

NEUROPEDAGOGICAL ASPECTS OF FINDING SOLUTIONS TO SPEECH THERAPY PROBLEMS

Temirbekova A.O.

Associate Professor, Nukus State Pedagogical Institute

PhD in Pedagogical Sciences

Abstract

This article analyzes the theoretical and practical foundations of neuropedagogical approaches to solving speech therapy problems. It examines the interrelationship between neurophysiological, psycholinguistic, and pedagogical factors in the correction of speech disorders. Furthermore, the study substantiates the potential of neuroplasticity, sensorimotor integration, and neurotechnologies in the identification and correction of speech disorders such as dyslexia, dysgraphia, alalia, and stuttering.

Keywords: Neuropedagogy, speech therapy, speech disorders, neuroplasticity, neurolinguistics, psycholinguistics, sensorimotor integration, dyslexia, dysgraphia, alalia, stuttering, neurotechnologies, corrective pedagogy, individualized learning.

Introduction

Annotatsiya

Mazkur maqolada logopedik muammolarni hal etishda neyropedagogik yondashuvlarning nazariy va amaliy asoslari tahlil qilingan. Nutq buzilishlarini korrleksiyalashda neyrofiziologik, psixolingvistik hamda pedagogik omillarning o'zaro bog'liqligi yoritilgan. Shuningdek, disleksiya, disgrafiya, alaliya va duduqlanish kabi nutq buzilishlarini aniqlash va bartaraf etishda neyroplastiklik, sensomotor integratsiya hamda neyrotexnologiyalardan foydalanish imkoniyatlari asoslangan.

Kalit soʻzlar: neyropedagogika, logopediya, nutq buzilishlari, neyroplastiklik, neyrolingvistika, psixolingvistika, sensomotor integratsiya, disleksiya, disgrafiya, alaliya, duduqlanish, neyrotehnologiyalar, korreksion pedagogika, individual ta'lim.

Аннотация

В данной статье проанализированы теоретические и практические основы нейропедагогических подходов к решению логопедических проблем. Рассмотрена взаимосвязь нейрофизиологических, психолингвистических и педагогических факторов в процессе коррекции речевых нарушений. Кроме того, обоснованы возможности применения принципов нейропластичности, сенсомоторной интеграции и нейротехнологий при выявлении и коррекции таких речевых нарушений, как дислексия, дисграфия, алалия и заикание.

Ключевые слова: нейропедагогика, логопедия, речевые нарушения, нейропластичность, нейролингвистика, психолингвистика, сенсомоторная интеграция, дислексия, дисграфия, алалия, заикание, нейротехнологии, коррекционная педагогика, индивидуализированное обучение.

The neuropedagogical foundations of solving speech therapy problems represent a modern interdisciplinary field that has emerged at the intersection of speech therapy, neurology, pedagogy, and psycholinguistics. The primary focus is on understanding how the characteristics of brain functioning influence the formation, development, and possible disorders of speech, as well as how this knowledge can be applied to improve the effectiveness of corrective and pedagogical interventions.

One of the fundamental theoretical principles is the concept of the systemic organization of speech function. Speech is not localized within a single region of the brain; rather, it is supported by the complex interaction of multiple brain areas, including those traditionally associated with speech perception and production. From this perspective, neuroplasticity plays a crucial role by enabling the compensation of impaired functions through the activation of alternative neural networks. It is precisely this principle that underlies most contemporary speech therapy methods aimed at the gradual restoration or development of speech skills. Professor N. A. Shermukhamedova emphasizes this idea by stating: "Science cannot be reduced merely to the recording and description of a collection of facts."

Genuine science exists only when we are able to explain phenomena and identify the principles that enable their prediction. Many scholars believe that science cannot exist without certain principles and simplicity. However, this view is debatable, since the maturity of science is determined not only by simplicity and clarity but also by its profound theoretical and conceptual foundation. If a person expects science merely to present facts rather than encourage critical reflection, they remain at the initial stage of scientific understanding rather than advancing beyond it. Today, science is primarily regarded as a socio-cultural phenomenon. This implies that science is influenced by the diverse forces operating within society, defines its priorities within a social context, demonstrates a capacity for compromise, and, at the same time, significantly shapes the development of society itself.” [3].

From a neuropedagogical perspective, speech therapy interventions should take into account the individual neurocognitive characteristics of each child. For example, differences in attention, memory, sensorimotor coordination, and auditory perception directly influence the success of language acquisition. Consequently, corrective programs are increasingly designed as individualized interventions that consider the unique profile of each learner's strengths and weaknesses.

Particular importance is attached to understanding the nature of various speech disorders, including dyslexia, dysgraphia, alalia, and stuttering. The neuropedagogical approach makes it possible to view these disorders not only as pedagogical problems but also as consequences of specific neurophysiological developmental characteristics. This perspective facilitates more accurate diagnosis and the selection of appropriate evidence-based corrective methods.

