

**ISCKMC 2020****International Scientific Congress «KNOWLEDGE, MAN AND CIVILIZATION»****COGNITIVE MECHANISMS AS OPERANDS OF POSITIVE  
TRANSFER-INTERFERENCE TEACHING TECHNIQUES**

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**Abstract**

The issue of interlingual influence in teaching a second foreign language from the standpoint of methodology, psycholinguistics and neuropsychology determining the polar opposite psycholinguistic phenomena of positive transfer and interference, is considered in the article. Features of the speech-thinking activity of trilinguals are analyzed in comparison with monolinguals. Taking into consideration the above mentioned positions, the authors come to the conclusion about the participation of other cognitive structures in mastering a second foreign language, rather than the first one: cingulate gyrus and hippocampus (limbic system), caudate nucleus and dorsolateral prefrontal cortex, which activation is not recorded when speaking one language. As a consequence, the optimizing potential of positive transfer and interference was determined as a possible controlled mechanism for using the potential of knowledge and skills from previously acquired languages (native language and first foreign language). Due to the increased interest and, accordingly, the attitude to mastering two foreign languages, the authors identified the problem of finding effective solution ways. Thus, the authors converted the psycholinguistic phenomenon of interlingual transfer (positive transfer, interference) into the most productive methodological technique through the conscious control of the operands of the trilinguals' speech-thinking activity in the process of teaching them a second foreign language. The authors developed a typology of tasks as a result of analyzing the features of the speech-thinking activity of trilinguals at moments of positive transference and, conversely, under the influence of an interfering effect.

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*Keywords:* Speech-thinking activity, operands-incentives, interlingual influence, positive transfer, interference, educational and cognitive activity



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## 1. Introduction

Trilingualism is indisputably in demand in present conditions of cross-cultural communication and is socially attractive, since proficiency in at least two foreign languages opens up a broad prospect for predicting successful life scenarios with the greatest variability. It is indisputable that the issues of developing the ability to master two foreign languages, as well as the ability to use three of them simultaneously when solving a certain communicative task, are relevant at the level of social adaptation of the individual and, therefore, play a significant role in the field of education. Trilingualism, as a unique linguistic and sociocultural phenomenon, is essential in the aspect of developing a competent methodology for teaching a second foreign language (FL2) on a competency basis. The mainstream of this work is a system of knowledge about the peculiarities of the FL2 learning process and optimization ways as a method to design a certain system of specific actions on the part of the educational process subjects, taking into account relevant cognitive processes in the context of co-learning languages. Recording data from the field of psycholinguistics, linguistics, pedagogy, and communication theory is crucial when working out a teaching methodology for FL2. The significant features are the role of thinking and its connection with language, principles of speech-thinking activity, the ratio of the unconscious and the conscious in mental operations' implementation, the formation of skills and abilities of educational and cognitive activity, as well as the methods of its motivation, mechanisms of speech generation and other constituent components that ensure the process effectiveness (Rubinstein, 2002).

## 2. Problem Statement

The authors of the article outlined the problem of the need to consider and analyze the close connection of the FL2 method with neuropsychology and psycholinguistics, which principles its main categories are based on. In the course of the study, it seems expedient to determine the optimizing potential of positive transfer and interference in the learning process of FL2 and to solve the problem of converting them from the rank of a phenomenon to the status of a priority methodological technique at the following levels: speech-thinking activity; general educational skills; language systems ("shared base"/phonetics, vocabulary, grammar, etc.). In view of the fact that the success and effectiveness of verbal communication directly depend on the formation of speech-thinking activity of trilinguals, the extreme importance of its development is obvious. The progress manifests itself in the conditions of educational artificial subordinate trilingualism, namely, the use of native (Russian) language at the native speaker level, parallel improvement of FL1 knowledge and mastering the second one, where the native language is the language of thinking (dominant) and prevails over FL1, and FL2 is influenced by both native and FL1. The problem of the qualitative development of the speech-thinking activity among students studying two foreign languages and the development of competent ways of managing it in the conditions of subordinate trilingualism remains undeservedly aloof and requires detailed consideration both in theoretical and practical terms.

