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Neuro-Pedagogical Diagnostic System for Developing Logical Thinking in Future Educators

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Abstract: This research explores the neuro-pedagogical diagnostic mechanisms aimed at developing logical thinking skills in future educators. The study examines how the integration of neuroscience and pedagogy enhances the efficiency of educational processes, allowing for targeted observation, evaluation, and support of students' cognitive development. The paper also presents diagnostic tools and strategies for identifying and improving logical reasoning through neuro-pedagogical approaches.

Keywords: Neuro-pedagogy, logical thinking, diagnostic system, future educators, neurodiagnostics, cognitive development.

Introduction: The study of the structural peculiarities of the student's brain mobilizes educators to approach educational challenges from a new perspective, moving away from conventional concepts and contributing creatively to the development of new pedagogical technologies based on the study of types of thinking.

The process of thinking is considered the highest level of human consciousness. The student's thinking, as the most complex and advanced form of intellectual activity, serves as a subject of research in psychology and neurophysiology. From the viewpoint of neuropsychologists or biologists, "thinking is the activation of groups of neurons." Recently, scientific disciplines such as neuropsychology, neurolinguistics, or neuropsycholinguistics, and psycholinguistics, which link educational processes to the structural peculiarities

of the student's brain, have been rapidly developing worldwide.

American neuropsychologists referred to the 1990s as the "Decade of the Brain," emphasizing the importance of this topic to educators. They highlighted the necessity for teachers to engage students in various forms and contents of educational activities and to utilize a wide range of teaching methods and techniques.

The relationship between the structure of the brain and the peculiarities of thinking processes has been scientifically proven through research conducted by scientists from over twenty countries.

In the 1980s, Y. Lotman conducted research in semiotics and cultural studies based on the achievements of neuroscience. He proposed the idea of the sequential activation of competitive types of consciousness, one excessively detached from essence and the other integrated with external reality, serving to reveal content and meaning.

Studying pedagogical processes from the perspective of neurological changes occurring in the human brain, i.e., the integration of neurology with pedagogy, led to the emergence and formation of neuro-pedagogy as a distinct discipline. The Organization for Economic Co-operation and Development (OECD) established the international scientific project "Brain and Learning" through its Centre for Educational Research and Innovation (CERI), involving over thirty countries' neurobiologists, educators, psychologists, sociologists, and medical professionals in scientific research.

In Russia, the Institute of Cognitive Neurology was established under the Academy of Modern Humanities, serving as an initial working platform for neuro-pedagogy. The institute, in collaboration with scientists from Moscow State University, the Institute of the Human Brain of the Russian Academy of Sciences, the Institute of Psychology, the Research Institute of Neurocybernetics, and Rostov State Universities, identified priority areas. These areas are directly related to pedagogical tasks, such as applying neuropsychological knowledge to solve learning difficulties (T.V. Akhutina) and developing the neuropsychology of individual differences (V.A. Moskvina, Y.D. Khomskaya, I.V. Efimova). Researchers like T.A. Dobrokhotova, N.N. Bragina, T. Khrizman, and V. Yeremeyeva conducted studies explaining the interaction between the functional processes of cerebral hemispheric asymmetry and thinking activity in students. The results of these studies significantly influenced the formation of neuropsychological pedagogy.

Since 1997, neuro-pedagogy (a term first used by V.A.

Moskvina) has developed as an "integrative direction" (brain-based/compatible education), uniting all the aforementioned studies.

Improving the neuro-pedagogical diagnostic system aimed at developing logical thinking in students requires clarifying the demands of this process and elucidating the essence of its fundamental principles. The student's brain functions as a "parallel processor," capable of simultaneously performing various processes: memorizing pedagogical concepts, responding to the teacher's questions, analyzing presented information, and engaging in other types of intellectual activities.

In this process, the teacher must ensure students' active participation in learning by involving them in diverse forms and contents of educational activities and effectively utilizing innovative teaching methods and techniques.

An insufficient educational load, considered the opposite of excessive, can negatively impact brain development. Therefore, in developing logical thinking in students, the teacher must adhere to this neuro-pedagogical principle.

The student's brain seeks to understand the essence of phenomena by identifying the causes and patterns of reality. Disorder hinders the productive activity of the brain. If the development of the human brain is facilitated by overcoming intellectual difficulties under conditions of identifying patterns, the effectiveness of the educational system increases.

Neuro-pedagogy emphasizes the significant role of emotions and feelings in developing logical thinking. As V. Dilthey noted, "We understand facts related to society only by internalizing them, accepting them as our own. We contemplate the historical world through love and hate, through the passionate play of our emotions. Nature is mute to us; it is alien, external to us, whereas society is our world." Emotions are among the initial conditions for the effective functioning of the brain. Educational material learned in a favorable environment is better remembered and has a strong connection with the corresponding emotional state. The emotional factor enhances the learner's thinking and logical, creative potential.

The brain can simultaneously analyze incoming information and determine their interconnections, working on the entire information or its parts.

According to neuropsychological research, the brain can "see" an object both as a whole and in parts simultaneously, possessing the ability to divide it into parts and integrate them. Analysis and synthesis are crucial, constantly interacting thinking processes in education, whose joint development requires

appropriate support through adequate teaching methods and techniques. Educational material should always be presented in the interplay of whole and part, analysis and synthesis, induction and deduction, specification and generalization, argumentation, and direct and inverse problem-solving methods.

The brain can perceive information simultaneously under conditions of focused attention and unconscious perception. If the educational process is correctly organized, the characteristics of unconscious perception can be used as an organizational factor in learning. For example, multimedia can be used to fully understand the content of historical events. However, failing to transition from unconscious to conscious perception.

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