EasyChair Preprint
№ 2808

Comparative Analysis of Specificity / Abstraction of Russian Words

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February 28, 2020

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Abstract – **The article presents the results of studying the perception of Russian words by parameters: specificity / abstractness. The purpose of the research: creation of a special dictionary where the degree of its abstractness is specified for each word. The research used semantic differentiation method, where respondents evaluated the degree of abstractness / specificity of the word on a scale from 1 to 5 in online mode. The sample of 154 respondents in the research was used. A 500-word analysis was made. The survey was conducted in English. The analysis of words allowed classifying them into three categories: abstract / specific / undifferentiated.**

Key words: cognitive linguistics, information processing, specificity, abstractness, semantic differential, dictionaries.

I. INTRODUCTION

Modern man is in the global information space, which is important to comprehend and structure. The person in the process of obtaining, processing and reproducing information has become the subject of study in a number of sciences. As V. V. Krasnykh notes, "there is a shift in scientific research to the study of a real person in real conditions of real life and real communication" [1, p. 173]. A personality is viewed through the prism of its communication, and, consequently, of language and speech. The ways of perception and assimilation of information flows by a person are increasingly determined by language constructs and linguistic properties of words. Research on the impact on the quality of information assimilation of the properties of speech utterances, such as the number of syllables in a word, regularity or irregularity of spelling of words, imagery / abstractness / concreteness of words, frequency of their use in a print publication, is becoming relevant.

Research at the intersection of sciences, including the work in the field of mathematical linguistics, the use of computerized psycholinguistic databases that contribute to understanding the language and creating a literate text in every way, is becoming popular.

The mediation (interface) function of a word as a means of access to a single information base of a person also becomes a focus of attention. Based on interface word theory A. A. Zalevskaya [2] defines the function of a word as a means of access to a single information base of an individual, which is a multifunctional product of a perceptual, cognitive and emotional-evaluative processing of a person's knowledge and communication experience. The author defines the word as a unit of the mental lexicon of a person and a means of access to the individual consciousness of a person. At the same time, the mental lexicon is interpreted as a functional dynamic (self-organizing) system, as a constant interaction of mental processes and their products. In the process of awareness and verbalization the word is identified and the text is understood. Cognitive traits can be more or less specific in terms of abstractness, in terms of generalization, and figurative, informational, and interpretative in content. This approach is characteristic of Z. D. Popova [3], who notes that a cognitive picture of the world is formed in the consciousness of a native speaker, which includes the following structural components of the concept: image, information content, and interpretation field. Thus, the sensory image combines perceptual, cognitive and figurative signs; information content of concepts, reflects artifacts, scientific concepts, conceptualizing abstract entities. In addition, the interpretation field of the concept includes cognitive characteristics of the carrier of verbal utterances.

The concept of abstraction is one of the most controversial and difficult to understand. The problem of determining the abstract arises in the process of determining the boundary of the abstract and the concrete. Consideration of this issue requires access to data from disciplines such as philosophy, logic, psychology. Logic considers the concept of abstraction in connection with various kinds of concepts. In philosophy the concepts of "concrete / abstract" are among the fundamental categories. In psychology the study of the above phenomena takes place in the context of the development of cognitive processes, which presupposes the flow of knowledge from various representation modules, which involve taking into account the data of the psychology of perception, memory and thinking.

In the humanitarian encyclopedia by V. S. Shvyreva and G. I. Ruzavin [4] the abstract and the concrete are both

interconnected and opposite in meaning of the concepts of philosophical, scientific and everyday discourses. In their relationship they express the manifestation of unity between abstract and concrete knowledge. The concept "abstract" is defined as a conceptualized mental image obtained by distracting (abstracting) from certain non-essential properties or relations of an object in order to highlight its essential features. The concept "concrete" defines something as really existing, well-defined, exact, objective, concrete, material, considered in all the variety of properties and relations.

Currently, the concepts of concreteness / abstractness are in the center of attention of interdisciplinary research: linguistics, psychology, pedagogy. A theoretical analysis of the stated problem is quite fully presented in the article [5]. Therefore, adhering to the theoretical and methodological foundations mentioned above, we restrict ourselves to placing emphasis on individual issues.

The purpose of our research is created a special dictionary where the degree of its abstractness is specified for each word. The research objectives: firstly, conducting a comparative analysis of words on the concepts of concreteness / abstractness in Russian and English; secondly, the definition of the boundaries of concreteness / abstractness / non-differentiation of words.