### **3. Research Questions**

From the perspective of the indicated problem, the subject of this study is interlingual influence, namely, positive transfer and interference. Features of the speech-thinking activity of trilinguals are determined as an object. In theory, Zimniaia (1991) defines speech activity as “an active, purposeful, motivated, objective (meaningful) process of issuing and (or) receiving a thought (expression of will) formulated through language, and aimed at satisfying a person’s communicative and cognitive needs in the process of speech communication” (p. 72). According to the experimental data studied by authoritative scientists in terms of the speech-thinking activity of polylinguals (Cook, 2008), it was found that the productivity of the thinking predictive component in coordinative bilinguals and trilinguals in comparison with artificial subordinate bilinguals and trilinguals, determined by the depth, analyticity, awareness, perspective, flexibility and evidence, are significantly quantitatively different. The first have a higher level of prognostic abilities formation in speech-thinking activity. They are also able to determine cause-effect relationships between linguistic phenomena, to theorize and, to a greater extent, operate with concepts, determine plan goals; they are endowed with greater prospects in the search for communicative hypotheses. The second are characterized by a reduced level of criticality and analyticity, which slows down operations such as analysis, synthesis, comparison, and anticipation of linguistic phenomena consequences and the determination of cause-effect relationships. This fact can be explained from the standpoint of different interhemispheric interactions in the speech process: the left and right hemispheres are involved to varying degrees in the processing and storage of NL, FL1 and FL2. Thus, the need for increased attention of the FL2 teaching methodology becomes obvious for the fundamental development of the speech-thinking activity of students who subsequently have artificial subordinate trilingualism by updating the priority techniques of positive transfer and interference and with the aim of their further improvement.

### **4. Purpose of the Study**

The purpose of the paper is a detailed analysis of the peculiarities of speech-thinking activity of students in educational artificial subordinate trilingualism and, as a result, the development of a tasks’ typology for the optimal management of positive transfer and interference in the aspect of educational and cognitive activity.

### **5. Research Methods**

The primary methodological basis of the study was theoretical and contrastive-comparative analysis of works on neuropsychology and methodological literature relevant to the research problem. Analysis of modern scientific literature on the issues of speech-thinking activity in the mainstream of the neurophysiology of bilingualism and trilingualism has demonstrated the presence and availability of reliable instrumental methods for fixing brain activity at the moments of choosing a language and planning an utterance, which are responsible for completely new mechanisms of the brain that carry out the speech-thinking activity of an individual in several languages. The importance of the

neuropsychological characteristics of artificial subordinate trilingual is obvious due to the awareness of it as a basis, namely, the material substrate of a trilingual personality, on which various socio-economic and linguistic factors are further layered.

## 6. Findings

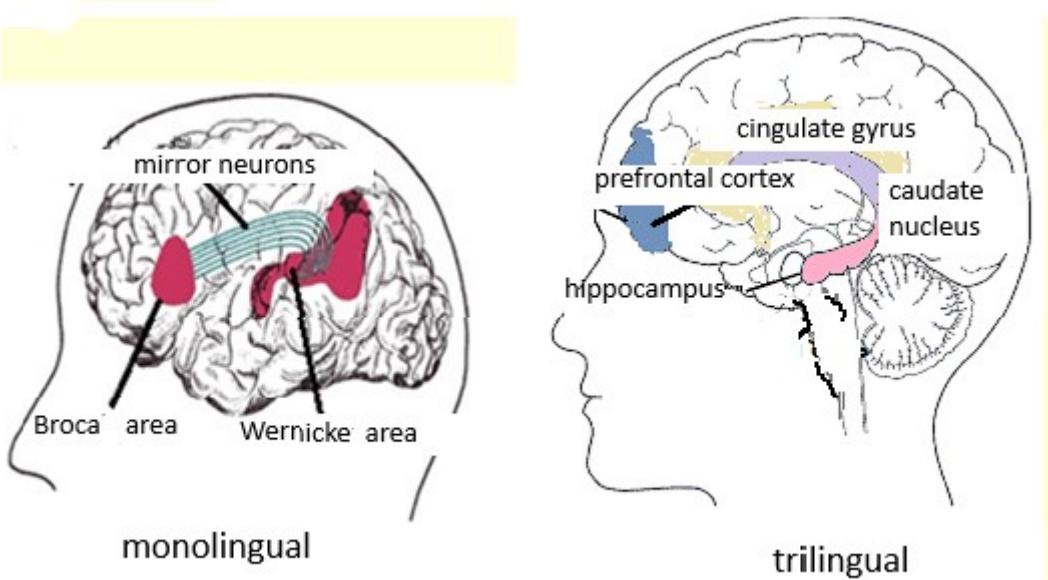
The literature analysis indicates that inductive learning is characteristic of natural bilingualism and trilingualism within the framework of a statistical learning strategy with an unconscious intuitive grouping of the presented material. Subordinate trilingualism, due to the existing features of speech-thinking activity, is determined by a conscious attitude to learning a language and the development for the conscious induction ability. In the first case, statistical learning serves as a universal principle in the perception, processing, and storage of information. However, the gestalt principles accounting of grouping is necessary for the possibility of learning the rules: temporal sequence and perceptual similarity, identified by a perceptual bulge (sensory luminosity), which is defined by isolating it as a significant element from the background. These principles allow grouping those elements that are perceptually convex and statistically regular, which leads to a high rate of assimilation (Aslin & Newport, 2012). Furthermore, the element correlation placed in a certain group with the current context occurs at the stage of formulating a rule using context signals. The degree of correlation correspondence designates the functional of the unit, which, in the aggregate with context signals, deduces probabilistic forecasting and conclusion of a rule based on generalizing the functioning patterns of the input components without specific formulations and instructions (Makarova, 2019).

