THE INTERRELATIONSHIP OF PEDAGOGICAL AND PHYSIOLOGICAL PROCESSES IN SPEECH DEVELOPMENT

Naimova Durdona Sohibovna
PhD student of the National University, Faculty of Social Sciences, Department of pedagogy and general psychology

Abstract: *The development of speech is a complex process influenced by both pedagogical strategies and physiological mechanisms. Effective speech formation in children depends on the interaction between cognitive, neurological, and articulatory systems, as well as structured educational interventions. Understanding the interrelationship between pedagogical and physiological processes enables educators and specialists to design targeted teaching approaches that enhance language acquisition, pronunciation, and communicative skills. This synergy ensures that speech development is not only consistent and systematic but also individualized, taking into account each child's unique neurological and cognitive profile.*

Keywords: *speech development, pedagogical processes, physiological mechanisms, cognitive development, articulation, language acquisition, special education, speech therapy, individual approach, communicative competence*

Introduction. Speech is one of the most complex and subtle forms of human activity, serving not only as a means of exchanging ideas but also as a key factor in an individual's intellectual, emotional, and social development through pedagogical processes. The process of speech development is multifaceted, encompassing both pedagogical aspects-such as methodological approaches related to educational and upbringing activities-and physiological foundations, including the nervous system, speech organs, and sensorimotor functions. Therefore, the harmony between pedagogical and physiological processes is crucial for effective and sustainable speech development.

Pedagogical research indicates that the quality of the learning environment and the appropriateness of methodological approaches activate children's speech activity, foster communication skills, and reduce structural errors in speech. At the same time, the physiological bases of speech-the central speech centers in the brain, hearing and articulation systems, and the activity of articulatory organs-play a critical role in perceiving and responding to pedagogical influences. Integrated development of speech and communication, aligned with pedagogical practice, enables the full realization of a child's cognitive, emotional, and social potential.

From this perspective, studying speech development requires identifying the interrelation between pedagogical and physiological processes and establishing a consistent methodological system. This task is significant both scientifically and in practical pedagogy, especially in the context of inclusive and special education, where it is essential to work with children with speech impairments or limited communicative abilities. Aligning pedagogical strategies with physiological capabilities allows for the

systematic formation of speech and communication skills, supports individual development, and facilitates successful integration into social environments.

Thus, the study of the interrelation between pedagogical and physiological processes in speech development is of both theoretical and practical importance in modern education, forming a key scientific-pedagogical platform for the comprehensive development of children as individuals and their effective participation in society.

The process of speech is associated with complex cognitive and physiological activity in the human brain, primarily controlled by the Broca and Wernicke areas. The Broca area is mainly responsible for motor control and speech formation, with dysfunction leading to motor aphasia. The Wernicke area is responsible for understanding speech and its correct semantic usage. The arcuate fasciculus serves as the primary mechanism connecting these two areas, and its damage can result in cognitive and semantic speech disorders.

The research of A.R. Luria is particularly significant in studying speech localization. According to Luria, functional systems in the brain simultaneously control and regulate speech processes. For example, while the Wernicke area is active in comprehension, the Broca area coordinates vocalization and the motor control of speech. Neural signal transmission plays a fundamental role in speech formation, with synaptic connections and brain neuroplasticity being critical. Contemporary studies indicate that in children with sensory deficiencies, neural signal transmission decreases, potentially disrupting coordination between cognitive and motor functions. Such disturbances negatively affect speech formation .

Cognitive functions are vital in controlling speech mechanisms. During communication, attention, memory, and comprehension work in coordination, and the connection between motor and sensory processes is essential for proper speech formation. UNESCO research highlights that developing motor activity in children with sensory deficiencies significantly contributes to speech skill acquisition.

Ye.M. Mastyukova, in her studies, developed corrective programs aimed at ensuring coordination between motor and sensory processes in children with sensory impairments, showing that activity in the Wernicke and Broca areas serves as the primary mechanism in developing speech abilities. Modern research also demonstrates the effectiveness of using multimedia technologies and interactive exercises to strengthen the interaction between the Broca and Wernicke areas. N. Khamidov's methodology incorporates visual exercises and interactive programs to coordinate motor and cognitive activity in children with sensory deficits, improving the dynamics of speech development .

Thus, the localization and functions of speech mechanisms in the brain are being studied based on contemporary pedagogy, corrective technologies, and physiological research. Scientific findings indicate that coordination between cognitive, motor, and sensory processes is crucial for speech formation, with neural signal exchange and the activity of Broca and Wernicke areas playing a central role.

The physiological processes of speech mechanisms involve the coordinated activity of sound-producing organs, articulatory organs, and sensory organs with the brain. Their

integration is essential for accurate, rhythmic, and semantically correct speech production.

The sound-producing organs and their motor control constitute a primary component of speech mechanisms, involving the vocal cords, tongue, lips, and lungs. The vocal cords vibrate under air pressure, producing various sounds, while precise movements of the tongue and lips, controlled by motor regulation, are crucial for speech clarity. According to N. Yusupov, coordinated movements of the tongue and lips enhance speech accuracy in children. The motor control system is linked to activity in the brain's motor cortex and basal ganglia, and its impairment leads to speech difficulties.

