BG Pulse Journal USA
ISSN:1947-2536 http://www.bgpulseusa.com/index.php/bg

NEUROPEDAGOGICAL FOUNDATIONS IN LINGUISTICS AND METHODS OF THEIR RESEARCH

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Abstract: This article analyzes the neuropedagogical foundations of linguistics and research methodologies based on an interdisciplinary approach. The connection of language and speech activity with cognitive processes such as attention, perception, memory, thinking, neuroplasticity and information processing is highlighted. The possibilities of studying the processes of language acquisition based on the mutual integration of linguistics, neurolinguistics, psycholinguistics, cognitive linguistics and neuropedagogy are revealed. The scientific and practical significance of theoretical-analytical, comparative, pedagogical observation, diagnostic tasks, pedagogical experiment, and speech activity analysis methods is also substantiated. As a result of the study, a model for studying linguistic processes based on the integration of neurocognitive, linguistic, and pedagogical-methodological levels was proposed. This approach creates important methodological opportunities for increasing the effectiveness of language education, mastering linguistic knowledge, and developing communicative competence.

Key words: linguistics, neuropedagogy, neurolinguistics, psycholinguistics, cognitive linguistics, neuroplasticity, language, speech, memory, cognitive processes, communicative competence.

INTRODUCTION. In the 21st century, the study of language and speech phenomena is moving beyond traditional linguistic approaches and is being studied in close connection with human cognitive activity, psychological state, and neurobiological processes. Such an interdisciplinary approach requires studying not only the properties of language as a grammatical, phonetic, or lexical system, but also how a person perceives, processes, remembers, and uses language in speech activity.

The study of the mechanisms of processing linguistic knowledge in the human brain laid the foundation for the development of neurolinguistics and psycholinguistics, and the application of these scientific results in the educational process has become one of the important tasks of neuropedagogy. Neuropedagogy is an interdisciplinary field formed at the intersection of neuroscience, psychology, and pedagogy, striving to harmonize the educational process with the functional characteristics of the human brain. Research conducted in the field of Mind, Brain, and Education also emphasizes the need to organize the educational process based on the integration of scientific knowledge about the brain, consciousness, and pedagogy.

Today, in linguistic education, one of the main tasks is not the mechanical memorization of language materials by students, but their comprehension, connection with existing knowledge, application in communicative situations, and transformation into independent speech activity. In this regard, the neuropedagogical approach serves as an important methodological basis for identifying the cognitive mechanisms of the process of assimilating linguistic material and developing appropriate methodological tools.

Main part. The study utilized a comprehensive methodological approach aimed at studying linguistic and pedagogical phenomena. In this case, the linguistic phenomenon was considered in integral unity with human cognitive activity, speech experience, and activity in the educational process.

The methodological basis of the study consists of an interdisciplinary approach, a cognitive approach, student-centered learning, an activity-based approach, and a neuropedagogical approach. The interdisciplinary approach allows for the study of linguistic phenomena not only from the perspective of linguistics but also in connection with neuropsychology, psycholinguistics, cognitive sciences, and pedagogy.

The cognitive approach links language to human knowledge generation, information processing, and the formation of a conceptual system.

The activity-based approach involves organizing language learning alongside practical speech activity.

Based on the neuropedagogical approach, it is considered important to consider the individual cognitive characteristics of the student, attention, memory, perception, and neuroplastic capabilities. However, when using the neuropedagogical approach, it is necessary to beware of scientifically unsubstantiated "brain myths" or neuromites. Modern mind-brain-education studies also emphasize the importance of distinguishing popular but unproven claims from credible scientific evidence.

The results of the study showed that the neuropedagogical foundations in linguistics can be considered at three interrelated levels.

The first level is the neurocognitive level. At this level, processes such as attention, perception, working memory, long-term memory, associative attachment, and cognitive flexibility are involved in language perception and processing.

The second level is the linguistic level. At this level, the acquisition of phonetic, lexical, grammatical, semantic, and pragmatic units, as well as the relationships between them, are studied.

