Craik & Lockhart: Levels of processing

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What is the nature of mental activity that allows a child to remember a past experience? Traditionally, the question of memory was answered with an exclusively static model: The mind was said to have storage bins to which represented experiences are added. Depending on the exact nature of the storage bin, the experience is remembered either for a short time (i.e., short-term memory) or for a long time (i.e., long-term memory). Though widely familiar, this model of static storage bins falls notoriously short on explaining the nuance of memory findings. For example, short-term memory appears to have strict capacity limits for some type of information—but not for all. Similarly, long-term memory appears to contain not only semantic information but also seemingly irrelevant perceptual details.

In an effort to address the shortcomings of a static storage model, Craik and Lockhart proposed a memory model that associates memory with levels of processing, not with bins of a certain capacity. This approach is referred to as the levels-of-processing theory. It postulates that the degree to which an event is remembered is a function of how representations are processed, not a function of how the experience is being stored.

At one extreme, information is processed on merely peripheral levels, without extensive attentional and reasoning resources. This *shallow* processing yields weak memory of the information, such as when rehearsing information of limited relevance for the individual. At the other extreme, information is processed elaborately, the person actively connecting new experience with already memorized experiences. This *deep* processing yields strong memory, such as when information is consciously analyzed and evaluated. Thus, memory is no longer described as a fixed capacity. Instead, memory is a function of an active interaction with the input, either at a shallow or a deep level.

The strength of the levels-of-processing model lies in explaining context effects that do not fit a storage-based model of memory. Consider, for example, the case in which a salient event fails to be remembered, despite being well within the storage capacity of short-term or long-term memory. According to the level-of-processing model, this happens because the child processed the information in only shallow ways. Vice versa, if an event is remembered well, despite being seemingly irrelevant, the child must have processed it at a deep level. Even the distinction between the memory for gist versus detail is no longer a challenge to capture theoretically: Deep processing incorporates memory for relevant information (gist or detail), while shallow processing incorporates memory for irrelevant information (again gist or detail).

Empirical evidence for the levels-of-processing framework comes from memory experiments in which the instructions were manipulated to prompt different levels of processing. An example is a word-memory task: Participants were presented with words and asked to complete a certain task with each item. To prompt deep processing, the task was to categorize the items based on their meaning or how well they would fit in a sentence (semantic categorization). Conversely, to prompt shallow processing, the task was to analyze the typescript of the item or determine whether the word rhymes with another words. As predicted, the specific task instructions affected memory performance: Where deeper processing was used, words were remembered better than where shallower processing was used.

Confirming patterns of results were found in both intentional-learning tasks (i.e., when participants were told they would be given a recognition test), as well as in incidental-learning tasks (i.e., when participants were given a surprise recognition test after they completed the activities with the words). For example, in the incidental-learning task, recognition increased from 15% to 81% when the tasks involve deeper processing, compared to tasks that involved shallower processing. This suggests that the advantage of the deep-level processing is an automatic feature of mental activity.

The levels-of-processing model of memory strongly influenced the thinking about children's memory and learning. For example, it provided a useful framework to capture individual differences in text comprehension, developmental differences in understanding metaphors, and clinical differences related to autism or ADHD. In all cases, the difference in task performance was said to stem from different levels of processing: The deeper the level of processing, the better the memory of what was being learned. Even educational aspects such as math learning was related to levels of processing, especially as it pertains to math anxiety.

Overall, the advantage of conceptualizing memory as a consequence of information processing, rather than as consequence of storage, was in its ability to explain findings that did not fall into the strictly defined terms of storage systems. At the same time, there are also concerns with the approach. A theoretical problem is that the exact level of processing cannot be established independently of memory performance. There are also empirical concerns, for example that shallow processing sometimes leads to durable memory traces. Thus, while influential at its time, the complexity of cognitive activity has forced the field to leave behind the idea of a one-dimensional change in levels of processing. In its place is a multi-dimensional model of information processing, one that includes emotions, motivation, and the social aspects of a learning context.

Further Readings

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