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COGNITIVE ALGORITHMS FOR LEARNING FOREIGN LANGUAGES: PSYCHOLINGUISTICS APPROACH

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ABSTRACT

The relevance of the undertaken research consists in considering psycholinguistics an interdisciplinary field, which studies the interrelation between mind and language. It is important to perceive learning foreign language as an act of cognition, experience, and creativity in the psycholinguistic aspect of studying. Psycholinguistics concerns with the study of the cognitive process that supports the acquisition and use of language.

*The **purpose** of the paper is to reveal the importance of psycholinguistics approach and cognitive science for learning a foreign language in the context of psycholinguistic approach and cognitive methods for learning second language, based on achievements of the "Scientific School of A.V. Khutorsky".*

***Methodology** is of an overview-analytical nature with an attempt to apply cognitive techniques to learning. Our observations on the psycholinguistic approach and the cognitive methods are based on the "Myth of Niels Bohr and the barometer question" by Alexander Calandra.*

***Results**. The analysis made it possible to determine how the logic of reflections has been explored from the lens of psycholinguistics and how the range of cognitive methods can be enlisted to learn a foreign language. It turns next to an overview of cognitive techniques used in psycholinguistics as applied to study. The verbal presentation of the idea is not only a form of compressed thought or interactive, creative cognition, but it also has a literary quality, and makes use of a range of devices in a way. In the article, the solution formation reflects the features of transforming mental representations about the multidimensional space of life.*

Conclusions. *According to the research, the paper concludes that cognitive methods are the ability to create judgments that are paradoxical in form and deep in content, perceived as deviating from the norm, and humor also presupposes the presence of the inverse ability to perceive such judgments in their entirety and depth and emotional brightness.*

KEY WORDS: *cognitive methods, language learning, psycholinguistics, approach, barometer question.*

INTRODUCTION

The famous scientist Chernigovskaya (2013) says that language is the key to consciousness. In the modern world, in the incredible, sometimes fantastic development of technology, the language problem remains relevant. Why, starting to learn a foreign language at the age of 6, in particular, English, some students at age of 16 can speak only basic phrases and use one grammatical tense? We are talking about Ukrainian schools where a foreign language is taught for 10 years.

At the same time, the IQ level in other subjects for these students is quite high. This fact is confirmed by an article of the Ukrainian scientist Nikolaeva (2016), which made analysis of the current state of foreign language teaching in Ukraine from the point of view of intercultural foreign language education.

Earlier, in the Soviet Union, the expression "no ability to languages" was used in relation to them. Now in the 21st century, in the era of globalization, this conclusion looks rather primitive. Numerous techniques have been developed for the so-called "unteachable", which have yielded positive results. As early as in 1965 Noam Chomsky, generally regarded as the most influential figure in 20th-century linguistics, proposed the theory that people have an innate, biological ability to acquire a language (Chomsky, 2000).

Nevertheless, the question remains how does our brain work when we are learning a foreign language? Language, mind, consciousness and the brain that generates them are the most complex systems known to us (Chernigovskaya, 2013). How to study them "from the inside"? The scientific studies allow researchers to consider this issue from different perspectives. For example, psychological "methodology of transaction", which is the process of bringing the subject into the perception of the object of memories of past cognitive experience, allowed to identify the nature of its enrichment with semantic nuances, emotional experiences, values, meanings that are deeply rooted in language, visual images, verbal and visual thinking (Kremen, & Ilyin, 2020).

THEORETICAL FRAMEWORK

In connection with the powerful technogenic development, new scientific multidisciplinary directions appear. In this article we turn to psycholinguistics (from the Greek "mind" + the Latin, "tongue") science. Psycholinguistics is examining the mental aspects of language and speech (Nordquist, 2020). This scientific discipline is studying the ways and the possibilities of the brain processing language.

It is generally accepted that it was Jacob Robert Kantor, American psychologist, who introduced the term "psycholinguistics" for the first time in his book (1936) "An Objective Psychology of Grammar". This idea was further developed in a 1946 by Nicholas Henry Pronko, Kantor's student, in his article "Language and Psycholinguistics: A Review". The strongest influence on the development of psycholinguistics as an academic discipline was provided in the Interdisciplinary Seminar in Psychology and

Linguistics at Cornell University in 1951 (Nordquist, 2020).

Carool David highlighted the fundamental concepts of psycholinguistics. According to his reasoning psycholinguistics is the study of how individuals produce, comprehend and acquire language (Carroll, 2008). Psycholinguistics studies also focused on the social rules having interrelated parts in language use and the brain mechanisms linked with language.