The third level is the pedagogical-methodological level. At this level, the didactic conditions, methods, and technologies for teaching linguistic knowledge are determined.

The integration of these three levels forms the following model:

NEUROCOGNITIVE PROCESSES

↓

ACCEPT AND PROCESS LANGUAGE

↓

MASTERING LINGUISTIC KNOWLEDGE

↓

SPEECH ACTIVITY

↓

COMMUNICATIVE COMPETENCE The uniqueness of this model lies in the fact that the final result of linguistic education is determined not only by the knowledge of language units but also by their purposeful application in communicative situations.

During the study, it was established that contextual presentation is one of the effective methodological tools in mastering linguistic material. When a new word or grammatical unit is presented not in isolation, but as part of a meaningful text, dialogue, or real-life situation, the student has the opportunity to connect it with their previous knowledge. The multisensory approach also provides important results. In this process, the processes of hearing, seeing, pronouncing, writing and practical application of linguistic material are combined. For example, when learning a new word, the following sequence can be used:

Hearing a word → Seeing a word → Understanding its meaning → Pronouncing → Using in a sentence → Using in a dialogue → Using in independent speech.

This process serves to transform a linguistic unit from passive knowledge into active speech skills.

The methodological significance of the neuropedagogical approach in linguistics can be linked to the views of representatives of the local scientific school. A prominent representative of Uzbek psychology, E.G. Gaziyev paid great attention to the interconnection of human cognitive processes, thinking, and speech activity. The scientist's psychological views allow for the substantiation of the necessity of considering human cognitive activity during the assimilation of linguistic material. From this perspective, language education should not be limited to teaching linguistic rules alone, but should be organized in connection with the student's perception, analysis, memorization, and independent thinking[1].

A. Nurmonov's scientific views on the relationship between language and speech show the need to connect linguistic knowledge with practical speech activity. The units of the language system function in the process of real speech. Therefore, in linguistic education based on a neuropedagogical approach, the study of language units must be completed by their application in communicative situations[2].

Sh. Rakhmatullaev's research on the lexical and grammatical system of the Uzbek language creates an important theoretical basis for the systematic study of the form and content aspects of linguistic units. From a neuropedagogical perspective, such systematicity facilitates the student's assimilation of new knowledge not as separate facts, but as an interconnected semantic and grammatical system[3].

As a result of harmonizing these views with modern neuropedagogical concepts, the following methodological principles of linguistic education can be developed:

The principle of semanticity - linguistic units are taught based on real content and context.

The principle of activity is that the student actively processes language material.

The principle of associativity – new knowledge is linked to previous experience.

The principle of multisensory is that different perceptual channels are used together.

The principle of communicativeness is that linguistic knowledge is applied in real communication.

The principle of repetition - knowledge is reactivated in different contexts and situations.

The principle of individualization takes into account the individual cognitive characteristics of students.

One of the important aspects of the neuropedagogical research methodology is to evaluate linguistic results based on comprehensive criteria rather than just test scores. This approach allows for a more objective assessment of the results of linguistic education.

Another important aspect of the neuropedagogical approach is the concept of neuroplasticity. The human brain changes under the influence of experience and activity. In the educational process, regular speech activity, repetition, and practical exercises can serve to develop cognitive processes related to language. However, one should not oversimplify this process and conclude that a specific exercise automatically develops a specific part of the brain.

In neuropedagogical research, relying on reliable scientific evidence, avoiding neuromyths, and substantiating pedagogical conclusions with existing empirical data is an important methodological requirement. The concept of Mind, Brain, and Education, developed by Tokuhama-Espinosa, also emphasizes interdisciplinary integration between neuroscience, psychology, and pedagogy, and promotes evidence-based pedagogical decisions.

At the same time, research on the application of the neuropedagogical approach to language and literary education is also emerging in the scientific space of Uzbekistan. In particular, N. Duschanova's study, published in 2025, analyzes the neurobiological, cognitive, and psycholinguistic mechanisms of literary literacy formation based on neuropedagogical approaches. This situation indicates that research at the intersection of neuropedagogy, psycholinguistics, and language and literary education is also developing in Uzbekistan.