II. RELATED WORK

The research of abstractness / specificity (C / A) goes back to the works of A. Paivio, J. Julle and S. Madigan, which, using subjective scaling and an associative experiment, resulted in figurative coefficients, specificity - abstractness for 925 English nouns [6]. Figurativeness, according to A. Paivio, J. Julle and S. Madigan, the ability of subjects to present the meaning of the word as an image of any modality (for example, the image of the words "sun", "silence" or "heaviness"), and specificity - abstractness - it is the availability of denotation (substantive attribution) of the meaning of the word to sensory perceptions. According to the results of the researches, a high correlation between the specificity and imagery of the word and a negative correlation between imagery and abstractness were shown. So, for words with a strong emotional connotation, the imagery coefficients were highly rated, while the specificity coefficients were low, and many scientific terms had a high index on the specificity scale and a low figurative level.

Based on the theory of double coding, A. Paivio [7] notes that the verbal system is responsible for the abstract, logical, and figurative - for the specificity, analog way of thinking. In other words, verbal and figurative systems differ in the way their units are organized into higher-order structures. The figurative system presents information in a "synchronous" or "spatially ordered" form when different parts of a complex object or scene become available at the same time. The verbal system, on the contrary, involves a sequential organization characteristic of linguistic structures. Accordingly, the figurative system provides transformations in spatial parameters, such as size, shape or position in space, while the verbal system is designed to provide sequential transformations (addition, division or change in linear order).

In the research of V. F. Petrenko [8], carried out according to the scheme of A. Paivio on the material of Russian vocabulary, similar results were obtained. It has been established that the concepts of "specificity", "abstractness" and "figurative" conceal psychic realities different for the subject. Emotionally colored concepts, as noted by V. F. Petrenko, such as "love", "longing", "loneliness" associated with emotional conflicts in the emotional experience of an individual, have sensory fabric, which is experienced as a figurative concept.

J. Richardson [9] concludes that the subjects frequently reported the use of images in the associative learning of pairs consisting of highly shaped words, and in this situation we should expect a high level of reproduction of the material. At the same time, figurative instructions improve the results of reproduction at the expense of the larger organization of connections between the memory elements.

The most promising direction "artificial intelligence", according to D. A. Pospelov [CIT. 8], makes the development of cognitive graphics, where the solution of problem situations is realized in the framework of visual thinking. Cognitive graphics methods can be used when it is necessary to transform the textual description of tasks in their figurative representations, and in the generation of textual descriptions of the paintings that occur in the input and output blocks of intelligent systems, as well as in human-machine systems, designed for solving complex, poorly formalized tasks.

Experiment on the analysis of semantic distance and verification of semantic relations by L. Rips, E. Shoben and E. Smith allowed us to conclude that the concept of "animals" (more abstract from a logical point of view, than the concept "mammals") are closer in semantic distance to a specific animal names than the concept of "mammals" [10].

The representatives of the set-theoretic memory model such as: G. Bower, D. Meyer, B. Schaffer, R. Wallace are noted that the semantic distance between the concepts and, accordingly, the time of their sequential retrieval from memory is proportional to the number of common functional characteristics of their subject denotations [11].

V. F. Petrenko [8] noted that the level of development of values (abstract concepts) can be described through the forms of relationships which it enters with other meanings. Thus, the research of the functioning of values in human consciousness requires the consideration of actual psychological processes, which exist as individual values and personal meanings. As already noted, the values have a dual nature: they are social in nature but can exist only in the minds of individuals. It is the "assignment" by a subject of socially developed meanings, the forms of their existence in the individual consciousness, which is of interest for a psychologist.

W. Kintsch [12] suggested that concrete nouns are grammatically simple and basic, whereas abstract nouns are formed from specific and thus are grammatically complex. J. R. Anderson and G. H. Bower have indicated that concrete words have fewer distinct values in the dictionary, but more semantic features than abstract. G. V. Jones suggested that the specific words may be considered as potential properties or "predicates" rather than abstract words [12].

As noted by F. A. Bleasdale [13], the degree of specificity / abstractness of verbal information is important to consider in

the research of human nature of representation and method of information coding. A. P. Lobanov [14] in their research noted that words acquire a specific or abstract nature in the consciousness of the subject and are grouped by him in an associative and / or conceptual way in accordance with the principle of typification or classification. The choice of grouping is determined by the mental experience of the subject, and the nature of the grouping demonstrates his cognitive development.