Imitative behavior is defined as an elementary method within the framework of statistical learning. This is assimilation to a model and involvement in joint activity, which mirror neurons are responsible for, connecting the sensory and motor parts of the cerebral cortex (Wernicke's and Broca's areas, respectively), correlating codes of behavior perception with codes of its implementation into a certain ensemble to ensure speech activity (Abutalebi & Green, 2007). The accumulated associations of the sensory and motor areas of the cerebral cortex predetermine unconscious and uncontrolled automatic imitation (Heyes, 2011). This is not feasible with subordinate trilingualism, in which the use of statistical learning strategy and probabilistic forecasting seems to be impossible, since the neural resources responsible for speech prediction are not activated. This appears unreal to achieve owing to the lack of a sufficient volume of critical mass of language material in FL1 and FL2, even with prolonged mastering (Allachverdov, 2014; Magen-Nagar, 2018).

In this regard, it is necessary to follow cognitive strategies for mastering FL2 in educational subordinate trilingualism. However, it is feasible to activate those areas of the cerebral cortex that are responsible for the accumulated speech experience from FL1. For instance, it is important to set on a conscious mastery of the language when learning FL2, and to use special methods of memorizing and systematizing material, mobilizing attention and control, forming and stimulating motivation.

Analysis of contemporary scientific literature on neurophysiology has shown that the limbic system of the brain is involved in maintaining motivation. This happens as follows: a set of neuroregulatory structures (including mirror neurons), damage to the connection at the moment of stress between which and the rest of the brain leads to a decrease in the activity of mirror neurons involved in

the transmission of the emotional component of communication and their activity is dependent on emotional involvement (motivation) in speech activity. Activation of other components of the limbic system in comparison with NL was recorded in subordinate trilinguals in the process of speech-thinking activity, namely, the cingulate gyrus and the hippocampus, which are responsible for explicit knowledge at FL1 and FL2. Considering that cognitive operations are in demand for mastering FL2, the area of the prefrontal cortex is involved in the process of speech-thinking activity at FL2. Also, an increased load of the left hemisphere and the work of the dorsal network, which is responsible for concentration of attention and the choice of signals that correlate with internal expectations, have been proven (Allachverdov, 2014). The dorsolateral prefrontal cortex, caudate nucleus, and anterior cingulate gyrus, which are in charge of resolving conflicts, but not involved in speech production, are activated in trilinguals during competition between languages at the time of lexical choice. Broca's area and other parts of the frontal cortex are connected when solving non-verbal tasks, in contrast to monolinguals. Thus, other structures in comparison with teaching NL and FL1 are involved in educational subordinate trilingualism in the process of speech-thinking activity in FL2: limbic system (cingulate gyrus and hippocampus), caudate nucleus, and dorsolateral prefrontal cortex. It is apparent that subordinate trilinguals are characterized by a lag in decision-making on the choice of phoneme, lexeme, and morpheme, mediated by the competition (interference) of languages in consciousness, the need to control speech and "cut off" the emerging associations from the critical mass of the currently unused language (Figure 1). Overcoming this issue is possible by accumulating appropriate trilingual experience in controlling and switching from the code of one language to another.