Psycholinguistics emphasizes the awareness of language and the cognitive processes connected with ordinary language use (Carroll, 2008). Many scientists agree that a sector of both psychology and linguistics, psycholinguistics is part of the subject of cognitive science. Cognitive science combines knowledge of linguistics, psychology, and, to a lesser extent, branches such as neuroscience, artificial intelligence and philosophy.

One of the main enthusiasts in this area is the *Academy of Neuroscience for Architecture* in San Diego, California. The Academy believes that discoveries in neuroscience will lead humanity to a Cultural Revolution, which is comparable only to the Renaissance. This optimism is due to the fact that not so long ago, scientists have refuted the well-known axiom "nerve cells do not recover".

In the late 1990s, neuroscientist Fred Gage proved that new neurons emerge over the course of a person's life, allowing them to expand their learning ability at any age. At the same time, neuroscientists began to better understand how the brain perceives and interprets different types of information. The combination of this knowledge will allow us to recognize and develop the learning abilities (Babkin, 2014).

In modern linguistics, interest in psycholinguistic approach is growing, the semantic structure of which is formed in human perception based on knowledge about the world. Wilson (2018) emphasizes three of the most commonly asserted psycholinguistic models posed in the literature: the fossilized Universal Grammar approach, the recreative approach, and the resetting approach. Reliance on the image of the world allows to navigate the situation, reflect on the reality or unreality of the event.

Reality is interpreted ambiguously: at the moment of perception, the cognitive, motivational, emotional spheres of a person's personality appear. Psycholinguistic approach views learning as a cognitive individual process happening within the individual and then moves to the social dimension (Purba, 2018).

So, the **purpose** of the paper is to reveal the importance of psycholinguistics approach and cognitive science for learning a foreign language in the context of psycholinguistic approach and cognitive methods for learning second language, based on achievements of the "Scientific School of A.V. Khutorsky".

METHODOLOGY

Most scientists point out applying cognitive learning methods that permit linking subjective-mental, natural and rational fundamentals of an individual. This approach allows integrating into completely through interrelated discussions, actions, reflections and self-regulation.

As a result, it provides improving the efficiency of cognitive advancement and the intellectual system in its entirety. In this case, a distinguishing characteristic of education is that the leading part is assigned to sensory-perceptual and emotional-intuitive ways of gaining knowledge and skills. (Khutorsky, 2003).

Actually, the cognitive learning methods are active; they allow revealing the procedural aspects of intelligence, contributing to the identification and development of hidden individual abilities of learners.

The researcher Andrej Khutorsky identified the following cognitive teaching methods:

Heuristic perception method. Perception as a purposeful personal observation of various objects by a learner is a preparatory stage in the formation of his theoretical knowledge. Perception is the wellspring of the student's information, a method of acquiring it from the reality of being, that is, it tends to be ascribed to heuristic educating strategies. The reason for this strategy is to instruct individuals to procure and develop knowledge through perception.

The "implantation" method. Through sensory-figurative and mental portrayals, representations the student attempts to "move" into the considered object, feel and know it from within. Perception of the object for this situation turns, in a manner of speaking, into self-perception of the student, if one first succeeds in identifying oneself with the object.

The method of semantic vision. The simultaneous concentration of actual vision and an inquisitive mind on the educational object permits one to get (see) the main driver of the object, the idea contained in it, the essential significance, for example, the internal quintessence of the object.

What's more, as in the previous strategy, here it is needed to create a specific state of mind in the student, comprising of dynamic sensory-mental cognitive activity. Exercises for the deliberate utilization of this technique lead to the advancement of non-conventional cognitive characteristics for use in students, like motivation, inspiration.

The method of symbolic vision. A symbol as a profound picture of the real world, containing its meaning, can go about as a method for noticing and cognizing this reality. The technique for symbolic vision is the understudy's finding or building associations between an object and its image.

The method of figurative vision. For this situation, the educational activity as a result of student perception is expressed in a symbolic or figurative form, and not just through a depiction of natural science realities. This strategy creates allegorical ways to deal with cognition in students.

The comparison method. The comparison strategy is applied to compare the adaptations of various students, their variants with cultural and historical counterparts, which were detailed by great researchers, rationalists, philosophers when contrasting different analogs with each other.

The method of facts. This method refers to such a phase of cognition as the search for facts, recognizing them from non-realities. The requirement for the natural observation of educational objects with the assistance of physical senses requires the use of this learning strategy, update and change of the standard content of education.