In a research of A. P. Lobanov [15] as a result of cluster analysis of indicators of intellectual development of the subjects, diagnosed using tests by R. Amthauera, D. Wechsler and G. Raven, they managed to localize verbal intelligence and structurally to present it as a vertical continuum of two factors: specific (SAs) and the abstract (SP) verbal intelligence and to offer definitions of two of the above factors in the paradigm of intelligence as an individual mental experience. Abstract intelligence formed a common subgroup with verbal scales test by D. Wechsler, and then together with specific intelligence (as a set associative abilities, the functioning of which is based on thematic representations and the mechanism of typification) were included in the cluster of higher order.

In linguistics different contents are put into the notion "abstractness" and "specificity". So, V. G. Huck [16] notes that such words that denote properties, relations, abstracted from material things, the state of things (kindness, reflection, causation) are called abstract. On the semantic level, the relation between abstract and concrete (e.g., human – human) words is reduced to interchanges of overseme and differential semes, that is metonymical transfer. However, they often refer to abstract the words denoting, in comparison with specific ones, broader concepts.

Possibly, the use of the abstractness / specificity of words connected with language and its connection with social conditions of existence. The abstract nature of the vocabulary noted by many linguists as a distinctive feature of the French language. V. G. Huck, who compared the French language with other languages, also notes its characteristic tendency to use the words of general value. In modern language, the "abstractness" of the word is manifested above all in some patterns of usage. So, the French language is forced to use the same word in cases where other languages use different words with shades of meaning are possible, depending on affixes.

When perceiving and processing information by virtue of mental-linguistic unity, as D. M. Mironova notes in her research [17], the semantics of the representatives carries traces of visual, auditory and tactile sensory processes. The results obtained by the researcher confirm that the visual figurative component is leading. In other words, for most people, the visual channel for perceiving information is the most popular.

In the study by K. Wiemer-Hastings and X. Xu [18] of the differences between concreteness and abstractness, the following results were obtained: 1) abstract concepts have less internal properties of objects and more properties expressing subjective experiences associated with the social aspects of situations; 2) they include more subjective signs that express the emotional and evaluative attitude of the speaker. At the same time, the concepts of specific objects comprise the knowledge of the "internal" inherent characteristics of the object itself (properties, structure, material). Abstract concepts,

according to L. W. Barsalou [19], refer to entities that are neither purely physical nor spatially limited.

L. O. Cherneyko [20] points out that different mental actions are necessary for a word to highlight a fragment of reality (and to realize the content of the word itself): in one case, attention (and consciousness) is directed to an external object (if it is a specific name), in another case - attention is directed to the internal aspects of consciousness.

Conducting an analysis of abstract nouns on the material of the English language E. V. Pupynina [21] concludes that understanding the word depends on other words in a certain semantic space. Therefore, to determine the meaning of a single word it is important to understand its position in a particular semantic field. According to E. V. Pupynina abstract words verbalize the conceptual content associated with the spiritual life of a person, with life in society. In this regard, such words indicate the properties and phenomena for which one or another assessment is fixed in society. The researcher notes that the choice of words and combinations can be an instrument of speech influence: the speaker can vary linguistic structures and impose on the addressee a certain interpretation of the surrounding reality.

In today's dynamically changing world, dictionaries and encyclopedias occupy an important place among books and electronic products. On the one hand, knowledge of the real world in lexicographic (vocabulary) form becomes the most popular for transferring information from generation to generation, on the other hand, the dictionary represents the most concise form, depth and breadth of the description of knowledge. Dictionaries are most in demand in social and professional groups of people for self-expression, communication and training [22].

The concepts and terms, with which we operate, as noted in psycholinguistics, are organized in our minds on the basis of the thesaurus. A thesaurus is a special kind of vocabulary of general or special vocabulary, in which semantic relationships (synonyms, antonyms, paronyms, hyponyms, hyperonyms, etc.) between lexical units are indicated. Thanks to the thesaurus, it is possible to reveal meaning not so much by definition, but by correlating words with other concepts and their groups.

The first thesaurus was created by British lexicographer Peter Mark Roger [23] and received the name "Thesaurus of English Words and Phrases", published in 1852. In thesaurus dictionaries, vocabulary is organized according to the thematic principle. P. Roger's thesaurus includes six main semantic categories: 1) abstract relations; 2) space; 3) matter; 4) reason; 5) will; 6) sensual and moral strength.

