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The Structure of the Individual Mental Lexicon from the Standpoint of L.S. Vygotsky’s Ideas

Research on the structure of an individual’s mental lexicon has shown that, among the set of concepts belonging to a single semantic field, there is typically one particular concept that stands out. The processes of storage, identification, and retrieval of this concept are faster and more successful than they are for the others. For example, in the vertical hierarchy of the concept fruit—apple—antonovka [McIntosh to give a familiar U.S. example—Trans.], apple plays this type of lead role and also occupies the most prominent position in the horizontal series apple—pear—plum—cherries—orange. Concepts with such characteristics are referred to as basic, source, or primary concepts. What is the reason for their special status?

R. Brown (Brown, 1958), who first raised this issue, associated the special status of one of the levels in a conceptual hierarchy with the fact that this level has maximum utility in the majority of contexts. The child first learns words at the level of distinction that is most useful to him. Thus, it is important for children to be able to distinguish an apple from an orange, while the distinction between a Golden Delicious and a Granny Smith [I have substituted U.S. for Russian apple varieties—Trans.] is not significant. Analogously the word tree is more useful than the word oak, and dog is more useful than animal. The idea that the basic concepts were those with maximum utility has been further developed in the works of ethnographers (Berlin, 1972; Berlin et al., 1973), who showed that the names of plants and animals in “folk biology” are divided into five (or six) levels: (1) unique names of the most primitive classifier: plant, animal; (2) names of categories of living things: tree, bush; (3) generic names: pine, oak, birch; (4) species names: dwarf birch; (5) varietal names: Karelian dwarf birch.

These ethnographers suppose that the basic level is occupied by generic names, which are at the center of the hierarchy. In the languages of the world this level contains the most terms and the terms that are the most useful. Thus, terms at this level provide greater discriminative ability than the hierarchical levels above it as well as simpler names (a simpler classification system) than the levels below it.

Agreeing with this point of view, E. Rosch and her colleagues (Rosch et al., 1976) add that generic names are, on the one hand, relatively close to each other in semantic space (as compared to the names at the higher levels), and, on the other hand, are relatively far away from representatives of neighboring categories (as compared to the names at the lower levels). The use of generic names is most convenient, expedient, and frequent, and, for this reason, children learn these terms earlier than the more general or specific terms at other levels.
However, investigations by German scholars (Khoffman, 1986; Hoffmann and Ziessler, 1982) have demonstrated that primary (basic) concepts may occupy different positions in the generic-specific hierarchy. For example, in the hierarchy, vehicle—car—Volkswagen, the primary concept coincides with the generic name (car). However, in the hierarchy, tree—deciduous tree—birch, the basic concept (tree) is located two levels above the generic name (birch).

Is it possible to determine what place primary concepts occupy in generic-specific hierarchies? I. Hoffmann and M. Ziessler conducted an experiment in which subjects were presented with various concepts and asked to name their features. The authors identified two forms of (mental) representation. Concepts to which subjects attributed mainly pictorial features were called sensorially represented concepts. Concepts that were generally described by abstract features and examples were called categorically represented concepts (Hoffmann and Ziessler, 1982). These researchers constructed a hierarchy whose lower levels were occupied by sensorially represented concepts, while the higher levels were devoted to categorically represented ones. They then defined the primary concepts as the “most abstract concepts that were still sensorially represented,” that is, the highest level of the sensorially represented concepts. Such concepts can be identified more rapidly and have the greatest “associative strength,” as shown by the fact that subjects generate the greatest number of features for these concepts.

We reanalyzed the results cited by the above authors and found that it is not possible to accurately identify the primary concept as being the highest hierarchical level among the sensorially represented concepts in a given hierarchy. This is particularly clear in the “musical instrument” hierarchy. Subsidiary to this highest level concept, there are two concepts belonging to the same level: wind instruments and string instruments. For the first of these categories abstract descriptors are predominant, while sensory features predominate for the second. Consistent with this, the authors automatically treat differently the concepts at the next (lower) level: they consider flute to belong to primary concepts, while violin to secondary ones. However, both flute and violin would have been considered primary on the basis of number of descriptors supplied insofar as the number of features subjects provided for them is higher than that for other representatives of this hierarchy. Such contradictions one can find also in the weapons hierarchy.

