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Proceedings of the Annual Meeting of the Cognitive Science Society

Title

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Permalink

Journal

Author

Johnson, Janice

Publication Date

1984

Peer reviewed

LEVELS OF PROCESSING IN METAPHOR COMPREHENSION[*]

Janice Johnson

Institute of Human Learning, University of California, Berkeley

In a metaphor a topic is described in terms of a vehicle. The topic and vehicle terms generally refer to two diverse, conceptual or experiential, domains. Several theories of metaphor assume that metaphoric comprehension involves a mapping from vehicle to topic of vehicle properties or aspects. For example, Ortony (1979) proposes that in a metaphor highly salient attributes of the vehicle are matched with low salient attributes of the topic. The matched (i.e., shared) attributes need not be identical, but must have high similarity. Glucksberg, Gildea, and Bookin (1982) suggest that metaphor comprehension involves instantiation, in terms of the topic, of a small set of salient properties of the vehicle. Tourangeau and Sternberg (1982) criticize the notion that the topic and vehicle in a metaphor have matching (i.e., shared) attributes, yet still consider that metaphor comprehension requires a mapping of attributes between vehicle and topic. They propose that the attributes of the vehicle domain must be transformed to apply in the topic domain. In a similar vein, Verbrugge and McCarrell (1977) argue that metaphor comprehension involves a "novel schematization of the topic domain" (p. 494) in terms of transformational and structural invariants of the vehicle domain.

These approaches all propose some mapping from vehicle to topic of vehicle aspects. They differ in their definitions of the aspects and in the degree to which they see vehicle aspects as being transformed rather than matched in the topic. Combining and extending these approaches, I propose here a metaphor comprehension model which allows for varying degrees of transformation in the mapping of vehicle aspects, that is, different levels of accommodation of the vehicle aspects to the semantics of the topic. I formalize these levels in terms of different kinds of mapping processes.

A Semantic Mapping Model of Metaphor Comprehension

I propose that the semantic process of comprehending a metaphor involves selecting some facets or aspects of the vehicle that are potentially applicable to the topic, then mapping these facets to the topic to evaluate analytically the appropriateness of the mapping. The mapping is done by means of semantic combinators (i.e., mapping functors); these are semantic transformations that convert one or more semantic facets into other different facets—combinators can apply on topic or vehicle facets. In terms of structure, the topic and vehicle in a metaphor refer, in the subject, to knowledge representations I call obs (short for "object schemes"). An ob is a complex mental structure that stands for all the discriminative, manipulative, and functional aspects or facets of a distal object (Pascual-Leone, Goodman, Ammon, & Subelman, 1978); it is thus the mental representation of a thing in the environment. The notion of an ob is analogous to other notions of memory structure, such as "frame," "schema," and "prototype." Facets are the functional components (properties or relations) of an ob that emerge from goal-directed interaction with the object; facets are not properties inherent in the object itself, but are constraints the subject has experienced.

I propose that the semantic processing of metaphors takes place in successive moments. In a first moment of global processing/mapping, the semantic relation between topic and vehicle is investigated by way of shallow, more or less concrete, semantic content processing. Global processing can yield an adequate metaphor interpretation only if topic and vehicle share (low-level) content facets. A further moment of deeper, analytical processing/mapping involves analytical

elaboration or modification of the global meaning in light of the detailed meanings of both topic and vehicle. Analytical processing, more so than global mapping, is guided by and obedient to semantic constraints imposed by the topic; it thus represents an accommodation of the vehicle facets to the semantics of the topic ob. A first level of analytical processing involves modification of the global meaning; a second level may involve a movement from one topic facet to another. I will make the processing levels clearer when I describe semantic combinator kinds that are instances of the levels. In order to specify the semantic combinator kinds, I developed a method of coding metaphor interpretations.

Method

I collected metaphor interpretations from children and adults. I report here data for the adult subjects: 24 students at York University in Toronto. I interviewed subjects individually and asked them to interpret orally each of 19 metaphoric sentences. This paper reports results for 6 of the metaphors; these were constructed by combining, in a sentence frame of the form "____ was a ____", each of three vehicle nouns (rock, mirror, butterfly) with each of two topics (My sister, My shirt) to form sentences such as "My sister was a mirror," "My shirt was a rock," etc. Subjects were encouraged to give as many interpretations as they could for each item.

