



The Interplay of Language and Thought in Shaping Organizational Cognition: Insights from Cognitive and Neurolinguistics

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Abstract

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*Correspondence: alicea@ukr.net The study is devoted to analysing the relationship between language, thinking and brain processes that reflect cognitive models in linguistics and neurolinguistics. The relevance of the work is stipulated by the need to understand how language structures form conceptual models, influencing cognitive processes and perception of reality, which is critical in interdisciplinary research. The study aims to identify the synergy of cognitive linguistics and neurolinguistics, which contributes to understanding the mechanisms of cognition and knowledge structuring. The study uses the method of cognitive modelling to analyse linguistic concepts and their connection with mental structures. The results show that concepts such as WAR, TIME, and LIFE are categorised through mental structures and conceptual metaphors. The concept of WAR in Western cultures is associated with heroism, while in other cultures, it is associated with destructive consequences. The concept of TIME is perceived as a resource, similar to money, which can be spent or saved. The conceptual metaphor LIFE IS A JOURNEY shows life as a journey with challenges and achievements. The conceptual sphere encompasses the interaction of universal concepts and culturally specific elements that influence the formation of a mental picture of the world. Language structures knowledge through frames, prototypes and scenarios, creating tools for organising cognitive experience. Neuro-linguistics has established the role of brain mechanisms, such as the activity of Broca's and Wernicke's areas, in ensuring speech activity. The linguistic relativity hypothesis also supports the relationship between language and thinking, which shows the influence of linguistic categories on the perception of the world. The results confirm the importance of an interdisciplinary approach to analysing language, thinking, and brain processes to understand the nature of human cognition.

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In their attempts to understand the mechanisms of human consciousness, leading scientists from various fields - psychology, linguistics, medicine, mathematics, physics, computer science and philosophy - have come to the common conclusion that natural language is the primary tool for accessing consciousness. This realisation has determined the critical role of linguistic disciplines in addressing issues related to studying thought processes. According to Chomsky (1988, p. 3), language is directly related to the system of knowledge, the ways of its formation and use, and his opinion has significantly influenced the development of linguistic research, contributing to the advancement of the cognitive approach to language learning to the fore.

Cognitive linguistics is a branch of linguistics that studies the relationship between language and the cognitive processes involved in language acquisition, use and understanding. It investigates how language interacts with thinking, how words are expressed and acquire meaning, how the brain processes language, and how concepts are organised and represented in the mind (Evans, 2015). Cognitive linguistics analyses how language affects perception and shapes our world understanding. One of the main ideas of this field is that language is inextricably linked to our conceptual system - the way we organise and interpret experience and the world around us. According to this concept, thoughts and concepts do not exist separately from language but mutually influence each other to shape speech (Murphy, 2024).

Neurolinguistics is another scientific discipline that studies the internal brain processes that underpin human speech activity. Its interests include the study of mechanisms for recognising speech stimuli, such as individual words or sentences. This discipline also studies the processes of generating spoken or written language, learning and using native or foreign language, and the so-called quasi-language symbols (mathematical and chemical formulas, musical notation, programming languages) (Ahlsén, 2006). Neurolinguistics is widely used in theoretical and practical medicine, as it allows us to determine the impact of various changes in brain activity resulting from neurological or psychiatric pathologies on the peculiarities of patients' speech behaviour (Andrews, 2014).

The subject of cognitive neurolinguistics is the role of language in human cognition. Cognitive neuro-linguistics focuses on the involvement of language functions in brain processes related to accumulating, storing, processing and using knowledge (Kim & Rah, 2020). In addition to its medical applications, cognitive neuro-linguistics is very important for educational psychology. Medical and pedagogical issues are combined in examining and treating children with abnormalities in their cognitive and speech development (Musso et al., 2003). Cognitive neurolinguistics is also used in research in artificial intelligence, information technology, and the general theory of cognition.

