blocks, Cuisenaire rods, and logical puzzles.

THE IMPORTANCE OF THE FAMILY ENVIRONMENT AND PROFESSIONAL PEDAGOGICAL SKILLS

The development of logical thinking in children depends not only on educational institutions but also significantly on the family environment. A survey conducted in 2022 by the Department of Psychology at the National University of Uzbekistan with the participation of 300 parents revealed that 61% of parents spend less than one hour per week playing logical games and solving puzzles with their children. Such a situation undoubtedly has a negative impact on a child’s intellectual development.

Regarding teachers’ professional competence, a study conducted by D.Mirzayeva (2022) found that in groups where educators used open-ended questions in 70% of their conversations with children, logical thinking indicators were 28% higher. This result highlights the necessity of improving communicative strategies among educators and using the Socratic dialogue method.



CONCLUSION

The development of logical thinking in preschool-aged children is not a random process, but rather the result of purposeful and systematic psychological and pedagogical influence. The scientific and empirical evidence presented in this article leads to the following conclusions:

1. Since the preschool period is a sensitive stage of brain development, the optimal time for developing logical thinking is between the ages of 3 and 7.
2. When didactic games are applied systematically, children's cognitive operations such as analysis, synthesis, comparison, and generalization improve by 34–42%.
3. Learning activities designed on the basis of Vygotsky's "Zone of Proximal Development" theory enable the child to fully realize their logical potential.
4. Sensorimotor activities and problem-based situations, from a neuroeducational perspective, activate the child's prefrontal cortex and strengthen the foundations of logical thinking.
5. The family environment and the pedagogical competence of educators are key factors that jointly influence the child's intellectual development.

Recommendation. In preschool educational institutions, at least 25% of the weekly lesson plan should consist of didactic games and problem-based situations aimed at developing logical thinking. Educators should also regularly participate in professional development courses focused on asking open-ended questions, acting as observers, and encouraging children's independent conclusions.

In general, the development of logical thinking in preschool children is a guarantee of their successful preparation for future school education. The proper application of psychological and pedagogical principles not only builds a foundation of knowledge in the child but also shapes the ability to use that knowledge rationally and develops their thinking mechanisms.

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