A review of some experimental methods for studying the semantics of lexical units

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Abstract. The article is devoted to the presentation of the theoretical and methodological foundations of experimental studies of the semantics of linguistic units. It is stated that the anthropocentric paradigm is one of the leading paradigms in modern world linguistics. There are numerous scientific schools in different countries of the world working within the framework of the anthropocentric paradigm. The article describes some words meanings experimental studies methods that are actively used by linguists in the Russian Federation. A review analysis of the methodology of semantic scaling, the method of free associations, perceptional experiment, directional association experiment and a chain association experiment are given. It is concluded that the combined use of these techniques in the linguistic research process is necessary, since this approach allows obtaining the most complete picture of the psycholinguistic processes occurring in the minds of native speakers.

1 Introduction

The most important trend in modern linguistics is the study of linguistic phenomena from the standpoint of the anthropocentric paradigm, in which the language is studied in a close connection with a person, his consciousness, thinking, spiritual and practical activities [1]. R. Pavlenko wrote that a person is not a passive referent of language utterances, only a simple native speaker; he is an active interpreter, a carrier of conceptual systems that allow him to learn and understand the language, the world, and also to communicate with other people [2].

If in classical linguistics the main research methods are systemic methods by which linguistic phenomena are analyzed within the framework of a language system based on dictionary data, in anthropocentric linguistics the main ones are empirical (or, in other words, anthropometric) methods that are aimed at obtaining data from native speakers themselves. Empirical methods of linguistic research in Russia (according to the classification of the Voronezh theoretical linguistic school) are divided into two groups: methods of linguistic interviewing and methods of linguistic experiment [3].
2 Methods

Lexicologists describe the meanings of lexical units based on a dictionary definition. Thus, they put a sign of identity between the semantics of toponyms in the language and its dictionary description. However, in numerous and diverse contexts of word usage, as well as the results of psycholinguistic experiments, semantic components are found that are not represented in dictionary interpretations. As experiments (in particular, our own [4,5]) show, the experimentally revealed meanings of words turn out to be deeper and more voluminous than those presented in traditional dictionaries. Experimental data allow us to conclude that at the present stage of the development of linguistics there are at least two major research strategies with two types of representation of the volumes of meanings of the described toponyms. On the one hand, there is a classical lexicography in which the meanings of words are described on the principles of reductionism (i.e., the meaning is reduced to basic, nuclear features). The meanings of words formulated in accordance with the principle of reductionism are their lexicographic meanings. Such (classical) type of meaning of words is formulated specifically for traditional dictionaries. However, lexicographic meaning is an artificial construct created by lexicographers specifically for dictionaries based on a minimum number of features. The problem lies in the fact that the dictionary definitions of lexical units presented in dictionaries do not exist in the language in this semantic volume. A native speaker understands and uses words in speech in a broader sense, which is confirmed, as noted above, by experimental studies. An alternative way of describing the meanings of words is used within the framework of the anthropocentric paradigm with its apparatus of in-depth and comprehensive description of lexical semantics based on experimental data. The experimental approach considers the content of toponyms as a psychological reality (psychologiological structure) and allows "...to establish WHAT lies behind the word in the individual consciousness and subconscious, what parameters of meaning are relevant to the user of the word, etc." [6].

In this article, we will give a brief overview of some experimental methods of studying the semantics of words that are currently used by Russian linguists: the method of semantic scaling, perceptional experiment, free association experiment, directional association experiment, chain association experiment.

3 Results and discussion

The technique of semantic scaling was developed by Ch. Osgood [11]. During the experiment, the subjects are presented with a form with prescribed scales, the quality of the poles of which are certain lexical units. Scales can be presented in different forms (for example, graphical, verbal, or numeric). The semantic scaling technique makes it possible to identify the subjective semantic space and measure the connotative meaning of symbols (in particular, lexical items). The poles of the scales are set by means of antonymic pairs. Character scores on some scales correlate with each other and factor analysis allows you to group highly correlating scales into factors, thereby determining the transition from character descriptions through signs to their shorter (succinct) description.
Factors are a way of generalizing antonymic pairs, on the basis of which a semantic differential is built. Ch. Osgud identified three basic factors in his research: “Activity”, “Strength”, and “Evaluation”. These factors are universal, which has been proven in studies based on the material of graphic oppositions used as poles for constructing scales of semantic differential. Nevertheless, the semantic scaling technique allows obtaining too heterogeneous information, and therefore this technique is not considered by many linguists as a single method of identifying these [7].

