

# **First Mention Drives How People Read and Comprehend Language**

Author: Dr. Morton Gernsbacher, Bartlett Professor of Psychology, University of Wisconsin

## **ASNE LITERACY COMMITTEE**

### **Writing and Reading Today**

#### Index

Language involves many general cognitive processes, and I've been trying to explore in my research what general cognitive processes underlie language behavior and language comprehension. About a decade ago I began developing a very simple framework, the structure-building framework, that describes the comprehension process in a general way. According to the structure-building framework, the goal of comprehension is to build coherent mental representation, or structure of the information being comprehended.

Three component processes are involved. First, comprehenders lay a foundation for the mental structure that they are developing. Next, comprehenders develop the structure by mapping on incoming information, when that incoming information coheres, or relates to the previous information. However, if the incoming information is less coherent or related, I propose that comprehenders employ a different process, that is, they shift and initiate or build a new substructure. So most mental representations comprise several branching substructures.

#### **Foundation**

Hypothetically, the initial stage of comprehension involves laying a foundation for the mental representation. Laying this foundation should consume some cognitive capacity, and we should be able to observe this greater consumption of cognitive capacity or cognitive processing in comprehension behavior. Indeed, a large body of converging data suggests that comprehension slows down at the point where we imagine comprehenders are laying the foundations for their mental structures. So for instance, in experiments that measure the reading time for each sentence in a paragraph, we find that initial sentences take longer to read than subsequent sentences. In fact, initial sentences take longer to read regardless of where the paragraph's topic sentence is, so it's a structural phenomenon as much as content phenomenon. In addition, the first sentence of each episode in the story takes longer to read than other sentences in that episode. Similarly, if you measure the reading time for each individual word within a sentence, you find that initial words take longer to read than other words (except a sentence's final words, a point I'll get back to later). And in fact, the same word is read more slowly when it occurs at the beginning of a sentence or phrase than when it occurs later.

Now during comprehension of spoken language, instead of measuring reading time, you can also do some other savvy measures. One of them is to measure latencies to respond to targets that you embed in a sentence. And we find that subjects' latencies, that is, their reaction times to target words, are slower when those targets occur at the beginnings of their sentences or phrases than when they occur later. That suggests that, perhaps when people are getting these initial words, they're doing something. I'm hypothesizing that they're using those initial words to lay a foundation for their mental representations.

So these data suggest that initial stimuli serve as a foundation onto which subsequent information is added. And indeed, initial stimuli play such a fundamental role in organizing that, when asked to recall the main idea of a paragraph, most subjects are likely to select the initial sentence even when the actual theme occurs later in the passage. So again these data support the idea that the initial process of comprehension involves laying a foundation.

Well, another phenomenon that could be the result of this foundation-laying process is what I've referred to as the advantage of the first-mentioned participant. And the advantage is this: After comprehending a sentence involving two participants, it's easier to access the participant who was mentioned first in the sentence than the participant who was mentioned second. So, for instance, after comprehending the very simple sentence: "Tina beat Lisa in the state tennis match," if subjects are asked whether the name Tina occurred in the sentence, they respond considerably faster if Tina was the first person mentioned in the sentence than if Tina was the second person mentioned in the sentence. One explanation of this advantage of the first-mentioned participant arises from the structure-building framework, and it is the notion that first-mentioned participants are more accessible, both because they form the foundations for their sentence-level representations and because it's through them that other things are mapped onto this developing representation.

However, as you can imagine, there are other explanations. Some of them draw on the linguistic, as opposed to the cognitive, structure for English. So, for instance, first-mentioned participants might be more accessible because in English declarative sentences, they're virtually always the subject, and they virtually always fill the semantic role known as agent. But it turns out that the first-mentioned participant's advantage doesn't depend on the first-mentioned participant literally being the initial word of the stimulus sentence. The advantage seemed to depend on the two participants' relation to one another — who was mentioned first.