Thus, we can see that none of the approaches considered allows us to accurately define the level of the basic concept in a generic-specific hierarchy. U.S. investigators, using formal logical criteria, identify the central level of the generic-specific hierarchy as primary. German psychologists combine formal logical and psychological approaches and provide an operational psychological definition of primary concepts, but at the same time they embed these in rigid hierarchies (which fail to correspond to the “naïve” logic of language) on the basis of the erroneous assumption that categorically represented concepts must occupy the highest levels, while sensorially represented concepts lie at the lower ones. As we have already seen in the examples cited, in a number of cases, this assumption is not justified. Furthermore, if we do not simply divide concepts into two groups, but indicate their place in the continuum of “categorically—sensorially represented concepts,” then we find that many higher concepts are closer to the sensory pole than lower concepts (e.g., tree—deciduous tree, boat—motorboat).

Both of the models considered correspond to reality to some extent, but both allow too many exceptions. This suggests that the very principle according to which basic concepts are identified should be different—ne that is consistently psychological, which we, following
L.S. Vygotsky, understand as historical genetic or genetic-functional. If we are to describe primary concepts, we must start by considering their origin and functioning.

In our research we were guided by Vygotsky’s findings that (i) the system of word meaning begins to form in a child while his thinking is still prelogical and based on complexes [A set of elements associated by mean of concrete and factual bonds, as opposed to abstract and logical ones. Complex based thinking, according to Vygotsky is a prelude to concept formation and logical thinking—Trans.] (the same is undoubtedly true with respect to philogeny) and that (ii) the child first learns words with concrete, pictorial meanings, forming associations of the type “word—generalized image” with the form of the generalization consistently changing through the course of development. We hypothesized that the meaning of the words first learned by a child will act as the initial (primary, basic) words for the construction of individual mental semantic fields (Akhutina, 1977; Akhutina, Petrenko, and Nistratov, 1978).

During our experimental verification of this hypothesis we were able to show that the primary meanings: (1) initially are “image—meaning” complexes (sensorially represented; (2) because they are images, they may, from a logical standpoint, be considered nonelementary; (3) are constructed according to the laws of thinking in complexes; of these nonlogical structures, ones that are reinforced by the linguistic context remain, and ones that are not so reinforced pass into a latent state or disappear; (4) are the reference points for defining meanings acquired later (that is, secondary) meanings in the same semantic field; (5) occupy a central position in the semantic field, which makes them easy to retrieve, thus ensuring that they will be used frequently.

In agreement with the ideas of R. Brown and E. Rosch, we hypothesize that primary concepts (which are the first words of children) are maximally useful. It is significant for a young child to be able to distinguish between an apple and an orange or a carrot and a cucumber. Thus, for the categories of “fruit” and “vegetables” it is the level of generic names that is the basic one and that contains the primary meanings. At the same time, to a small child the difference between a birch and a linden or a bullfinch and a sparrow is not so significant and thus it is tree and bird (names at a higher level) that form the primary concepts in the newly forming semantic fields. The history of the semantic field determines its structure.

We have been speaking about the primacy of concepts in a vertical series; however, members of a horizontal series can also be distinguished by their functional characteristics.

When subjects are asked to list the features characteristic of apples, pears, oranges, and other members of the “fruit” category, it was found that no single feature listed is common to all members of this category (Rosch and Mervis, 1975).

At the same time, when subjects are asked to classify members of one or another category on the basis of how “typical” they are, they unanimously put the apple in the most typical category, and olives in the least typical one. If the subjects can evaluate the typicality of category members, it may be hypothesized that they have an idea of the most typical member—the prototype. In Rosch’s opinion, this is just what they have in mind when they refer to the category. The prototypical category member, occupying the central place in the semantic category, has the greatest number of features in common with other members of this category and is furthest away from representatives of other categories. All category members are grouped around the prototype according to the principle of “family resemblance.”

The degree of typicality determines how easy it is to operate with the given concept. For example, if we ask subjects to evaluate the truth or falsity of the propositions: “A crow is a bird,” and “A chick is a bird,” then it will require less time to verify the first proposition than the second, which names a nontypical category member.
The facts and proposed explanation advanced by E. Rosch and her colleagues accords fully with Vygotsky’s theory of concept formation. Generalization of the “thinking in complexes” type and organization of groups according to the principle of “family resemblance” are two different descriptions of a single phenomenon. Despite their basic similarity, there is one difference between them. The U.S. investigators speak of the principle of typicality or “family resemblance” only with regard to the members of one category, one horizontal series. On the other hand, Vygotsky, who was making a more general assertion about the different types of verbal thinking, attributed a broader sphere of operation to complexes.

Despite the fact that Vygotsky is cited so often in semantic investigations, his point of view is far from thorough or accurate understanding (the review by the erudite and subtle scholar S. Carey (see Carey, 1982) is a case in point), and we will thus consider it in somewhat more detail.