Thus, cognitive linguistics and neurolinguistics are interrelated disciplines that explore different aspects of the relationship between language, thinking and the brain. While cognitive linguistics focuses on the study of conceptual structures and the impact of language on the perception of reality, neurolinguistics analyses the neural mechanisms underlying speech activity. The synergy of these areas contributes to a deeper understanding of the role of language in the processes of cognition, storage and processing of knowledge, which is of both theoretical and practical importance for medicine, pedagogy, artificial intelligence and cognitive sciences.

This article aims to analyse the synergy of cognitive linguistics and neurolinguistics, identify their complementary aspects that explain the relationship between language, thinking, and brain processes, and outline the prospects for the development of these areas in an interdisciplinary context.

Literature Review

There are two main stages in developing the cognitive approach to language: the early logical or objectivist one, and the modern experimental one, i.e., based on experience. The logical approach is associated with identifying objective semantic features in the meaning of language units and logical rules for constructing grammatically correct statements. This stage is usually associated with the generative approach and the development of generative semantics (Murphy, 2024). The logical approach is based on logical-conceptual, theoretical modelling of the relationship between language and cognition, which does not consider many qualities of ordinary cognition related to the specifics of perception, accumulated experience and knowledge. In this case, theoretical and everyday cognition results are not distinguished or correlated with different levels of cognition: abstract, directly related to language activity, and sensory, unrelated to language, respectively (Mandler, 2004).

The most modern direction – the experimental approach – considers the features of theoretical and ordinary cognition. This approach is directly related to the theories of prototypes and natural categorisation (Lakoff, 1990; Rosch, 1978; Taylor, 1995), the theory of salience (Langacker, 1987), and concentration or focusing of attention (Talmy, 1988). In contrast to the logical approach, the experimental approach is not based on logically derived rules and characteristics but on the experience of interaction with the world around us, including everyday language practice. This experience often underlies the formation of the content of language forms and the whole utterance and its understanding during everyday communication for people. Accordingly, the experimental approach provides a more profound and natural description of semantics, as it considers all kinds of knowledge - both theoretical and every day, including, thus, knowledge of logical, objective characteristics. This is evident in the analysis of figurative meanings and pragmatic senses.

Contemporary linguistics continues to study these approaches. In particular, various aspects of metaphorization are studied (Gibbs, 2011; Ruiz de Mendoza Ibáñez & Perez, 2011), including attempts to clarify specific provisions of the theory of conceptual metaphor and apply them in various thematic areas of knowledge (Kövecses, 2015), figurative meanings (Ruiz de Mendoza Ibáñez & Perez, 2011), typology of constructions (Diessel, 2019), cognitive and socio-pragmatic aspects of discourse and communication (Givón, 2005), conceptual semantics of individual units and categories (Croft & Cruse, 2005) At the same time, new directions of application of the cognitive approach are emerging, which require a separate detailed discussion, but within the framework of another review: Socially-oriented and functional linguistics (Harder, 2009), corpus-based studies, studies of discourse polymodality, and attempts to present integrative theories (Giora, 1997).

Modern cognitive semiotics considers the problems of correlation between the conceptual and formal levels based on verbal and non-verbal communication units, their ability to convey specific meanings and form appropriate typologies, from the point of view of the role of humans and other living organisms in assigning specific meanings to particular objects and using them as means of communication. Representatives of cognitive semiotics, for example, believe that meaning does not exist in the head or group consciousness. It is the result of human interaction with the world around us. They associate further prospects for the development of this area with the interdisciplinary study of semiotic relations, typology of symbols, the semiotic function of verbal and non-verbal signs, polymodality (Zlatev et al., 2016), problems of conceptualisation and formation of multilevel concepts (Brandt, 2016; Parthemore, 2014).

Method

The study used a comprehensive methodology. The cognitive modelling method was used to analyse the representation of concepts in language and their connection with mental structures, and the semantic analysis of linguistic units allowed us to study phenomena such as metaphors and categories (Methods of Cognitive Linguistics, 2006).

Results

First, it is crucial to consider the essences of cognitive linguistics, which help to analyse the reflection of thinking in language: concepts, categories, prototypes, and conceptual metaphors.