Coding of metaphor interpretations. According to the processing model, in interpreting a metaphor the subject maps facets from vehicle to topic by means of some semantic combinator. In coding a metaphor interpretation, one first infers the actual vehicle facet(s) that underlie the interpretation and then the kind of semantic combinator that must have applied on the facet(s) to generate the interpretation. The three main kinds of semantic combinators I propose (and the only ones space limits permit me to discuss here) are the Identity, Analogy, and Predicate combinators. Identity and Analogy are types of between-obs combinators that map facets from vehicle to topic.

The Identity semantic combinator is an instance of the initial, global level of metaphor processing. In an Identity mapping the subject finds a facet in the vehicle ob that has (or could have) the same name and semantic definition in the topic ob and does a direct mapping of the facet from vehicle to topic. The facet is mapped without any change in meaning. An example is the following response to the sentence "My sister was a rock": "Maybe she felt to the physical touch very hard." The rock facet used is "hardness", the defining statement of which could be <<rocks do not change shape under the application of external physical force>>. Here the subject selects a salient facet of the rock ob and maps it to the sister ob without changing the sense of the facet. For a response to be scored as an Identity the mapped facet(s) must be compatible with the semantics of the topic ob. A second example is the following response to "My shirt was a mirror": "It could actually be a mirror--made out of some kind of material that would actually reflect." This response is based on one or both of two mirror facets: a facet corresponding to the optical "image" produced by the mirror (<<a mirror gives back a reproduction or likeness in two dimensions of whatever is in front of it>>) and a facet corresponding to the mirror's ability to reflect light (i.e., its "shininess").

The Analogy combinator is an instance of the first level of analytical metaphor processing. In an Analogy mapping the facet(s) emerging from global processing undergo a change in sense as they apply from vehicle to topic. The change in sense represents an accommodation of the vehicle facet(s) to the semantics of the topic. An example is the following response to "My sister was a rock": "She was very firm and unyielding sort of like a rock . . . his sister is like a rock as far as the way she behaves or acts, like hard as a rock." Here the "hardness"

vehicle facet is accommodated to the topic ob through a process of constructive abstraction, whereby topic-relevant content is inserted into the vehicle facet structure (see definition of "hardness" rock facet above): "does not change shape" becomes "does not change behavior" and "external physical force" becomes something like "verbal instruction" or "psychological pressure." In an Analogy mapping, the vehicle facet and the (semantically different) topic facet it maps are related by way of a higher-level (i.e., generic) superfacet that subsumes the topic and vehicle senses. A second example is the following response to "My shirt was a mirror": "Maybe it would mean that you saw someone else with the same shirt as you." This response is based on the mirror "image" facet described above, but in this case the facet is mapped with a change in sense; that is, it is applied with the sense of resemblance rather than optical reproduction.

The Predicate is a type of within-obs combinator that applies within the topic ob following a between-obs mapping; it is an instance of the second level of analytical processing. The Predicate serves to express the result of a between-obs mapping in terms that closely conform to the pragmatics of the topic ob. To this end, the subject elaborates the initial mapping in terms of a concept or an instantiation that is relevant to the topic, but not to the vehicle. An example is the following response to "My sister was a rock": "Whenever I think of a rock I think of something hard, so maybe your sister is cold or unfriendly. You are not very close with your sister." Again, this response is based on Analogical mapping of the "hardness" rock facet (with the sense of non-responsiveness), but here the subject elaborates the initial mapping in terms of unfriendliness and psychological distance--concepts that are relevant for describing persons, but not rocks. In contrast to the Analogy, in a Predicate response the topic-relevant concept or instantiation is cued by the generic superfacet, but is not subsumed under it. Another Predicate example is the following response to "My shirt was a mirror": "My shirt was a reflection of myself, so if I had on a white shirt I'd be a conservative, and if I had on a wild shirt I would be a wild person." Here the shirt is, Analogically, an "image" of the wearer's personality, and the subject instantiates this Analogy in terms of types of shirts and personalities.

