

## Cognitive Information Processing: Part 1

Slide 1	Everyone knows that we use our brains to think, but have you thought about exactly how that is done. This presentation will provide an overview of four theories that offer insights how human being process cognitive information processing. My name is Bill Huitt and I am Professor Emeritus at Valdosta State University and Adjunct Professor at Capella University. The presentation is narrated by Geoff Huitt who is assisting me with the production of these videos.
Slide 2	While behavioral theories focus on overt behavior
Slide 3	such as writing
Slide 4	or demonstrating how to solve math problems
Slide 5	cognitive theories focus on how stimuli received from the 5 senses
Slide 6	are processed internally before action is taken
Slide 7	While there are a variety of information processing theories, the dominant views include
Slide 8	a stage theory,
Slide 9	a levels-of-processing theory,
Slide 10	a parallel-distributed processing theory,
Slide 11	and a connectionist theory.
Slide 12	The stage theory proposes that external stimuli are processed in three stages.

Slide 13	In the first stage, labeled Short-term sensory store or Sensory Memory, information is processed very quickly and then either initially processed and moved into short-term memory or forgotten. The key processing activity is attention.
Slide 14	A stimulus activating the sensory receptors in the eye will only last about one-half second while
Slide 15	a stimulus activating the sensory receptors in the ear will last about three seconds.
Slide 16	If attention is given to the external stimulus, there is an initial processing where the encoding of that stimulus is combined with information stored in long-term memory and pulled into short-term or working memory.
Slide 17	At that point it is either repeated,
Slide 18	acted on,
Slide 19	or forgotten. Without repetition, information is likely to remain retrievable for only 15 to 20 seconds.
Slide 20	However, the learning goal is to have information stored in long-term memory on a relatively permanent basis. That requires some sort of coding and elaboration.
Slide 21	The Levels of Processing theory of information processing has a slightly different view. Rather than hypothesizing three different stages with three different types of storage, the levels of processing theory proposes one overarching type of processing –
Slide 22	elaboration. The developers of this theory proposed three different levels of elaboration. The first is
Slide 23	shallow processing that involves coding the object in terms of its physical properties. For example, do the words all start with capital letters. The second level is labeled
Slide 24	Intermediate processing that involves coding the object in terms of how it sounds or phonemic coding. For example, what is the difference between shallow and structural? Finally,

Slide 25	deep processing is done semantically, with an emphasis on the meaning of the object. Thus, the levels of processing theory proposed that it was the type of elaboration done that impacted whether or not new information was readily retrievable.
Slide 26	The parallel-distributed processing theory critiqued both the stage theory and the levels-of-elaboration theory for proposing that all information processing was done in a serial fashion;
Slide 27	For example, in the original version of the stage theory proposed in the 1960s, it was thought that attention pulled what was in sensory memory which was then maintained there through rote or maintenance rehearsal as it was encoding into long-term memory.
Slide 28	The levels-of-processing theory proposed a similar serial process.
Slide 29	However, the parallel-distributed processing theorists proposed that multiple types of processing were occurring simultaneously in a parallel manner.
Slide 30	The stage model shown previously has incorporated the parallel processing feature of this theory.
Slide 31	Rather than an arrow going straight from sensory memory to short-term memory, this model shows an arrow going from long-term memory to short-term memory. This indicates that what is placed in short-term or working memory is a combination of the stimulus that activated a sensory receptor cell and what was stored in long-term memory that might relate to that stimulus.
Slide 32	Think of this as a cup of tea. In the cup is water, the tea molecules, and perhaps some sugar and milk. Once these are all stirred into the cup, it is very difficult to separate the ingredients into the separate components that made the tea.
Slide 33	In the same way, what is stored in short-term memory is a composite of what was stored in sensory memory as it was combined with what was stored in long-term memory. It is very difficult at that point to separate that memory into its basic components.

Slide 34	Another way that the parallel-distributed processing theory is incorporated in this revised stage theory model is in the two arrows connecting short-term and long-term memory. This dual processing is occurring simultaneously as the individual attempts to understand what is stored in short-term memory. That is, the meaning of what is stored in short-term memory is created in the process of actively working on that memory. This is why short-term memory is often referred to as working memory.
Slide 35	Finally, the connectionist theory advocates that memory is actually
Slide 36	stored in networks and that
Slide 37	the more connections that any specific piece of information has to other pieces of information, the more easily the memory will be easily retrieved.
Slide 38	For example, we have been discussing the information processing theories of memory.
Slide 39	We have discussed four different theories: the stage theory, the levels-of-processing theory, the parallel-distributed processing theory, and the connectionist theory.
Slide 40	We have said that the stage theory and the levels-of-processing theories are similar in that they both proposed that processing occurs in a serial fashion.
Slide 41	However, the parallel-distributed processing theory critiqued those two theories and proposed that information is processed simultaneously in a parallel manner rather than serially.
Slide 42	Finally, we talked about how the connectionist theory suggests that it is not the manner in which the information was originally coded that makes the information more readily available for retrieval, but it is the number of connections that are made among the individual pieces of information.
Slide 43	So, what does all of this mean for educators? How can this information be used to guide instruction
Slide 44	for children,
Slide 45	adolescents or

Slide 46	adults? That is the topic for part two of this presentation.
Slide 47	<p>Huitt, W. (2018). References. In W. Huitt (Ed.), <i>Becoming a Brilliant Star: Twelve core ideas supporting holistic education</i> (pp. 249-311). La Vergne, TN: IngramSpark. Retrieved from <a href="http://www.edpsycinteractive.org/papers/2018-13-huitt-brilliant-star-references.pdf">http://www.edpsycinteractive.org/papers/2018-13-huitt-brilliant-star-references.pdf</a></p> <p>Lutz, S., &amp; Huitt, W. (2018). Information processing and memory: Theory and applications. In W. Huitt (Ed.), <i>Becoming a Brilliant Star: Twelve core ideas supporting holistic education</i> (pp. 25-43). La Vergne, TN: IngramSpark. Retrieved from <a href="http://www.edpsycinteractive.org/papers/2018-02-lutz-huitt-brilliant-star-information-processing.pdf">http://www.edpsycinteractive.org/papers/2018-02-lutz-huitt-brilliant-star-information-processing.pdf</a></p>
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