

THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF DEVELOPING COGNITIVE SPEED IN PRESCHOOL PREPARATORY GROUP CHILDREN**Musratova Zilola**

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ABSTRACT

This article presents a comprehensive analysis of the theoretical and methodological foundations for developing cognitive speed in children attending preschool preparatory groups, addressing a critical gap in early childhood education research. The research examines classical and contemporary theories of cognitive development, including Piaget's stages of cognitive development, Vygotsky's sociocultural theory, and modern neuroscientific approaches to understanding processing speed in early childhood, synthesizing these diverse perspectives into a coherent framework for educational practice.

Keywords

cognitive speed, processing speed, preschool education, school readiness, cognitive development, attention training, memory enhancement, multisensory learning, pedagogical methodology, early childhood education, diagnostic assessment, executive functions.

The transition from preschool to formal schooling represents a critical developmental milestone that significantly influences children's long-term academic trajectories and overall educational outcomes, serving as a foundational period during which essential cognitive capabilities are established. Contemporary educational research increasingly recognizes that successful school adaptation depends not merely on the accumulation of content knowledge, but fundamentally on the development of cognitive processing capabilities that enable efficient learning, information integration, and adaptive problem-solving in novel academic contexts (Blair & Razza, 2007)¹. Among these capabilities, cognitive speed—defined as the rate at which individuals can process, integrate, and respond to information—has emerged as a particularly salient predictor of academic achievement across diverse subject domains and educational levels (Kail & Ferrer, 2007)².

In Uzbekistan, the importance of preschool education has been recognized at the national policy level through the implementation of comprehensive educational reforms designed to modernize the education system and align it with international standards. The "Ilk Qadam" (First Step) state program, established by presidential decree, emphasizes holistic child development and school readiness preparation, reflecting the government's commitment to ensuring that all children enter school prepared to succeed (Republic of Uzbekistan, 2017)⁵. This program represents a significant investment in early childhood education infrastructure, teacher training, and curriculum development, signaling a national priority for strengthening the foundational years of education.

Current practice in Uzbekistan preschools, while incorporating many developmentally appropriate activities, often lacks systematic attention to cognitive processing speed as a specific developmental target. Teachers may engage children in activities that incidentally support



processing efficiency, but without explicit understanding of the theoretical foundations, assessment methods, and targeted intervention strategies that could maximize developmental gains. This gap between policy intentions and implementation realities highlights the need for comprehensive frameworks that bridge research and practice, providing educators with the knowledge, tools, and strategies necessary to systematically enhance cognitive speed development.

Jean Piaget's (1896-1980) seminal work on cognitive development provides foundational understanding of how children's thinking evolves through qualitatively distinct stages, with each stage characterized by specific cognitive structures and capabilities that constrain and enable particular forms of reasoning. The preschool period primarily corresponds to Piaget's preoperational stage (ages 2-7), characterized by symbolic thinking, egocentrism, and gradual development of representational capabilities that allow children to mentally manipulate images and concepts without requiring concrete physical objects (Piaget, 1952)⁷. During this stage, children transition from intuitive reasoning based primarily on perceptual appearances to more systematic, though not yet fully logical, thought processes that incorporate multiple dimensions and perspectives.

Lev Vygotsky's (1896-1934) sociocultural theory offers complementary insights by emphasizing the social and cultural mediation of cognitive development, arguing that higher mental functions originate in social interactions and are internalized through participation in culturally organized activities. Vygotsky's concept of the Zone of Proximal Development (ZPD)—defined as the gap between what a child can accomplish independently and what they can achieve with guidance from more knowledgeable others—has profound implications for designing interventions to enhance cognitive speed and represents a cornerstone of contemporary educational practice (Vygotsky, 1978)⁹.