There is a phenomenon that demonstrates an advantage of clause recency. Maybe some of you remember it from introductory psychology. That phenomenon looks something like this: Immediately after subjects hear a two-clause sentence, words from the most recently heard clause are more accessible than words from an earlier clause. This is classically known as the advantage of clause recency. So when we first discovered the advantage of the first-mentioned participant, we thought, this is a problem because it conflicts with this very well-known, established finding, the advantage of clause recency. So in a series of experiments, we tried to resolve this discrepancy. When we presented test names coincident with the last word of the sentence, we found an advantage of clause recency. When we presented them a bit later, we found the two were equally accessible. And then when we presented them at an even longer test point, we found the advantage of first mention. These two phenomena, the advantage of clause recency and the advantage of first mention, are not mutually exclusive. These data are some of the ones I like the best because I think that they also tell us quite a bit about linguistic structure and cognitive processing. The advantage of clause recency is relatively quick-lived. It is, in fact, the case that people remember momentarily the most recent thing you said, but the long haul goes to the advantage of the first mentioned.

## **Mapping**

Well, now let me turn to talk about another general cognitive process involved in language comprehension: the process of mapping. According to the structure-building framework, once a foundation is laid, incoming information that is coherent with the

previous information is mapped onto the developing structure, or substructure — the more coherent the information is, the easier the mapping process should be. What do I mean by coherent? Dictionaries define coherent as cohesion and relatedness, and what I've tried to do is identify some sources of coherence in text. The types of coherence that I've identified are these: referential coherence, consistency in who or what is being referred to; temporal coherence, consistency in when the events that are being discussed occurred; locational coherence, consistency in where these events occur; and causal coherence, which is consistency in why these events occur. I'm not assuming that these sources of coherence are independent. My sense is that coherent information is probably characterized by all four, if not more. I've also tried to find out whether these sources of coherence affect comprehension and the comprehension process.

## **Shifting**

The structure re-building framework assumes that when the incoming information is less coherent, comprehenders employ the process of shifting. That is, they must shift from actively building one substructure and initiate another. Laying this foundation for a new substructure should require some cognitive capacity, so we should be able to observe this in the laboratory. And in fact, there are lots of studies that did that for us. We know that sentences and words that change the ongoing topic, point of view or setting take longer to comprehend, because those subjects slow down. We feel it, and we've observed it in the laboratory.

We also know from laboratory studies that comprehenders have more difficulty retrieving information presented before a change in topic, point of view or setting. When you change the topic in an expository task, if you then ask subjects about the most recently comprehended information, they're worse off than if you had not changed the topic or changed the setting or the narrative point of view. This shifting and initiating a new substructure also appears to explain a well-known phenomenon in the psycholinguistic world: that recently comprehended information often becomes less accessible, particularly if you ask people to remember the verbatim form. So if I asked you to tell me, word for word, the most recent sentence I just said, most people have difficulty with that. We usually can remember the gist of the information, but the actual word-for-word verbatim information is usually quickly lost.

Why should that be? As soon as you introduce something new and say "on the other hand" or "and the next," that's the cue for when people lose this information. I'm suggesting that people use those cues like "on the other hand," "next," "three days later," to shift and initiate a new substructure, and that's why you lose access to that substructure that you were just developing. I think this is a compelling phenomenon and we've studied it with lots of linguistic devices. What we're doing is giving our readers guideposts about where we're going, but the guidepost we're giving them is we're going somewhere new. In fact, if you put a paragraph indentation, people are worse at remembering the sentence that they just read than if you don't have a paragraph indentation there. Why? Consider a recoding hypothesis. That information becomes less accessible because it's recoded into gist. By this reasoning, it's great to lose the surface information because there's a tradeoff: the more surface information you lose, the more big-picture gist you have. The good news is, they have that information compartmentalized; the bad news is, you're not going to have the most recent information as accessible.

What I've tried to do is describe, very briefly, these three structure-building processes: laying a foundation, mapping coherent or relevant information onto that foundation, and shifting to initiate a new substructure. I have also done quite a bit of work on mechanisms that underlie the structure-building process: enhancing relevant information and

suppressing irrelevant information. As a tease, I'll tell you that some of my favorite work has demonstrated that university-age students who are poor readers tend to be marked by an inability to suppress irrelevant or inappropriate information. It's as though they can't pick out what is appropriate from what is inappropriate. And because of that, I argue that they tend to build clumsier mental representations and that their structures are not neatly organized and packaged because they can't suppress the inappropriate information.