Studying the history of the thesaurus of P. M. Roger W. Hullen draws attention to the fact that most of the vocabulary is abstract. It is used to describe the names of categories: classes (class), subclasses (division), groups within subclasses, headwords. V. Hullen also notes that the enumeration of synonyms in the first paragraph goes from more abstract to more specific words, and in the subsequent paragraphs, as a rule, mostly specific vocabulary is given [24].

That is why, the creation of a dictionary of concrete / abstract words is quite relevant in connection with the complex worldview of people and various information processing systems.

Thus, the study of abstraction / specificity doesn't lose their relevance, while preserving its interdisciplinary status. The obtained results enable to have a different look at intercultural communication, and hence the specific structure of the educational process.

III. MATERIALS AND METHODS

This study was carried out in the framework of the joint project of Kazan Federal University (KFU) and the Belarusian state pedagogical university named after Maxim Tank (BSPU). In fact, it continues the experiment of a group of scientists of Kazan Federal University [25] at the Belarusian Russian-speaking sample. The purpose of the study is comparing and matching C / A ratings of nouns in the Russian language.

For carrying out the survey software toolsets were used in which online respondents were required to rate on a scale from 1 to 5 the degree of abstractness / specificity of each word from the list. The 1st position (on the left) means "the highest degree of specificity", the 2nd – "a high degree of specificity", the 3d – "the presence of equal levels of specificity and abstraction", the 4th – "a high degree of abstraction" and the 5th means "the highest degree of abstraction".

From 40 to 60 student responses were received for each word, assuming the statistical validity of the results. In the process of the study 10 profiles of 50 words in each questionnaire were processed (a total of 500 words).

The words are taken from the frequency dictionary of the Russian language [26]. In accordance with the traditions of Russian linguistics the concept of specificity / abstractness is considered only in relation to the noun. From the dictionary [13] we highlighted the nouns, and then for the experiments conducted in our university (BSPU), we selected the nouns with numbers from 5001 to 1000. The first 500 nouns were used in the experiments in the KFU. Full data are given on the website of the project (https://kpfu.ru/tehnologiya-sozdaniya-semanticheskih-elektronnyh.html).

The study was conducted on the basis of BSPU (autumn, 2019).The respondents were 2-4 year full-time students (N = 154), students at the faculty of social-pedagogical technologies who are native speakers of the Russian language. The age of the subjects ranged from 18 to 25 years.

The following instruction was presented to the students: it is necessary to choose where the position of the word is, in the interval between the two poles, specific (1) and abstract (5) "Fig. 1". Upon presentation of the instruction, students were not given any hints, directions, only an example was given: "table" is a concrete concept, and "trust" is abstract. There were no time restrictions during the survey.

Fig. 1. A fragment of the questionnaire

Then for each word the average index of abstraction was calculated, according to the results of which it could be stated that the higher the word index is, the more abstract it is.

In identical experiments with English words a 7-point inverted scale was used, where 7 is the specific word, and 1 is the most abstract. In this regard, for comparison of ratings of Russian and English words two scales had to be combined. The Russian scale had to be turned on the formula $Si = 6 - x$, where x is the initial value in the Russian questionnaire. Then the scale was being stretched according to the formula: $100 * (1,5 * (Si - 1)) + 1)$. Thus identical scales were obtained to assess the degree of specificity / abstractness: from 700 to 100 with the highest C / A, equal to 700, and the lowest C / A – 100.

IV. RESULTS

When transferring data in standard (adopted for English, see above) system the following figures (Fig. 2, 3) of the rating of Russian words were obtained. According to the results of the conducted research the following data were obtained. The most abstract were the following words: memory (Russian: 3,83 / US: 275), opening (3,83 / 275), efficiency (3,83 / 275), creativity (3,85 / 272), demand (3,85 / 272), study (3,88 / 269), basic (3,9 / 264), dream (3,91 / 263), beauty (4,00 / 247), adoption (4,02 / 247) "Fig. 2".
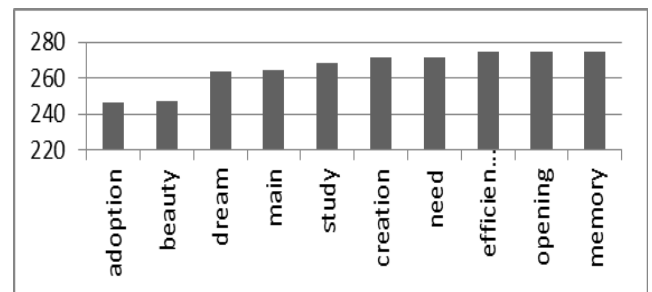