The most effective and productive methods of experimental research of the meanings of words are perceptual experiment, free association experiment, chain experiment and directed association experiment. The method of perceptual experiment makes it possible to identify a visual image associated in the linguistic consciousness with a particular lexical unit. The subjects are asked to describe a visual image that comes to mind after reading (or listening to) a particular word. By the method of perceptual experiment M. Rosenfeld and I. Sternin conducted a study of the semantics of a number of lexical units [8]. They conducted a group experiment with 300 schoolchildren and university students, in which the subjects had to describe everything they see, hear and feel while listening to each lexical item from the experimental list. The reactions obtained in the experiment were brought into a single system: they were ordered by frequency. Here is an associative article describing reactions to the “door” lexical item (reactions with a frequency of at least 5 are given; at the end of the article, the number of participants in the experiment and the number of “zero” reactions, i.e. failures, are indicated).

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Door
300 - wooden 99; white 30; round handle; iron 23; large; with lock 20; golden handle 18; brown 15; with handle 13; wooden handle 12; iron handle 11; carved; oak 10; creaks; opens and closes 8; closed; door with an inscription; with a peephole 7; open; lock; opens to my room 6; barrier; entrance; twisted handle 5 ...
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At the same time, the use of this technique has certain limitations. For example, subjects may have a verbal deficit to fully describe the visual images they have. It may seem that this problem should be solved if the subjects are given the opportunity to express the image that has arisen with the help of a drawing. However, the subjects may not be able to draw. Moreover, “a schematic image does not always correspond to a real visual image…” [8]. In addition, the perceptual experiment does not allow us to clearly and vividly express the conceptual component of the denotative macro component of meaning, and also does not allow us to characterize its connotative and metalanguage macro components. The perceptual experiment is rather a highly specialized technique that allows us to identify an exclusively figurative component of the lexical items’ meaning denotative macro component. See, for example, the work of M. Rosenfeld “Methods for identifying a perceptual image in the structure of lexical meaning (based on the material of the noun “eyes”)” [9].

Linguistic association experiment is one of the most effective and productive methods of empirical research of the semantics of lexical units. Conducting association experiments has a long tradition. There are five stages in the genesis of the free association experiment.

The first stage (1879-1910) occurred at the end of the 1870s and was associated with the experimental work of the English psychologist F. Galton.
Galton used the association experiment as a psychodiagnostic technique that allowed him to study individual human abilities. Later other psychologists also conducted association experiments. In particular, V. Wundt used this technique to measure the speed of verbal associations, E. Kraepelin used association experiments to study the activities of mentally ill people, and J. Cattel measured people's intellectual abilities.

The second stage began in 1910 and lasted until 1954. During this period, lists of associative norms were created for the first time (G. Kent, A. Rozanov), introduced the concept of an associative field (Sh. Bally), as a set of associative reactions to stimuli. The association experiment is being used for the first time to study the unconscious component of the structure of the human psyche (Carl Jung) and identify the motives of his behavior.

At the third stage (1950s–early in the 1970s, the association experiment actively penetrates into a new scientific discipline—psycholinguistics, and becomes one of its basic methods. Thus, the association experiment begins to be applied in linguistic research, as well as in research on intercultural communications.

During this period, a monograph by J. Dis "The structure of associations in language and thinking", in which he attempts to combine linguistic and psychological analysis of associations and describes a new method of analyzing associative structures [97].

The fourth stage (1970s–1980s) is associated with the development of associative research in the USSR within the framework of the theory of speech activity. Associative reactions are studied as specific (associative) meanings of words. Dictionaries of associative norms of national languages (Russian, Kazakh, Ukrainian, etc.) are being created.

The fifth stage begins in the late 1980s and continues to the present. E. E. Guts defines an association experiment as a technique that allows individuals to identify in individuals the associative series formed in previous experience [10]. E. E. Tarasov believes that the associative field, as a set of experimentally obtained reactions to verbal stimuli, is an external form of the existence of images of consciousness [11].