Research method. The object of exploration is chosen: scientific, natural, cultural, symbolic and so forth. Students are welcome to freely explore a given object according to the plan.

It implies several successive stages of research: objectives, work plan, facts about the object, tests drawings of investigations, new facts, questions and issues that have emerged, forms of answers, hypotheses, reflexive decisions, conscious ways of activity and results, conclusions. Such algorithmization of students' activities assists with getting their own educational results.

The method of constructing concepts. The development of the contemplated concepts in students starts with the realization of the thoughts they as of now have. The aftereffect of such work is an aggregate creative product mutually formulated meaning of a concept that is composed on the board. Different formulations remain in students' notebooks

as a condition for their own self-determination according to the concept being considered.

Method for building rules. The rules concentrated as general education courses can be made, "discovered" by students. For instance, from the content recommended by the educator, students distinguish the spelling underlying rules and afterward create their own writings on these principles. The investigation is completed according to the algorithm indicated by the educator, which relies upon the type of text and the task.

Hypothesis method. Students are offered the following task: to create versions of answers to a question or issue presented by the educator. The underlying assignment is to choose the basis for developing renditions. Students offer introductory positions or points of view on the problem. They get familiar with multi-logical, multi-faceted approaches to deal with the development of hypotheses.

At that point, they learn how to most completely and obviously formulate their responses to the question, in light of the rationale and intuition. The technique for hypotheses is created when tackling prescient issues, for example, "what will occur if …".

The forecasting method differs from the hypothesis method in that it is applied to a real or planned process. Pupils, relying on previous observations, discovered patterns and their own predictive abilities perform a drawing. After a given time, the forecast is compared with reality, the results are discussed, and conclusions are drawn.

The method of errors. This strategy includes changing the grounded negative mentality towards mistakes, supplanting it with a useful utilization of mix-ups (and pseudo-mistakes) to develop educational processes. Finding the connection between the mistake and "correctness" animates the heuristic activity of students, leads them to a comprehension of the relativity and fluctuation of any information.

The method of constructing theories. Students are invited to perform a theoretical generalization of their work in the following ways: 1) the facts discovered by the students are classified according to the grounds given by the teacher.

For example, 1) facts about the structure of an object, facts about its functions, facts about processes, facts about relationships; 2) the types of positions of observers are clarified, for example, the chronological position (sequential recording and description of events), mathematical (the quantitative characteristics of the object, its shape and proportions are investigated), figurative (expressive verbal characteristics of the object, its symbolic features are found); 3) questions and problems related to the most remarkable facts are formulated.

RESULTS & DISCUSSION

Thanks to the considered methods proposed by Khutorsky, we turn to an applied life example. The material for observations for psycholinguistic analysis was the well-known *The myth of Niels Bohr and the barometer question*.

This story was published in 1959 in the journal *Pride* of the *American College Public Relations Association* entitled *Angels on a Pin*, by Alexander Calandra, professor of physics at Washington University in St. Louis, Missouri. The story is about a physics student who surprises his professor by his extraordinary response to a simple question of physics (Calandra, 1959).

It was required to give an answer to a simple examination question from the point of view of physics: *"Show how it is possible to determine the height of a tall building with the aid of a barometer"*.

The student correctly answers the question from the standpoint of logical thinking and gives a solution to the problem, but

incorrectly from the standpoint of an established, generally accepted solution: *"Take a barometer to the top of the building, attach a long rope to it, lower the barometer to the street and then bring it up, measuring the length of the rope. The length of the rope is the height of the building"* (Calandra, 1959).

He provides a solution that is accessible to students with basic knowledge of physics. The student doesn't use a barometer as "an instrument measuring atmospheric pressure".

In this context, he applies this barometer in its direct linguistic definition: from Ancient Greek βάρος (báros, "weight") + romanized *métron* meaning "measure". In terms of the cognitive methods presented by Khutorsky, one can single out the method of semantic vision.

This simultaneous concentration on the educational object and the "inquisitively tuned" mind allows us to see the root cause of the object, the idea contained in it, the primary meaning, that is, the inner essence of the object.

A certain mood is created, consisting of active sensory-mental cognitive activity. At the same time, one of the main pedagogical goals is to instill skills in mastering the characteristics inherent in humor: conciseness, brightness of description, use of an ironic tone and selection of essential details.