Fig. 2. C / A rating indicators of the most abstract words of the Russian language

The most specific of the cases were: hospital (Russian: 1,39 / US: 642), vodka (1,41 / 639), dress (1,41 / 638), bed (1,42 / 638), photography (1,43 / 636), travel (1,45 / 633), bird (1,45 / 633), glass (1,46 / 631), neighbor (1,47 / 630), island (1,47 / 630) "Fig. 3".
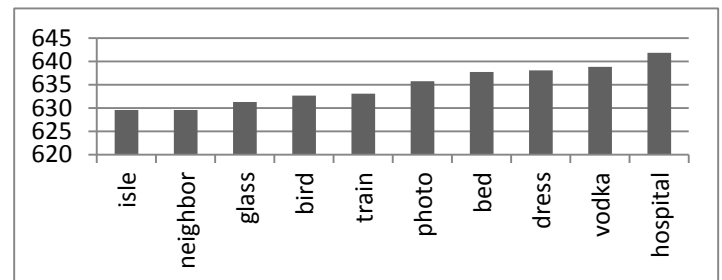

Fig. 3. C / A rating indicators of the most specific words of the Russian language

The calculation of the arithmetic mean, standard deviation and median was done. The arithmetic mean for the sample was

equal to 2.59; standard deviation was equal to 0.67; the index of the midpoint - 2.51, which enables to note the downward trend in results. On the basis of the rule of two sigmas the specific words include those which have an index of 1.92 (104 words), the abstract words include the ones with an index greater than or equal to about 3.26 (109 words). Note that most of the words are in the interval of 1.92 and 3.26, which enabled to assign them to the category of poorly differentiated (287 words).

The analysis of Figures 2, 3 show that the C / A rating ranges from 247 for the word "acceptance" to 642 for the word "hospital".

To analyze the results we also used a multidimensional statistical method - cluster analysis. The results of multidimensional scaling made it possible to note that there are certain latent signs by which subjects combined these words into certain groups, but due to the large number of words it is not possible to identify these signs "Fig. 4".
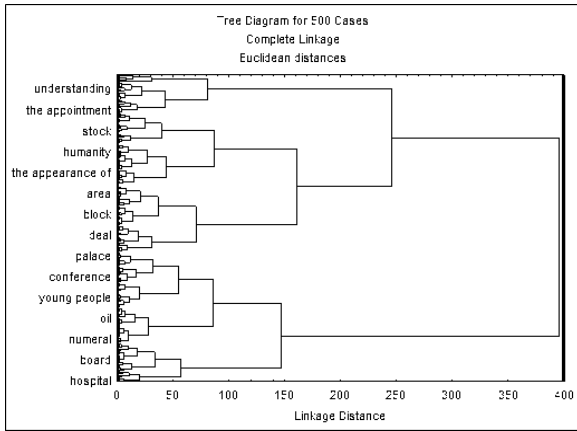

Fig. 4. A horizontal tree diagram of abstraction / specificity of words

However, the cluster analysis by the K average method allowed us to distinguish three clusters: cluster 1 in the range [since 2,21 to 2,98], to which weakly differentiated words (170 words) can be attributed; cluster 2 [since 2,99 to 5], including highly abstract words (159 words); cluster 3 [since 1 to 1,20], which included highly specific words (171 words). That made it possible to concretize and clarify the boundaries obtained by determining the specificity / abstractness / non-differentiation of words.

Further work was aimed at analyzing the specificity / abstractness of the rating of Russian and English equivalents. With this purpose the most frequently used words have been translated into English. This approach allowed us to use the MRC Psycholinguistic Database. MRC is a computer database of psycholinguistic information. The base includes semantic, syntactic, phonological and spelling information about some or all of 98 538 words. The database is accessible and can use a specially written and very simple programming language [15]. Let's consider the most abstract Russian words C / A indicators with English equivalents "Fig. 5".
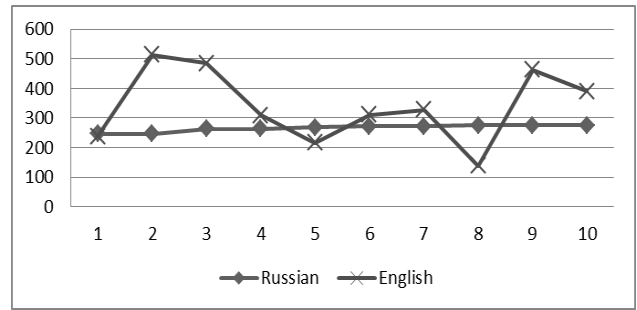