Identity, Analogy, and Predicate are three main kinds of semantic combinators that are instances (and most characteristic) of three proposed levels of metaphoric processing: global, analytical-1, and analytical-2. Elsewhere (Johnson & Pascual-Leone, 1984) I have described additional kinds of combinators and developmental data that support the validity and reliability of the coding method (see also Johnson, Fabian, & Pascual-Leone, in press). Here I use the notions of semantic combinators and vehicle facets to characterize adult processing of metaphors. In the Results I use the combinator names introduced above to refer to the processing levels; responses coded with other kinds of combinators are assimilated to the appropriate level.[1]

Results and Discussion

Level of processing. Subjects typically gave more than one interpretation for an item; the mean number of responses across subjects and items was 2.6 (the modal numbers of responses were 2 and 3). Of the total number of responses, 17% are at the global level (i.e., are of the Identity type), 27% are at the Analogy level, and 50% are at the Predicate level (6% are below the global level; e.g., responses that violate the reality constraints of the topic ob or that do not make a mapping from vehicle to topic). Thus, adults use all three processing levels when interpreting metaphors, but more often respond at the higher levels. Eighteen out of 24 subjects gave responses at all three levels.

As one would expect, the Identity level is used more often for items with the shirt topic (27%) than for those with sister (7%). Shirt shares more physical facets with the vehicle obs than does sister (i.e., Identity mappings are more likely to be compatible with the semantics of shirt). In order to say something meaningful about sister, in light of the vehicles, the vehicle facets must be transformed: For items with the sister topic, 33% of the responses are at the Analogy level and 53% are at the Predicate level; for shirt, 21% are Analogies and 46% are Predicates. "My shirt was a butterfly" has the highest rate of Identity responses (39%); there are a number of butterfly facets (e.g., colorful, light, soft) that are directly compatible with possible shirt facets. "My sister was a mirror" has the highest rate of Analogy responding (51%); the most frequently used mirror facet is the mirror "image"—subjects make numerous Analogies concerning resemblance in looks or behavior. All items yield a high rate of Predicate responding (ranging from 40-59%), but "My sister was a rock" has the highest rate; here the most frequently used vehicle facets refer to the hardness, strength, and immobility of rock, and in sister these aspects are transformed into Predicates expressing emotional coldness, strength of character, and stubbornness.

Vehicle facets. It is often proposed that facets that have high salience in the vehicle are selected for mapping to the topic (e.g., Ortony, 1979). Results of the current study show that some vehicle facets are more frequently used than others in the metaphor interpretations (one might characterize these frequently used facets as more salient), but that the topic also plays a role in the vehicle-facet selection. For example, I inferred 23 different facets of rock as underlying the 61 responses given to "My shirt was a rock." The most frequently used facets correspond to the hardness and heaviness of rocks; these facets are involved in 31% and 28% of the responses, respectively.[2] The next most used facets refer to the greyish color (11%) and rough texture (10%) of rocks. Of 26 rock facets inferred to account for the 71 responses to "My sister was a rock" (18 of these also inferred for the shirt item), the "hardness" facet is used most often and is involved in 48% of the responses. The next most used facets refer to the strength (23%), immobility (rocks do not themselves move-- 17%, and are difficult for people to move--18%), and changelessness (14%) of rocks. Thus, beyond what is likely the most salient facet of rock (i.e., "hardness"), different facets tend to be mapped to shirt than to sister; similar results obtain for the other vehicle obs.

Conclusions

The notion that the topic and vehicle in a metaphor share low-level content facets, which constitute the metaphoric ground, is probably true only for relatively trite metaphors (e.g., those based on immediate topic-vehicle resemblance). The ground is more likely to be facets shared at a higher level (i.e., superfacets), and thus one must propose some process whereby content facets selected from the vehicle are transformed into related facets in the topic. I formalize this process in terms of semantic combinators. The vehicle facets selected for mapping are likely to be ones that have been salient in the subject's construction of the vehicle ob (or that are made salient in some context). However, in interpreting a metaphor one must construe something meaningful about the topic, in light of one's knowledge of the vehicle; thus topic and vehicle interact, in that the selected facets in the vehicle must be transformable into pragmatically important aspects of the topic ob. One can represent metaphor interpretations in terms of vehicle content and the process by which this content is accommodated to the topic.

Notes

[1]Note that the metaphoric processing levels are ordered because they are embedding and because of their cognitive-developmental difficulties which lead to their ordered emergence in development (see Johnson et al., in press; Johnson & Pascual-Leone, 1984).

[2]Responses can be based on more than one vehicle facet; thus, percentages do not add to 100%.

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