The classical scheme of linguistic associative experiment can be represented as follows: S→█→R, where S is a stimulus, which is a lexical unit. R is a reaction, which is either a lexical unit (non–zero reaction) or a refusal (zero reaction). █ is a symbol of linguistic consciousness, which can be described as a kind of "black box".

A stimulus is an impulse that, as noted by Yu. Karaulov, triggers the activation of the associative–verbal network and brings its nodes into pre–speech readiness. A reaction is an act of verbalization of one of the nodes of the associative–verbal network.

Regarding the methodology of the association experiment, we note a number of points.

1. Association strategies are largely spontaneous and unconscious in nature. The mechanism of occurrence of most associative reactions has a predicate nature (in accordance with the hypothesis of J. Miller).

2. The associative relationship between S and R is probabilistic. The probability (or predictability) of the appearance of a certain reaction to the presented stimulus is reflected in its quantitative characteristics, in the form of which the indices of the frequency of reactions act.
The process of distributing reactions to a stimulus is also probabilistic; the degree of predictability of the distribution of reactions can be revealed through a comparison of associative fields.

3. An associative linguistic experiment is a technique that allows, under given experimental conditions, to reveal the strength of the connection of some lexical items with other ones through the construction of associative fields.

4. The association experiment is aimed at investigating the subjective content of signs. At the same time, the subjective content is a phenomenon that actually exists (in the consciousness of the linguistic community), and in this regard, "the form of representation of meaning in the experiment (individual semantic competence) does not contradict the objectivity of meaning, since the general (systemic) meaning exists in the form of individual linguistic competencies, and only they can become the subject of experimental research" [12].

5. Associative reaction is a verbal actualization of the semantic component of the stimulus lexical item, which is significant for linguistic consciousness and reflects its current state.

A. Leontief emphasized that the formal processing of experimental data ultimately makes it possible to obtain material that can be interpreted as semantic components of experimentally studied lexical items [13].

The subjects' explication of the semantic components of the meaning of the lexical item-stimulus is carried out thanks to the mechanisms of semantic implication during association.

A. Zalevskaya distinguished two types of associative implications: semantic and lexical [14].

The semantic implication reflects the subjective identification of the meaning of the lexical item-stimulus on the part of the subjects.

The lexical implication is the reaction of the subjects to the sound form of the lexical item-stimulus.

There are 8 types of semantic implication:

1) An implication reflecting the identification of meaning through synonymy (the Homeland-the Fatherland).

2) An implication reflecting the identification of meaning through opposites (the light-the darkness).

3) An implication reflecting the identification of a value through class assignment (a planet-a celestial body).

4) An implication reflecting the identification of the value through conversion (to buy-to sell).

5) An implication reflecting the identification of the value by purpose (a jug-water).

6) An implication reflecting the identification of the value by affiliation (an udder-a cow).

7) An implication reflecting the identification of a value through an indication of a unit of a given class (a predator-a wolf).

8) An implication reflecting complementary identification (a spouse-a spouse).

A. Zalevskaya emphasized that in consciousness such implications occur in the form of deep predication according to schemes such as "X means Y", "X belongs to Y", "X is Y", etc. [14].

Those associative reactions that, due to various reasons, did not receive a predicative interpretation during the processing of experimental data are excluded from the semantic description of the lexical item.
Thus, it is the mechanism of semantic implication that ultimately makes it possible to interpret associative reactions as semantic components of the meaning of the stimulus lexical item. In addition, the set of identified semantic components makes it possible to determine the lexical item–stimulus (for example, teaches, educates, explains–teacher; explores, writes, experiments–scientist), which confirms the adequacy of the associative method of determining semantic components.

A. Zalevskaya believed that only semantic implication, which has a frequency index of at least 50%, would be relevant for the meaning of the stimulus lexical item. In our opinion, such a threshold is extremely high, since many peripheral, but quite bright semes will remain outside. We are convinced that the semantic periphery of the stimulus lexical item should also receive a theoretical description in the structure of its meaning. Semantic micro-components with brightness indices of 0.12 and higher belong to the core of the field. The seme brightness index of 0.11–0.04 means that it is located on the near periphery, and the brightness index of 0.03–0.02 distributes it to the far periphery. The extreme periphery of the field is filled with semes with brightness indices of 0.01 and below.