**Figure 1.** Operands of speech-thinking activity of monolinguals and trilinguals

Since other operands (previously described brain structures) are involved in the process of speech-thinking activity of trilinguals, it seems necessary to determine the corresponding mental operations engaged in the moment of interfering and positive impact. This is due to obtain the possibility of further

control of the psycholinguistic phenomenon of positive transfer and interference in terms of optimal pedagogical conditions of educational cognitive activities of the trilingual. Besides, attention should be paid to their neurophysiological nature to model the typology of tasks for the effective management of positive transfer and interference and transform them into the rank of a methodological technique using certain operational stimuli.

Following M.A. Panchenko, who investigated the positive transference in teaching grammar, we understand the mental operation of comparison, not just as a cognitive operation, but as a methodological device for the regular positive influence on the transfer implementation, which can be traced through the functioning of psychophysiological mechanisms of the brain. The essence of the comparison operation is reduced to control over the introduction of an action based on acceptor's mechanisms, by dint of which consciousness performs comparative-identification functions. Then, "the work of the afferent complex, which warns us from mistakes, is a condition that allows the further operation of positive transfer, which takes place on the linguistic (internationalism/phonetics/grammar), and socio-cultural level of speech-thinking activity, and general educational skills" (Ondrakova, 2017, p. 980).

The above mentioned allow us to attempt the development of a typology of tasks:

- motivation for comparison at the level of mechanisms of perception, combination, production when writing and speaking, etc.: for example, *define the subject and predicate in the sentences by analogy with NL and FL1; make up a monologue in German, following the same algorithm as in FL1 (introduction, body, conclusion);*
- maximum and conscious introduction of internationalisms at the initial stage of learning FL2 in order to intensify the studying process and increase interest in the German language by creating a sense of its proficiency due to international vocabulary: for example, *name the English equivalents to the following German words: der August, alle, die Person, der Text, der Park, blind;*
- conscious transfer of formed skills from FL1 in vocabulary maintenance, planning, dialogue, writing a letter, essay, etc.: for example, *identify keywords such as internationalisms in the process of the text listening, highlight the main sentences in the text;*
- motivation for the conscious transfer of traditions and realities from FL1 to FL2: for example, *select the corresponding words in English for Russian and German etiquette formulas.*

The reverse side of positive transfer is considered to be interference. It is known that there are various hypotheses related to the problem of explaining the interference nature, and following a number of scientists, we believe that interference is associated with overcoming awareness, and it lies beyond the neurophysiological understanding. However, we will make an attempt to substantiate the logical nature of the negative influence of the contacting languages based on the Stroop-interference phenomenon (Allachverdov, 2014).

We will pay attention to the factors producing interference from both NL and FL1:

- the degree of relationship of the contacting languages (the closer the language groups, the higher the interference, but the more opportunities for a positive transfer);
- skill formation in FL1 (influence of FL1 is stronger than NL);
- actualization of NL and FL1 at the time of learning FL2;

- period of time in sequential learning of languages (the larger the interval, the less interference and positive transfer);
- type of speech activity in which interference is manifested (Cook, 2008).

The above mentioned allows us to conclude that under the influence of various groups of factors, the vector of interfering influence and the possibilities for positive transfer in relation to FL2 are different. It is also necessary to assert objectively about the dominant donor-language in a comprehensive manner, taking into account a specific set of factors.

Having analyzed the experimental work on the interference phenomenon, we came to the conclusion that two tasks were simultaneously posed to the student when presenting Stroop-stimuli: main (for example, read words in FL2) and additional (do not confuse with words from FL2). Even if the second task of ignoring FL1 is not announced as an instruction, the testee gives such a self-instruction as not to read the words in FL1. Nevertheless, consciousness directs the work of the body and gives commands to complete the task and check on its implementation. As soon as consciousness begins to check the correctness of *not doing what* the brain does *automatically* (due to the greater degree of skills formation in FL1 and the close degree of languages relationship), this fact inevitably falls into consciousness, which generates interference as a result of the mental operation of comparison by verification the outcomes of automatically performed actions with a conscious requirement not to perform these actions.