In modern linguistics, the concept is considered an independent object of research since it is through it that one can better understand linguistic phenomena by studying the basic mental processes. As a basic unit of mental representation of the world, the concept is a key and widely discussed concept with various interpretations due to its numerous characteristics and features. With the emergence of cognitive linguistics, the concept has become a key concept, highlighting the mechanisms of individual cognitive activity. However, understanding a concept as a semantic entity that underlies a word allows us to analyse all possible meanings of a concept in its broader sense, including value connotations that are layered on top of the word's meaning. Thus, a concept can be interpreted as a verbal meaning with a particular ethnic specificity (Mandler, 2004). This emphasises the need to consider the complex interaction of internal and external factors that influence an individual's connection with the extra-linguistic environment and socio-cultural interaction.

The researchers emphasise that although the notion *concept* allows for different interpretations, its study requires the use of cognitive operations such as systematisation, classification, categorisation and identification (ibid.), which give the identification of different aspects of the concept's existence and its manifestations in language and speech.

A concept does not exist in isolation, and the concepts that form the cognitive space of a particular language community, culture or individual are defined as the *concept sphere*. It reflects how the world is perceived, categorised and interpreted through the prism of language, culture, thinking and experience. The national conceptual framework includes basic units of thought that combine knowledge, emotions, associations and cultural meanings (Selivanova, 2008). For example, the concept of FREEDOM may have different meanings depending on different cultures' historical and social contexts. The conceptual sphere is dynamic and changes with the development of language, culture, and technology, as well as by borrowing ideas from other conceptual spheres. Each conceptual sphere has unique features determined by a particular culture's historical, social and religious experience. Along with culturally specific elements, a conceptual framework contains universal concepts, such as LIFE, DEATH, or LOVE. At the same time, their interpretations may differ depending on the cultural context.

Thus, the concepts here are structured by levels: from basic concepts that form the core of thinking (e.g., TIME, SPACE, GOOD) to culturally specific concepts related to traditions and even individual concepts that depend on the experience of a particular person. The conceptual sphere plays a crucial role in shaping the worldview, reflects cultural identity, and is a tool for understanding a particular community's values and mentality. For example, in Ukrainian culture, essential concepts are WILL, KIND and LAND, which reflect Ukrainians' historical and cultural experience. The conceptual framework also helps to understand the specifics of other cultures and facilitates effective intercultural communication through comparative studies. Thus, the conceptosphere is a mental universe that structures our thinking, communication and perception of reality.

It is crucial to consider all of the above in the example of analysing the representation of the WAR concept in English and its connection with mental structures. Within the framework of cognitive modelling, the WAR concept is considered a multilevel mental structure reflected in linguistic units through metaphorical, metonymic and frame projections. This concept represents various ideas about conflict, struggle, aggression, strategy, defence and interaction. Metaphors play a vital role in the linguistic representation of the WAR concept. War is often presented as a game ("the battle for victory" (BNC)), a disease ("the cancer of war" (BNC)), or a natural phenomenon ("the fire of war spreads" (BNC)), activating specific mental scenarios related to struggle, strategy, or destructive consequences. Another vital aspect is frames, such as "weapons", "strategy", "enemy", and "victory/defeat", which structure the cognitive perception of war, guiding the interpretation of the conflict. Metonymies also contribute to the representation of the concept through specific symbols, such as "tank", "missile", "battlefield", or places of combat, such as "trenches" or "the front line".

WAR is closely linked to mental structures deeply rooted in human consciousness. These include conflict scenarios that include a sequence of actions (cause \rightarrow escalation \rightarrow outcome), prototypes based on historical or contemporary wars that form culturally determined perceptions, and emotional reactions, such as fear, anger or pride, expressed in language with strong emotional connotations.

Cognitive modelling shows that the linguistic representation of the WAR concept varies depending on the cultural and historical context and mental models that are part of the collective consciousness (Figure 1). For example, in Western culture, war is often associated with heroism and fighting for freedom ("fight for liberty" (BNC)). In contrast, in other cultures, it can emphasise the devastating consequences for society ("war leaves scars on generations" (BNC)).