The brightness index in the range from 0.05 to 0.10 is, in our opinion, sufficient to identify the seme as relevant and include it in the composition of the psycholinguistic meaning.

Various classifications of association experiments have been proposed in the modern literature. In most cases, researchers distinguish three types of association experiments: free, directed and chain.

The free association experiment is a type of association experiment, the most common in modern research [15, 16, 17]. In accordance with the methodology of a free association experiment, the subject is required to respond with the first word that comes to mind to the presented stimulus, while the formal or semantic features of reactions are not limited.

The most common in the psycholinguistic tradition is the written form of registration of reactions. In this case, the subjects receive special forms containing stimulus material (lexical items), and after preliminary instruction from the experimenter fill them out. Free association experiments can be conducted in groups or individually.

According to the results of the experiments, the researcher receives material in the form of various types of associative reactions. Unlike a free association experiment, in a directed experiment certain restrictions are imposed on reactions, which may relate to:

a) the syntactic form of the associative reaction (the experimenter asks to answer pre-formulated questions: for example, where is X? What is X known for? What does X look like?);

b) parts of speech (when the experimenter asks to answer only with verbs or adjectives, etc.);

c) the number of associative reactions (for example, the experimenter asks for at least 5 associations).

The limitations introduced in a directed experiment are related, on the one hand, to the nature of the stimulus lexical item, and, on the other, to the objectives of the experiment. For example, if the goal is to identify the numerous and most striking differential signs of the denotation of a lexical item or its connotative semes, it is advisable to limit associative reactions to the syntactic form.
Thus, the associative process is directed in the direction necessary for the purposes of the experiment. Directed association experiments can also be conducted in written or oral forms, in groups or individually.

A chain association experiment is often considered as a type of free association experiment with the registration of all these reactions, and not just the first reaction that came to mind. Klimenko and Suprun called it an experiment with an emergent reaction. A chain association experiment is a spontaneous and uncontrolled flow of an associative process.

Within the framework of a chain experiment, subjects must respond to each presented stimulus with an unlimited number of words within a limited period of time. There are also acceptable options when time is not limited, but at the same time it is fixed by the experimenter for additional control. Each of the listed types of association experiment has its advantages and disadvantages. If a free experiment allows you to identify the most striking senses of meaning, with the help of a directed experiment, peripheral and connotative senses can be well detected. At the same time, the limitations imposed on the association process in a directed experiment can negatively affect the reliability and validity of the results. The introduced framework is somewhat artificial in nature, they can significantly distort information about the course of the associative process, which is spontaneous, unconscious in nature and is thus a natural state of the psyche.

On the other hand, as noted by L. Sakharniy, the directed experiment provides more opportunities for the reconstruction of deep associative connections, since it directs the association process in a variety of ways. The chain association experiment makes it possible to identify such components that are not revealed in free and directed experiments, and also gives a clear picture of the hierarchical organization of the meaning of lexical item. At the same time, it is time-consuming for semantic interpretation of the results.

In addition, the disadvantage of the chain association experiment is the significant dependence between the series of associative reactions. Often, the second reaction following the first reaction to the stimulus turns out to be a reaction not to the stimulus itself, but to the previous (i.e., the first) reaction.

4 Conclusion

Thus, the article outlines the theoretical and methodological foundations of experimental studies of the meanings of words and provides a general overview of some experimental techniques. Their advantages and disadvantages were noted. The analysis leads to the conclusion that it is necessary to combine various experimental techniques in the process of semantic analysis of words. Such an integrated approach will allow us to obtain a lot of new information about the composition and specifics of the meanings of words, identify opposite evaluative components in the same meaning, the presence of purely individual and false semantic components, etc.

We invite our colleagues to cooperate.

References


3. O. Vinogradova, I. Sternin, Psycholinguistic methods in the description of word semantics (2016)


7. A.A. Zalevskaya, Introduction to Psycholinguistics (2007)


14. A.A. Zalevskaya, Psycholinguistic study of the principles of organisation of the human lexicon: on the material of interlingual comparison of the results of associative experiments (1980)