In the logic of the research, we consider it necessary to highlight and thoroughly consider the *principles that predict and reduce interference*, the conversion of which into the form of a methodological technique will allow us to design an effective typology of exercises in teaching FL2:

1) A decrease in interference occurs with a direct weakening of conscious control over the performance of the additional task of ignoring. The implementation of this principle is to completely remove control over the task of ignoring (for example, not to be confused with words in FL1).

A typology of tasks:

- first set the additional task of ignoring before students: for example, *read the words first in FL1 and then do it in FL2*, that will certainly double the response time but prevent interference;
- formulate tasks based on an implicit attitude (hidden attitude based on unconscious past experience) using social priming: for example, *having previously given the installation that the student is in a German-speaking country and has never learned English*, give the task to conjugate a sentence in the future tense Futur I in German by persons and numbers, using the auxiliary verb werden + Infinitive, where werden has a paradigm of personal endings, in contrast to English Future Simple, where the auxiliary verb will is constant in all personal forms;
- multiple repetition of the same task with an interfering index: this type of tasks is productive, since their performance is automated (due to the subjective feeling of the meaning loss of the repetitive one) and consciousness ceases to control them. This means that long-term retention of the task of controlling consciousness is impossible, and the transition from control over the main task to control over the implementation of an additional one takes place. That is, during prolonged training of language phenomena with an interfering marker, the student learns not to

quickly complete the task, but not to control its implementation. Then it is performed correctly, as, for instance, training of grammatical-syntactic interference: *repeatedly transform sentences with direct word order into synonymous with reverse or affirmative into interrogative and negative.*

2) *Interference grows with increased conscious control by complicating the task of ignoring.* The more difficult the automatically performed task of ignoring with the same main one, the more time it takes to control its failure, and, as a result, the interference increases.

A typology of tasks:

- remove the semantic load of ignored material: for example, the effective wording of an ignored task in the main *task of translating words from German into Russian* should be the following “*distinguish the semantics of English and German words*” instead of the complicated version “*find the words that have different meanings and combinations in English and German*”, since in the second option, consciousness controls a greater number of mental operations (remember the meaning, compare, identify differences and similarities).

3) *Interference is reduced by weakening control over the secondary ignore task by increasing the complexity of the primary one.* This principle has many opponents who argue the opposite. However, we share the experiments’ results conducted under the leadership of F. Daier, M. Martin, N.N. Kireeva, confirming a decrease in control over an ignored task due to the expansion of the main one, since consciousness controls the correctness of the main task more time and switches rarely to an additional one.

A typology of tasks:

- complicate the main task by increasing the cognitive operations required for its implementation: for example, *make up phrases in German, distinguishing the semantics of English and German words;*

4) An increase in the similarity between the main and ignored tasks enhances conscious control, therefore, raises the interference effect. The closer the elements of the task, the more strict criteria are necessary for their differentiation, and, therefore, the control of consciousness over them is more serious.

A typology of tasks:

- avoid the urge to compare interference-tagged elements with moderate similarity in contacting languages. The greatest identity should be transformed into a positive transfer, where it makes sense to stimulate comparison: for example, *make up sentences in German, paying attention to the meaning and compatibility of the vocabulary* instead of *remember that these words have a different meaning in English.*

## 7. Conclusion

Thus, the essence of the above comes down to the following: the process of speech-thinking activity of trilinguals is different, since other structures of the brain are involved (cingulate gyrus, hippocampus, caudate nucleus, dorsolateral prefrontal cortex). The comparison operation encourages the implementation of a positive transfer. The psycholinguistic phenomenon of interference is not a vague imposition of one cognitive operation on another but is justified from the point of view of controlling the

mental operation of comparison. The teacher needs to trace the prediction of the above principles in order to work out efficient exercises to overcome interference and trigger transfer mechanisms. Prediction is carried out with the aim of further introduction of conscious methodological techniques into the FL2 learning process, both for taking advantage of the positive transfer and leveling the interference process.

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