In addition, besides this answer the student had many solutions to this problem. The next answer was: *"Take the barometer to the top of the building and lean over the edge of the roof. Drop that barometer, timing its fall with a stopwatch. Then using the formula, calculate the height of the building"* (Calandra, 1959).

In the Spiritual Regulations of 1721 there is such a prescription "The newly arrived student to taste the memory and wit and, if it seems very stupid, not to be admitted to the Academy" (Musiychuk, 2020).

The effectiveness of this answer is based primarily on the fact that the mechanism of activating intellectual activity, in the process of perceiving a solution, generates a change in meaning (generation of a new meaning) based on an appeal to the creative abilities of this student. From the perspective of cognitive approach, in this case it should be allocated the method of facts. The conscious mastery of students' physical receptors requires steady advancement in additional cognitive activity.

Most importantly, this refers to such a phase of comprehension as the search for facts. The requirement for the natural perception of educational objects with the assistance of physical senses requires the utilization of this teaching method, modification, and change of the standard substance of training.

In this way, the interaction of reflection is straightforwardly identified with the capacity to learn through the recognizable proof of verifiable content, through the dynamization of stable semantic connections, the obliteration of semantic stereotypes.

The student continued to give his versions of the solution to the same problem: *"You could take the barometer out on a sunny day and measure the height of the barometer and the length of its shadow, and the length of the shadow of the building and by the use of a simple proportion, determine the height of the building"* (Calandra, 1959).

This student with different linguistic and educational backgrounds thinks differently. This decision is also based on the creation of alternative meanings to the existing ones through the rise of a new meaning created by critical deviations from the regularizing primary assumptions interceded by the game significance; arousing extra interest in the issue, all through of-coherent types of verification.

Concerning the organization of cognitive technique, it is conceivable to recognize the

technique for metaphorical vision. That implies an emotional-figurative investigation of an object. The educational product because of student perception is expressed in a verbal or graphic figurative form.

The student suggested the following way to resolve the issue: *"In this method you take the barometer and begin to walk up the stairs. As you climb the stairs, you mark off the length of the barometer along the wall. You then count the number of marks, and this will give you the height of the building in barometer units. A very direct method"* (Calandra, 1959).

We observe research method. The object of research is selected - scientific, the student explores the given object according to the following plan: to walk up the stairs – to mark off the length of the barometer along the wall – to count the number of marks and results - conclusions.

Such algorithmicization of this activity amplifies the creativity. It gets his own educational result. The reflection, which is most clearly manifested in the affective-cognitive form of techniques, effectively contributes to an increase in intellectual activity by changing the methods of coding information, selecting strategies for processing information, and arbitrarily applying one's intellectual actions. This is achieved by systematically repeating the algorithmic stages of the study.

Then the student proposed the most difficult solution to this problem: *"...if you want a more sophisticated method, you can tie the barometer to the end of a string, swing it as a pendulum, and determine the value of 'g' at the street level and at the top of the building. From the difference of the two values of 'g' the height of the building can be calculated"* (Calandra, 1959).

We witnessed Heuristic observation method. Perception as a deliberate individual impression of different objects by a student is a preliminary stage in the arrangement of his hypothetical knowledge. Perception is the wellspring of the student's knowledge, a method of getting it from the truth of being, that is, it very well may be ascribed to heuristic educating strategies.

Students doing perception get their own outcome, including: a) educational aftereffect of perception; b) the applied strategy for perception; c) a complex of individual activities and emotions that went with the perception. The level of a student's imagination throughout his perception is dictated by the oddity of the outcomes acquired in comparison with those generally accessible to him prior.

Finally, this student concluded, there are many other ways of solving the problem: *"Probably the best", he said, "is to take the barometer to the basement and knock on the superintendent's door. When the superintendent answers, you speak to him as follows: "Mr. Superintendent, here I have a fine barometer. If you tell me the height of this building, I will give you this barometer"* (Calandra, 1959).

And this is also a kind of solution to the issue. This is a method for constructing rules. The rules studied in general education courses can be created, "discovered" by students. In this fable, we can see the interrelationships among science, language and cognition.

This story illustrates an extraordinary approach to learning and the use of cognitive techniques. However, to determine how our brain works and why we make exactly such decisions remains at the level of research, scientific theories. A physics student and his professor engage in a conversation whose native language is English, but they think differently.

The focus on the positive result of the incentive provides the obligatory accounting of known or assumed background knowledge, social and communicative status of interlocutors, communicative situations (Shynkaruk, & Kharchenko, 2020). Is this

style of thinking in a different way imparted by the language, the culture, or both?