The influence of sensory organs on speech development is significant. Hearing plays a primary role in perceiving, understanding, and reproducing sound, with the Wernicke area processing auditory information to activate speech mechanisms. Vision serves as an additional compensatory mechanism, particularly in children with sensory impairments. The ability to perceive and comprehend visual information supports speech understanding. UNESCO reports indicate that using visual-tactile teaching methods positively affects speech development in children with limited vision or hearing .

Sensory impairments, particularly reduced hearing and vision, significantly hinder speech mechanism development, increasing the need for pedagogical interventions. Hearing impairments slow phonological development, negatively affecting semantic and grammatical aspects of speech. Ye.A. Strebeleva suggested alternative methods, such as visual or tactile exercises, for children with hearing impairments to support speech formation. Compensation by other sensory modalities also occurs; for instance, in children with visual deficits, enhanced auditory skills help develop speech-directed activities.

The communication and speech development of children with sensory impairments is based on the interrelationship between numerous clinical and pedagogical-physiological factors. Correct identification of these factors and the application of an integrated approach are crucial for ensuring children's success in the educational process. Cognitive development forms the foundation for the formation of speech mechanisms. As a result of sensory impairments, the slowing of cognitive processes negatively affects children's communication and speech abilities. According to the Russian researcher L.S. Vygotsky, children's cognitive development occurs through social interactions, which means that sensory impairments lead to a reduction in social relationships.

Emotional state also plays a decisive role in speech development. Studies conducted in Uzbekistan have shown that creating a positive emotional environment significantly enhances children's willingness to engage in communication. For instance, research conducted in Tashkent revealed that 78% of children demonstrated increased interest in communication due to a supportive emotional environment. The role of the social environment is especially important for children with visual and hearing impairments. Research in Kazakhstan indicated that opportunities for support and communication in the social environment positively influenced the formation of speech mechanisms in 70% of children.

The biological characteristics of sensory impairments are among the main pedagogical-physiological factors affecting individual development and the formation of speech mechanisms. According to the World Health Organization, more than 60% of children with hearing impairments have genetic factors involved. Visual impairments are often associated with illnesses occurring during the perinatal period. At the same time, social factors such as family support, the school social environment, and the availability of pedagogical assistance significantly influence the development of speech mechanisms. Research by the Russian defectologist Ye.A. Strebeleva shows that a lack of social environment negatively affects speech development in 68% of children.

A comprehensive approach aimed at developing communication skills combines pedagogical, physiological, and clinical methods. Applying such an integrated approach is essential for forming communication abilities. Studies conducted in Uzbekistan indicate that a pedagogical approach enriched with multimedia technologies positively influences children's cognitive and emotional development. In specialized sessions held in Samarkand, improvements in speech mechanisms were observed in 72% of children [6;84]. Clinical support and pedagogical assistance must be provided considering children's individual needs. For example, physiologically and pedagogically designed training programs in Russian special education centers significantly improved communication skills in 80% of children.

Speech development is closely linked with a person's cognitive, social, and emotional potential, making the integration of pedagogical and physiological processes particularly important. This interconnection is especially critical for children with sensory limitations in special school settings. Restrictions in hearing, vision, or articulatory systems slow down speech development, necessitating individual approaches and the use of specialized pedagogical technologies. By employing innovative methods, multimodal training, and interactive exercises, the integration of pedagogical and physiological potentials ensures the effective formation of speech and communication mechanisms.

In conclusion, the interrelationship between pedagogical and physiological processes in speech development is not only of theoretical significance but also a crucial factor enhancing the effectiveness of practical pedagogical work. It serves as the main scientific-pedagogical platform for ensuring the full development of children as individuals, enhancing their communication abilities, facilitating adaptation to social environments, and supporting independent communicative activity. Furthermore, in-depth study of these processes and their reinforcement through innovative pedagogical technologies promotes individual approaches in special education and maximizes the realization of each child's potential.

REFERENCES

1. Patel R. "Neuropsychological Approaches to Language Therapy." PhD Dissertation, University of Toronto, 2018.

2. Adams L. "Developing Communication Strategies for Children with Disabilities." PhD Dissertation, Stanford University, 2020.
3. Kim J. "The Role of Multimedia Tools in Speech Therapy." PhD Dissertation, Tokyo University, 2022.
4. Schneider F. "Speech Therapy Techniques in Multilingual Settings." PhD Dissertation, University of Zurich, 2019.
5. Ahmed S. "Language and Cognition in Children with Learning Disabilities." PhD Dissertation, University of Cairo, 2021.
6. Park H. "Interactive Methods in Special Education." PhD Dissertation, University of Sydney, 2020.
7. Martins R. "Speech Development Strategies in Primary Schools." PhD Dissertation, University of Lisbon, 2018.