

# How Do We Learn? Four cognitive models explained

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## Introduction

Educational research is driven by an understanding of cognition. Without having some theoretical basis for understanding how students think and learn, there can be no warranted claims about how instructors should teach to maximize student learning and success. However, there seems to be a lack of consensus among cognitive models in the educational research community. This can be a challenge since varying lenses may have different implications for both research and practice. For an educational researcher to choose which cognitive lens will be applied, it is important that one understands these implications. To follow, a general discussion of the predominate viewpoints. ' itucatPan re s For an educational ' Bot





and not readily appraised in isolation" (Strike & Posner, 1992). It is for this reason, they suggested, that misconceptions were so resistant to change. This resistance, according to Strike and Posner (1992), not only sparked thinking about how knowledge was organized in the mind, but also was the underlying research question to be answered by constructivist theories.

To best determine how to elicit and resolve these misconceptions, it is necessary to understand how students are organizing, accessing, and assimilating concepts (diSessa, 2006; Chi, 2008; Strike & Posner, 1992; Taber, 2001; Vosniadou & Ioannides, 1998). There are many theoretical explanations that have been offered to represent the organization of student thought, or their conceptual frameworks.

In studying memory, Bartlett (1932) was said to begin creating the foundation for what is known today as schema theory. He claimed that the purpose of memory is for recollection, assimilation, and acquisition of knowledge and knowledge structures (Bartlett, 1932). Bartlett also studied what caused some information to be remembered and others to be forgotten. In having subjects read a story and reassessing their memory of the story over extended periods of time, he found that most commonly things are remembered (1) that make sense to the reader, fit into her current cognitive structure, and seem relevant, (2) that confuse the reader so much that it creates cognitive dissonance, (3) that are relevant to the reader's social and emotional state at the time of reading, (4) that are consistent with the reader's initial recollection, and (5) that are related to the general order or structure of information within the story (Bartlett, 1932).

Alba and Hasher (1983) extended on Bartlett's work and proposed that memory, and thus knowledge, may be schematic. A schema, they say, is a selection of domain specific knowledge that allows for adding, storing, and recalling knowledge about that specific content area (Alba & Hasher, 1983). They describe the processes of remembering, or learning, as having five necessary processes (1) selection, in which only relevant information from the environment is acknowledged, (2) abstraction, in which the meaning of the information is determined, (3) interpretation, in which prior knowledge which is seen to be relevant is activated to help with understanding of new information, (4) integration, where the memory or piece of knowledge is actually formed, and (5) reconstruction, where the memory of knowledge is reproduced or recalled at a later time (Alba & Hasher, 1983). From this perspective, to achieve correct, precise knowledge, it seems that students must be given opportunities to draw from the correct prior knowledge a

that learners have built a complex theoretical network to explain the world as they understand it; and if misconceptions exist within the theoretical framework, the theory may become faulty in its explanations of some, or all, of physical phenomena. Conceptual change, under this model requires students to undergo complete theory revision.

In an extensive review of science misconception literature, Chinnand Brewer (1993) found that students are often reluctant to change their incor o

categorization of these concepts based on the mentioned ontological properties by which they are categorized (Chi, 2008). In order for misconceptions to be addressed and conceptu

building upon prior knowledge to create additional normative knowledge. Assessment, I









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