Will we find, upon deeper inspection, fundamental similarities in thought processes in individuals with diverse linguistic and cultural backgrounds? This question was posed by David Carroll in his book *Psychology of Language*. According to his way of thinking, it is obviously difficult to measure a person's world view (Carroll, 2008).

CONCLUSIONS

Basing on our analysis, we may assume that cognitive processes help to find a non-standard solution to a problem, using skills, knowledge about the world. The psycholinguistic approach allows establishing causal relationships.

The results obtained make it possible to formulate conclusions about which mechanisms underlie psychological phenomena and cognitive processes, cause their development and qualitative restructuring. They also show the ability to manage your thinking, consciousness, in such a way as to convey information to people (educated, literate) who are not ready to accept it as true.

In the psycholinguistic approach, interaction helps learners activate the individual internal cognitive processes that allow them to access the comprehensible input they need to further advance in the acquisition of the second language (Long, 1996).

An excellent answer to the question "what is language?" gives the scientist Altmann: "So, finally, what is language? .... Language, quite simply, is a window through which we can reach out and touch each other's minds. We must be sure, always, to keep that window open" (Altmann, 1997).

The fact that the study of psycholinguistics approach is interdisciplinary is undeniable; this is also a great advantage. Meanwhile, it is also obvious that the interdisciplinary nature of psycholinguistics creates additional conditions for the development of a person's creative abilities in the learning foreign language process.

Along with this, at present, there is an interest in methodological recommendations aimed at intersubject connections that form an idea of the general nature of the action of cognitive mechanisms, and above all in the field of creative activity, creative thinking, and intellectual activity of the individual.

In modern linguistics, interest in psycholinguistic analysis is growing, the semantic structure of which is formed in human perception based on knowledge about the world. Reliance on the image of the world allows us to navigate the situation, reflect on the reality or unreality of the event. The reality is interpreted ambiguously: at the moment of perception, the cognitive, motivational, emotional spheres of a person's personality appear.

The cognitive approach in the study of human consciousness is to understand how people decode information about reality and organize it in order to make comparisons, make decisions and solve problems of everyday life. Obviously, there is still much more to study about teaching and learning language.

CONFLICT OF INTERESTS
The authors declare no conflict of interests.

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АНОТАЦІЯ / ABSTRACT [in Ukrainian]:

КОГНІТИВНІ АЛГОРИТМИ НАВЧАННЯ ІНОЗЕМНИМ МОВАМ: ПСИХОЛІНГВІСТИЧНИЙ ПІДХІД

Актуальність проведеного дослідження полягає у розгляді психолінгвістики як міждисциплінарної галузі, яка вивчає взаємозв'язок розуму та мови. Важливо сприймати вивчення іноземної мови як акт пізнання, досвіду та творчості в психолінгвістичному аспекті навчання. Психолінгвістика стосується вивчення пізнавального процесу, який підтримує засвоєння та використання мови.

***Мета** роботи – розкрити значення психолінгвістичного підходу та когнітивної науки для вивчення іноземної мови, зокрема, розглянути психолінгвістичний підхід та когнітивні методи вивчення другої мови, засновані на досягненнях «Наукової школи ім. Хуторського».*

***Методологія** має оглядово-аналітичний характер зі спробою застосувати когнітивні методи до навчання. Наш аналіз психолінгвістичного підходу та когнітивних методів базується на відомому «Міфі про Нільса Бора та питання про барометр» Олександра Каландри.*

***Результати**. Аналіз дав змогу визначити, як логіку рефлексій можливо досліджувати з погляду психолінгвістики та як когнітивні методи залучити до вивчення іноземної мови. Зроблено стислий огляд когнітивних методів, що застосовуються у психолінгвістиці. Словесна презентація ідеї є не лише формою стиснутої думки чи інтерактивного, творчого пізнання, але вона також має літературну якість і певним чином використовує цілий ряд пристроїв. У статті формування рішення відображає особливості трансформації психічних уявлень про багатовимірний простір життя.*

***Висновки**. Згідно з дослідженням, зроблено висновок, що когнітивні методи – це здатність створювати парадоксальні за формою і глибокі за змістом судження, що сприймаються як відхилення від норми, а гумор також передбачає наявність зворотної здатності - сприймати такі судження у їх цілісності й глибин, та емоційної яскравості.*

КЛЮЧОВІ СЛОВА: *когнітивні методи, вивчення мови, психолінгвістика, підхід, питання про барометр.*

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