Figure 1

Representation of the WAR Concept (Cognitive Modelling)

This diagram illustrates the connection between cognitive modelling, the WAR concept, and its linguistic representation, which varies depending on the cultural and historical context and mental models. In Western culture, the concept of WAR is associated with heroism and the struggle for freedom, while in other cultures, the emphasis is on the destructive consequences of war. The central elements are cognitive modelling, which explains these dependencies, and the concept of WAR, which serves as a basis for different cultural interpretations and, simultaneously, as a prospect for further research.

Language is the primary tool for reflecting thinking, thanks to its ability to communicate, shape, and organise ideas, concepts, and knowledge. In cognitive linguistics, language mirrors cognitive processes, as it structures abstract concepts through metaphors, organises knowledge into frames and scenarios, and forms categories around prototypes that reflect typical representations.

Revising the classical category within the framework of prototype theory is a crucial aspect of modern cognitive research. The classical category theory assumes that all objects in a category have clearly defined and identical properties that are necessary and sufficient for their classification. This approach assumes rigid boundaries between categories and absolute equality of objects within a category. However, research in cognitive linguistics, primarily the work of Eleanor Rosch, has questioned this concept (see, in particular, Rosch, 1978). Prototype theory offers an alternative view, according to which categories are not clearly defined but somewhat fuzzy, with some objects being more typical of a category than others. Prototypes are the central, best examples of a category that has the most significant number of characteristics inherent in that category. Other category members are organised around the prototype, showing varying degrees of conformity. This approach emphasises the graded nature of category membership and recognises the influence of context and experience on how categories are perceived (ibid).

Prototype theory expands the understanding of categorisation by proposing considering the dynamism and cultural variation of categories. It allows us to explain phenomena that cannot

be adequately described within the framework of classical theory, such as metaphorical and metonymic extensions of meanings and cognitive modelling processes.

Another area of research into the reflection of thinking through language is the analysis of conceptual metaphors (Kövecses, 2015). It is crucial to consider the most common ones (Table 1).

Table 1

Metaphors and Their Contexts

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Metaphor	Example Contexts	Conceptual Basis
TIME IS MONEY	You are wasting my time; I don't have	Time is a valuable resource, similar to
	enough time to spare for that; He invested a	money, that can be used, lost, saved, or
	lot of time in that project (BNC).	invested.
ARGUMENT IS WAR	He attacked every weak point in my	Arguments are conceptualised as
	argument; Her criticisms were right on	battles where participants use arguments as
	target; I defended my position (BNC).	weapons.
LOVE IS A JOURNEY	We're at a crossroads; This relationship	Love is understood as a journey where
	isn't going anywhere; We've come a long	partners are travellers facing obstacles and
	way together (BNC).	milestones.
IDEAS ARE FOOD	That's a meaty idea; I can't digest that	Ideas are compared to food that can be
	concept; He fed me a lot of interesting	digested, savoured, or consumed.
	thoughts (BNC).	
LIFE IS A JOURNEY	He's at a crossroads in his life; She's	Life is depicted as a journey with
	following her own path (BNC).	stages, challenges, and achievements.
HAPPINESS IS UP / SADNESS IS	I'm feeling up today; She's in high	Emotional states are associated with
DOWN	spirits; He's really down in the dumps	vertical positions: happiness as upward and
	(BNC).	sadness as downward.
THE MIND IS A MACHINE	My mind is running out of steam; He's	The mind is likened to a machine that
	grinding out ideas non-stop; My brain just	can function efficiently, break down, or
	isn't working today (BNC).	require maintenance.

Conceptual metaphors demonstrate how people use familiar concepts to understand more complex or abstract ideas. They shape the way we perceive the world and organise our thinking.

Discussion

From the point of view of neurolinguistics, language reflects thinking through the brain mechanisms that provide language activity. Broca's area is responsible for speech production and transforming ideas into words, while Wernicke's area processes speech stimuli, giving them meaning. The connections between different brain areas allow us to integrate speech and thinking into a single system. The activity of mirror neurons provides an understanding of the non-verbal elements of language, which is essential for empathy and social interaction (Zhang & Liu, 2023).