Note: 1 – prinytie (adoption), 2 - crasota (beauty), 3 - mechta (dream), 4 - osnovnoe (main), 5 – isuchenie (learning), 6 – tvorchestvo (creation), 7 - potrebnost (need), 8 – effectivnost (efficiency), 9 - otcritie (opening), 10 - vospominanie (memory)

Fig. 5. The most abstract words with the highest of C / A in Russian and English languages and most specific words

The results obtained allow us to note the following points. Most of the words by both Russian and American data have the same situation with the categorization of specificity. However, in the category abstractness the following words have obtained great differences: beauty (Russian 247, 513 U.S. sample) and dream (263 and 485, respectively), efficiency (275 and 139), opening (275 and 391). You can say that for the Russian sample the concepts such as beauty and dream have a more abstract image for real people.

Let's consider the most specific Russian words C / A indicators with English equivalents "Fig. 6".
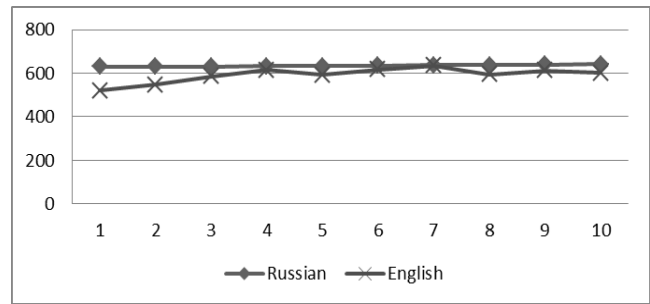
Note: 1 - ostrov (island), 2 - sosed (neighbour), 3 - stacan (glass), 4 - ptitsa (bird), 5 - poezd (train), 6 - fotografiy (photograph), 7 - krovaty (bed), 8 - platye (dress), 9 - vodka (vodka), 10 - bolnitsa (hospital).

Fig. 6. Words with the highest rating of C / A in Russian and English languages

For most American respondents beauty / dream is perceived as a more concrete concept. In terms of specificity the greatest differences were given to the following words: neighbor (630 Russian, 548 U.S. samples) and island (630 and 520, respectively).

V. DISCUSSION

One of the tasks of cognitive linguistics is to explain how a person processes information coming from outside. In connection with the conceptual system of concentration of knowledge coming from different representation modules, there is a need to take into account the data of psychology and psycholinguistics.

The studies done have shown that specific concepts are much easier to learn and remember than abstract ones. Apparently, this is due to the fact that abstract and concrete concepts are processed in different areas of the brain. The experience of understanding the world helps a person to form cognitive maps, thanks to which the meaning of concepts is formed. So, what is perceived through the senses: colors, shapes, textures, aromas, sounds, helps to shape the content of specific concepts.

So, to specific nouns can be attributed words that denote an object or phenomenon that exists in reality; they can be singular or plural. Abstract nouns include words that designate intangible concepts, such as states, feelings, qualities, properties, actions; they are used in a single language.

Psycholinguistic studies prove that specific nouns that denote objects and which a person encounters in everyday life have a large imagery coefficient. Between the word and the image of this subject there is a fairly close relationship.

Establishing precise criteria and boundaries of concreteness / abstractness is extremely difficult. To a greater extent, words are best characterized as more or less abstract / concrete in a number of other words. In different languages there are certain nuances in the definition of specific / abstract concepts. Perhaps, for a more detailed study of concreteness / abstractness it is necessary to increase the number of words considered and expand the age range of subjects.

VI. CONCLUSION

Thus, awareness of the meaning of the word, perception and understanding of texts has become an important area of research in various fields of science. There are questions about how to convey information to the teacher, how to promote advertising products, creating readable texts, how to build communication in business, family, so that the terms you use are understandable to the other side and understood with the accuracy of your message. These and many other issues still require more detailed consideration. Our research is the beginning of the journey.

Thus, the results of the research confirm that in most cases the representation of abstractness / specificity of words has an identical performance both in the Russian and American sample. The ascertained differences are few and can be explained by the specificity of translation and perception of certain concepts. Words can be classified in terms of abstraction / specificity / weak differentiation that allows you to use them in the communication process, the educational process and promotional activities.

ACKNOWLEDGMENT

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