The use of neurotechnologies in speech therapy practice represents an important area of contemporary research and intervention. For example, biofeedback techniques enable children to receive information about their physiological processes, such as breathing patterns, muscle tension, and speech rhythm, and to learn how to regulate them effectively. Such technologies enhance children's self-awareness and active participation in the corrective process, thereby increasing the overall effectiveness of speech therapy sessions [4].

Furthermore, neuropedagogy emphasizes the significant role of sensorimotor integration in speech development. Physical activity, rhythmic exercises, articulatory gymnastics, and tactile stimulation are regarded not merely as

supportive techniques but as essential components in the formation of neural connections required for speech functioning. This approach is particularly beneficial for children with severe speech disorders, who frequently experience accompanying motor impairments.

Researcher A. D. Barbitova, in her study “The Possibilities of Using Neuro-Linguistic Programming as a Learner-Centered Educational Tool for Senior School Students,” identified the effectiveness of Neuro-Linguistic Programming (NLP) as a learner-centered educational approach as the principal objective of her research.

During the course of the present study, a pedagogical framework for investigating neuropedagogy through the perspective of linguistics was developed in the following sequence:

The pedagogical and psychological framework for neuropedagogical research includes the following conceptual approaches:

Neurolinguistic Concept of Language Teaching

This concept is based on the assumption that language learning is associated with the functioning of specific brain regions, including Broca's area, Wernicke's area, and other language-related neural structures.

Within the framework of neuropedagogy, neural networks are investigated in relation to speech perception, reading processes, and the formation of grammatical structures. The findings of these studies should be applied to optimize language teaching methodologies and improve learning outcomes.

Cognitive-Linguistic Concept

This concept views language as a system of cognitive processes involving perception, information processing, and knowledge construction.

Neuropedagogical research within this framework focuses on:

- the organization of lexical representations in the brain;
- the formation of grammatical processes;
- the development of language competence.

Connectionist (Neural Network) Concept

The connectionist approach considers language as the result of the functioning of distributed neural networks. Particular attention is paid to the role of repeated exposure, language practice, and the interaction of linguistic structures during the learning process, all of which contribute to the strengthening of neural connections.

Psycholinguistic Concept

This concept examines the processes involved in speech production and speech perception. From a neuropedagogical perspective, the following factors are considered essential for analysis:

- learners' language errors;
- the stages of speech development;
- the influence of memory and emotions on language acquisition.

Sensorimotor Concept of Language Learning

This concept proposes that language is acquired through the interaction of sensory systems, particularly auditory and visual perception.

It also emphasizes communicative learning through physical activity and purposeful movement, which facilitate the development of language skills [6].

Bilingual and Multilingual Brain Concept. This concept investigates how the brain stores, processes, and switches between multiple language systems.

In pedagogical practice, it focuses on:

- understanding language interference;
- developing cognitive flexibility;
- preventing language confusion while promoting balanced bilingual and multilingual competence.

Emotional–Neuropedagogical Concept

This concept emphasizes the role of emotions in language acquisition and retention. It highlights the importance of such influencing factors as motivation, long-term memory, and the reduction of language anxiety, all of which significantly affect the effectiveness of language learning.

The proposed pedagogical and psychological framework provides a systematic basis for organizing, integrating, and conceptualizing the goals, objectives, and expected outcomes of neuropedagogical research within the system of pedagogical sciences. It establishes a comprehensive model for understanding the theoretical and practical dimensions of neuropedagogy.

Another important aspect is the influence of the emotional and motivational domain on speech development. Stress, anxiety, and low self-esteem may significantly complicate the corrective process. From a neurological perspective, this is associated with the impact of emotional states on cognitive functions and learning capacity. Therefore, effective speech therapy should incorporate

elements of psychological support and provide a supportive educational environment that promotes emotional well-being.

Nevertheless, the neuropedagogical approach faces several challenges. One of the major concerns is the risk of oversimplifying complex neurophysiological processes. The popularization of neurological concepts may sometimes lead to the emergence of neuromyths, which can distort scientific knowledge and reduce the quality of professional practice. Furthermore, not all methods presented as neuropedagogical are supported by sufficient scientific evidence.

Another significant challenge is the shortage of qualified specialists. Speech therapists do not always possess adequate knowledge of neuroscience, which complicates the implementation of contemporary neuropedagogical approaches. Addressing this issue requires the revision of teacher education curricula and the strengthening of interdisciplinary professional training.

In conclusion, neuropedagogical foundations provide new opportunities for addressing speech therapy problems by enabling a deeper understanding of the mechanisms underlying speech disorders and facilitating the development of more effective corrective methods. At the same time, the successful implementation of this approach requires scientific rigor, a high level of professional pedagogical competence, and a critical understanding of the technologies and methods employed in educational and corrective practice.

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