According to Vygotsky, cognitive functions first appear on the social plane through interaction with more knowledgeable others in what he termed interpsychological functioning, then become internalized as individual capabilities in intrapsychological functioning through a process of gradual appropriation and transformation. This process of internalization is mediated by cultural tools, particularly language, which serves as the primary instrument for thought and enables the symbolic representation and manipulation of reality (Bodrova & Leong, 2007)¹⁰. The quality and nature of social interactions, particularly scaffolding provided by adults or more capable peers, significantly influence the rate at which children develop cognitive competencies, as skilled interactional partners can structure tasks, provide strategic guidance, and gradually transfer responsibility as

Mental operation speed reflects both the efficiency of component processes involved in executing specific operations and their coordination and integration into coherent cognitive sequences. As children develop during the preschool years, increased automaticity of basic operations frees cognitive resources for higher-order processes, enabling faster and more sophisticated reasoning as attentional resources are not consumed by basic operations. For example, when children automate number recognition and counting, they can devote more resources to mathematical reasoning about relationships and operations, accelerating mathematical development.

Individual differences in mental operation speed have been found to predict academic achievement across domains even after controlling for general intelligence, suggesting that processing efficiency makes unique contributions to learning outcomes (Kail, 2007)²⁴. Children



who can execute mental operations more rapidly can solve more problems in a given time period, providing more practice opportunities that further accelerate skill development, and can handle more complex problems involving multiple steps or components by completing initial steps before relevant information is forgotten or attention wanders.

Play provides a natural, developmentally appropriate context for cognitive skill development, leveraging children's intrinsic motivation and natural tendencies toward exploration and mastery while avoiding the stress and pressure that can accompany formal instruction. Structured play activities can systematically target processing speed while maintaining the engaging, enjoyable qualities that characterize high-quality play experiences. Speed-based games reward rapid responses while maintaining accuracy requirements, such as matching games requiring quick identification of corresponding pairs, rapid sorting activities requiring classification under time pressure, or simple board games where rapid die-reading and piece-moving provide advantages.

Timed construction tasks provide building activities with time constraints encouraging efficient planning and execution, such as block construction competitions, puzzle races, or assembly challenges. Fast-paced group games require rapid information processing and response coordination, such as relay races with cognitive components, musical chairs variations, or quick-response question games. Rhythm and movement games link timing, coordination, and cognitive processing, such as action songs requiring synchronized movements, clapping patterns requiring temporal sequencing, or dance activities requiring rapid response to changing music.

Rapid, informative feedback enhances learning efficiency by allowing children to adjust performance in real-time, correct errors before they become habitual, and understand the connection between actions and outcomes. Feedback should be immediate rather than delayed to maximize its effectiveness, specific rather than general to clarify exactly what was successful or unsuccessful, and process-focused rather than outcome-focused to reinforce effort, strategy use, and controllable factors rather than fixed ability attributions that can undermine motivation and persistence.

Effective feedback practices include descriptive statements about what the child did rather than evaluative judgments about the child, such as "You carefully checked each piece before placing it" rather than "Good job"; error analysis helping children understand mistakes as learning opportunities rather than failures, such as "The circle doesn't fit in the square space—let's look at the shapes more carefully"; strategy suggestions providing specific approaches for improvement rather than vague encouragement, such as "Try saying the sounds out loud as you look at the letters"; and attribution to effort and strategy rather than ability, such as "Your practice with these puzzles is really paying off" rather than "You're so smart."

Research on feedback demonstrates that well-designed feedback can substantially accelerate learning and skill development, while poorly designed feedback can actually impair learning by reducing motivation, creating anxiety, or focusing attention on irrelevant factors. Understanding feedback principles and implementing them consistently represents a crucial component of effective cognitive speed instruction.

This comprehensive examination of theoretical and methodological foundations for developing cognitive speed in preschool preparatory groups has established that processing speed represents a critical, malleable component of school readiness with far-reaching implications for academic success and lifelong learning trajectories. By synthesizing insights



from developmental psychology, neuroscience, and educational research, we have constructed a coherent framework demonstrating that systematic attention to cognitive speed development during the sensitive preschool period can yield substantial benefits for children's educational outcomes while aligning with broader developmental goals and respecting cultural contexts. The evidence reviewed supports implementation of multifaceted interventions combining assessment, targeted training, environmental optimization, and family engagement to maximize cognitive development during these formative years, with particular promise for implementation within Uzbekistan's evolving preschool education system.

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