Language not only reflects thinking but also shapes it. According to the Sepir-Whorf hypothesis of linguistic relativity, language structures influence the perception and categorisation of the world. For example, native speakers of languages that do not have words for specific colours have difficulty distinguishing between them. The Himba language from Namibia does not have a separate word for blue, but there are many words for different shades of green. In the experiment, Himba speakers were shown a circle of 12 shades of green, among which one was different. They could quickly identify this different shade. However, when blue was added to the green shades, it was difficult for them to distinguish it since blue and green are not distinguished in their language. So, not having a word for a colour can limit its perception.

In the Dani language of Papua New Guinea, there are only two basic categories of colour: mola (light, warm colours such as white, yellow, and red) and mili (dark, cool colours such as black, blue, and green). Native speakers of this language performed worse than speakers of languages with more developed colour terminology in distinguishing shades that were not part of their basic categories. For example, they had more difficulty distinguishing between blue and green. However, if the colours matched their categories, they identified them quickly.

Among the Pirahã Indians in Brazil, colours are not denoted by separate words but are described through associations, such as *looking like blood* (red) or *leaves* (green). The lack of clear linguistic categories for colours made it difficult for them to identify colours without context (Andrews, 2014).

These examples prove that language categories affect the way we perceive the world. The absence of words for colours limits the ability to distinguish between them, emphasising the relationship between language, thinking and cognitive processes.

Cognitive neuro-linguistics, which synthesises the above approaches, investigates how thinking is encoded by language functions in the brain. This can be traced through the integration of sensory stimuli into language constructs, the study of speech pathologies (e.g., aphasia), or the application of knowledge in pedagogy and the development of artificial intelligence.

The pedagogical (didactic), social, political, neurolinguistic, biological, and medical aspects of the above problems open up vast opportunities for applying the results obtained in the above areas. Identification of principles and mechanisms, cognitive schemes and models of interaction of collective and individual knowledge in the processes of verbal communication provides a direct way to solve applied problems of social orientation and adaptation of the individual, teaching native and foreign languages, translation, countering information wars and modern political and economic challenges, diagnosis and treatment of pathologies of linguistic processes. From this point of view, the cognitive approach opens up broad prospects for the methodology of teaching languages and other disciplines.

In particular, the idea of the principles of formation and organisation of the knowledge system, its category-level structure (that our memory does not just store lexical items and constructions or knowledge from other areas, but structures them in a certain way, establishing a network of relations between them), the role of various cognitive and linguistic mechanisms, inferential knowledge, linguistic and non-linguistic experience in the formation and transmission of meanings, their interpretive nature can serve as the basis for the development and successful use of a specific system of teaching methods and techniques.

Thus, language is a means of reflecting thinking and its tool. It integrates the structures of cognitive experience, shapes our perceptions of the world, and is implemented through neural mechanisms, confirming the close connection between speech, thinking, and brain processes.

Conclusion

The analysis of the relationship between language, thinking and brain processes, carried out within the framework of cognitive linguistics and neurolinguistics, shows that language is a tool for transmitting information and a key element in forming and structuring human thinking. It reflects cognitive experience, integrates knowledge, and influences the perception and categorisation of the world. Cognitive linguistics sees language as a mirror of the conceptual

system, reflecting how knowledge is organised, categories are formed, and concepts are used. At the same time, neurolinguistics studies brain mechanisms that support speech activity.

Research results confirm the influence of language on cognitive processes, in particular through the formation of conceptual metaphors and prototypes that allow organising experience and perception. The reverse influence of thinking on language is realised through its dynamism and ability to adapt to new realities, reflecting the evolution of cultural and social contexts.

The synergy of cognitive linguistics and neurolinguistics opens up broad prospects for interdisciplinary research with theoretical and practical significance. It contributes to a deeper understanding of the nature of speech disorders, develops effective teaching methods, studies language behaviour in multilingualism, and improves artificial intelligence and speech processing technologies.

The findings confirm that language is an integral component of cognitive activity and cognitive processes. Language learning allows us to better understand the nature of human thinking and implement innovative solutions in medicine, education, psychology, and information technology.

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