Experience with artificial concepts (using the Vygotsky-Sakharov procedure) allowed Vygotsky to experimentally establish that the meaning of words develops during childhood and that the development goes through a series of stages (syncretism, complex, preconcept, concept), which involve different types of generalization. These conclusions are well known. The following assertions are less well known. “Every generalization structure is based on a specific system of commonality and commonality relationships between general and particular concepts” (Vygotsky, 1982, p. 271). The commonality relationship of “flower—rose” differs in the complex and concept structures. To a two-year-old child, who has learned the word flower before learning rose, both concepts stand alongside each other, and can replace each other, while to an eight-year-old child, one stands above the other and includes more particulars.

Vygotsky believed that only at the highest developmental stages of word meaning (and thus of relationships of commonality) does a complete system of concepts arise that permits each concept to be designated in an unlimited number of ways through use of other concepts to define its place in the system (Vygotsky, 1982, p. 273, and further). He also suggests that the new level of generalization does not completely supersede the developmentally previous one in the linguistic consciousness of an adult; rather, old and new forms coexist in a relationship akin to geological stratification. Everyday thinking, which is based on everyday speaking, makes extensive use of the higher forms of complex-based thinking in the form of pseudoconcepts—everyday concepts, while scientific thinking relies on scientific concepts (ibid., pp. 168, 176).

The essential difference between everyday and scientific concepts is associated with the presence or absence of a system. “Outside a concept system, all that is possible are associations established among objects, that is, empirical connections… When a system of concepts exists, meta-empirical associations become possible” (Vygotsky, 1982, p. 284). Thus, conceptual thinking differs from thinking in complexes by virtue of the existence of a system (cf. “The different commonality relationships determine what types of operations are possible for a given level of thinking”—ibid., p. 290).

Let us now turn to two aspects of word meaning—“relatedness to an object” (= reference) and “meaning per se.” We will see that the latter is a part of a system and may be identified in terms of its place in the system, and that the laws of formal logic are applicable to this system. Reference, which is based on a pictorial association between the word and the object, also entails association between words, but these are complex-based associations of the “family resemblance” type. The meaning of a word that designates a concrete object, thus, is stored in two coordinate systems: (1) in a formal logic-based hierarchical system utilizing a system of “meanings per se” (categorical meanings), and (2) in a visual image “gallery of generalized images” associated with the referential meaning of the word.
These ideas of Vygotsky are supported by the most diverse empirical evidence. The natural division of meanings into sensory and categorical representations, the characteristics of primary concepts, the typicality effects for everyday concepts and the size of categories for scientific concepts—all these facts can be explained consistently by Vygotsky’s ideas. For example, experiments on lexical recognition and naming of a word have shown that a concrete word has two types of meaning—perceptual and conceptual—and that these are activated at differing rates (Flores d’Arcais, Schreuder, and Glazenborg, 1985).

The fact that Vygotsky’s ideas correspond to the findings about aphasia provides an important piece of evidence demonstrating that they are correct. Special experiments targeted at analyzing the retention of categorical meanings of words and referential meanings have shown that one of these can be impaired without impairment of the other. Patients with brain lesion localized in the parietal-temporal-occipital areas (i.e., suffering from the semantic aphasia syndrome—Luria, 1947) have great difficulty operating with categorical meanings. Categorical classification (either of words or of objects), retrieval of words with a given meaning (apple: fruit = dress???) were the most difficult for this group of patients (Akhutina and Malakhovskaia, 1985) When the focus of lesion is in the lower temporal-occipital cortex of the dominant cerebral hemisphere, patients have the most trouble operating with the referential meanings. With my student N.V. Komolova we developed an experimental methodology based on the idea that underlying such meaning is a generalized image-template, which is used to segment the continuum of real phenomena. In these studies, subjects were asked to view schematic depictions of animals, whose features changed smoothly along a single continuum and to divide them into groups.

In our experiment, in addition to perceptual classification, we used verbal classification in which words were to be placed in groups not on the basis of generic-specific categories, but on the basis of whether they referred to a single object (in particular, the words: pussycat, kitty, and purr, had to be distinguished from vixen, sly, cub, yelps). The difficulty of these tasks, which was intercorrelated for these tasks but not correlated with defects in performing tasks involving categorical meanings, was greatest for patients with lesions located as described above. This suggests that acoustic-amnestic and optical-amnestic (optical) aphasias suppose a primary impairment of referential meaning (for more details see Akhutina, Gluzman, 1993). These data confirm Vygotsky’s ideas and suggest that the meaning of words denoting concrete objects is dually represented and may be retrieved by two different routes: the categorical, within the verbal system of concepts (cf. the term “concept network” in Luria), and the “imagistic,” within the system of references. In the first case, the “categorical (significative) meaning” is activated, in the second the “object denotation,” to use Vygotsky’s term. Each meaning occupies a particular place in a continuum, at one end of which are the most categorically represented and least perceptually represented words and at the other end the most imagistically and least categorically represented.