On this basis, the promising areas of neuropedagogical research in linguistics are defined as follows:

- identifying individual cognitive profiles of language acquisition;

- studying the relationship between students' working memory and vocabulary;

- determining the effectiveness of multimodal linguistic education;

- assessment of the cognitive effectiveness of digital technologies and linguistic education;

- diagnosing communicative competence based on neuropedagogical criteria;

- verification of neuropedagogical methods in teaching the Uzbek language on the basis of experimental testing.

Furthermore, the publication of research related to neuropedagogical strategies, multisensory integration, and digital tools for teaching foreign languages in preschool education in Uzbekistan in 2026 demonstrates the practical relevance of this direction.

Based on the research results, the following step-by-step methodological model for conducting neuropedagogical research in linguistics is proposed.

Stage 1. Initial diagnosis. The initial linguistic and cognitive state of the study participants is determined. It assesses vocabulary, speech activity, text comprehension, memory, and communicative competence.

Stage 2. Neuropedagogical methodological influence. In the experimental group, linguistic materials are studied based on contextual, multisensory, associative, and communicative methods.

Stage 3. Active speech practice. Students apply new linguistic knowledge through dialogue, role-playing, problem situations, storytelling, and creative assignments.

Stage 4. Interim monitoring. Changes in students' knowledge and skills are regularly observed.

Stage 5. Final diagnostics. Preliminary diagnostic results are compared with the final results.

Stage 6. Statistical analysis. Differences between the experimental and control groups are determined using mathematical and statistical methods.

This model can be expressed as follows:

Diagnosis → Neuropedagogical influence → Active linguistic practice → Monitoring → Final diagnosis → Statistical analysis

This methodology allows for the empirical verification of the effectiveness of the neuropedagogical approach in scientific research.

The scientific novelty of the research is manifested in the following results:

First, in linguistics, the neuropedagogical foundations were conceptualized as the integration of neurocognitive, linguistic, and pedagogical-methodological levels.

Secondly, a "attention – perception – comprehension – memorization – reproduction – speech application – reflection" model for mastering linguistic material has been proposed.

Thirdly, a comprehensive methodological model for the neuropedagogical study of linguistic processes has been developed.

Fourthly, when assessing linguistic competence, it is necessary to consider not only knowledge indicators but also indicators of cognitive processing, memory, speech activity, communicative competence, and reflection.

Fifth, the possibilities of integrating the scientific heritage of local schools of linguistics and psychology with a modern neuropedagogical approach have been demonstrated.

CONCLUSION. The study of neuropedagogical foundations in linguistics is one of the promising scientific directions requiring the interdisciplinary integration of modern linguistics, psycholinguistics, neurolinguistics, and pedagogy. Language is not merely a human communicative tool, but a complex cognitive system closely linked to one's thinking, memory, perception, and cognitive activity. The results of the study show that the process of effective acquisition of

linguistic knowledge is based on the interaction of attention, perception, working memory, long-term memory, associative connection, cognitive flexibility, and speech activity. Therefore, the use of a neuropedagogical approach in linguistic education allows for the adaptation of educational content to the cognitive capabilities of the student, the presentation of knowledge in a meaningful and contextual manner, and its application in active communicative situations. At the same time, in neuropedagogical research, it is important to rely on scientific evidence, avoid neuromyths, and carefully incorporate information about brain activity into pedagogical practice. In the future, it is advisable to expand research on experimentally studying the effectiveness of neuropedagogical approaches in the process of teaching the Uzbek language, identifying students' individual cognitive profiles, and evaluating communicative competence based on neuropedagogical criteria.

In general, the integration of linguistics and neuropedagogy has great scientific and practical opportunities for improving the content and methodology of language education on new scientific grounds, ensuring the speech and cognitive development of students and forming their communicative competence.

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