The fact that the two systems of word meanings generalization coexist in the linguistic consciousness of an adult is also clearly demonstrated by investigation of speech and thinking in patients who have undergone a course of unilateral shock therapy (Balonov and Deglin, 1976; Deglin, Balonov, and Dolinina, 1983; Chernigovskaia and Deglin, 1986). The most striking data come from word association experiments and syllogistic reasoning exercises. Under conditions where the left hemisphere is depressed, “in response to the stimuli words, there is an increase in responses from the lexicosemantic area comprising the names of sets of objects and real phenomena. Particularly typical of this state are utterance-complexes (in Vygotsky’s term)—naming of components of a concrete image that underlies the word”
(Deglin, Balonov, and Dolinina, 1983, p. 34). When the right hemisphere is depressed, “the tendency to rubrification, to superimpose an abstract classification scheme on the external world is intensified.” Responses based on the principle of binary opposition, syntagmatic responses, responses with semantically vacuous changes in words, and word formations all increase. “The number of utterance-complexes reflecting individual life experience, and concrete images decreases sharply” (ibid., pp. 36–37).

As noted above, in Vygotsky’s opinion, “every generalization structure corresponds to a specific system of logical mental operations that are possible with that structure” (1982, p. 283). Study of logical problem solving after one hemisphere has been depressed showed that the same individual may use either logical (when the right hemisphere is depressed) or empirical (when the left hemisphere is depressed) methods of solution. Thus, after presenting the syllogism, “Every artist can draw a rabbit. Dürer is an artist. Can Dürer draw a rabbit or not?” a patient with a depressed right hemisphere answered, “Dürer can draw a portrait of his mother very well, and he can also draw a rabbit, because he is an artist, I know of him” (logical answer, reinforced by experience). The same patient, after her left hemisphere had been depressed said: “Dürer? He probably can (with little confidence). I don’t remember” (the patient does not use logical reasoning).

Research on speech and thinking when one of the hemispheres is depressed poses the question of the lateralization of various forms of representation of meaning. While these investigations suggest that the image glossary is stored in the right hemisphere and the categorical in the left, the data from studies of aphasia suggest the possibility of both systems being impaired in cases of pathological lesions in the left hemisphere. As a working hypothesis, we take the viewpoint that object images are stored bilaterally and categorical word meanings are stored in the left hemisphere. We understand, however, that this issue requires further careful consideration using data obtained from a variety of experimental models.

Thus, we have considered the viewpoints in the literature on the organization of the semantic field as components of an individual’s mental lexicon. Studies performed on concrete words have made it possible to identify primary concepts, which occupy a favored position in the semantic field. These constitute the starting point and center around which the entire field is structured according to the principle of complexes (“family resemblances”). The imagistic nature of the generalization underlying the formation of a complex leads to a situation where a meaning logically subsumed under a particular complex (cf. “a chicken is a bird”) may not be part of this complex but forms a separate semantic complex. The system of logical generic-specific hierarchies that forms later, under the influence of schooling, is superimposed on the first without replacing it. This viewpoint, which follows from the experiments and theoretical generalizations of L.S. Vygotsky, is confirmed by the data on aphasia.

Notes

1. Because this research used indirect criteria for judging the form of a concept’s representation—that is, the verbal definitions provided by subjects—it is important to emphasize that there are other data in favor of this division, in particular, data on aphasia. Also testifying in favor of this distinction are analyses of problems with naming in patients suffering from various forms of aphasia performed by A.R. Luria (1947), E.P. Kok (1967), E.D. Markova (1961), L.S. Tsvetkova (1972), N.G. Kalita (1974, 1979), T.V. Akhutina (1981a, 1981b, 1983), E.K. Warrington (1981a, 1981b), A. Caramazza, R.S. Berndt, and H.H. Brownell (1982).

2. One can draw a parallel between the continuum “complex—preconcept—concept” proposed by Vygotsky and the continuum of E. Bates and B. MacWhinney “grouping on the basis of family resemblance—grouping on the basis of features with different weights—grouping according to a formal logic principle” (Bates and MacWhinney, 1982).
3. For more detail on this see: Chernigovskaia and Deglin (1986). On the existence of different types of thinking in members of modern cultures; See also, Riumina (1982); Tul’viste (1982, 1988); Tul’viste and Tul’viste (1985); Frumkina (1984); Frumkina, Riumina, Mostovaia (1985).

References