Cognitive Information Processing: Part 2

Slide 1	Welcome to Part 2 of an introduction to the cognitive information processing theory. In this presentation we will focus on how to use some of the concepts and principles identified in cognitive information processing theories. My name is Bill Huitt and I am Professor Emeritus at Valdosta State University and Adjunct Professor at Capella University. The presentation in narrated by Geoff Huitt who is assisting me with the production of these videos.
Slide 2	Remember that we discussed four theories in part 1.
Slide 3	The stage theory in which researchers found that memory is stored in different structures in the brain.
Slide 4	The levels-of-processing theory which proposed it was the level of elaboration, from shallow based on structure or physical properties, intermediate based on phonemic encoding of sounds, and deep processing based on semantic meaning.
Slide 5	The parallel-distributed processing theory that proposed that information processing occurs simultaneously in a parallel manner rather than serially as proposed by stage and level-of-processing theorists.
Slide 6	And, finally, the connectionist theory that proposed information is stored in networks.
Slide 7	Each of these theories developed concepts and principles that educators can use to engage learners in the learning process and learners can use to self-regulate their own learning.
Slide 8	First, the stage theory proposed that learners must pay attention to the stimuli that activate sensory memory as that is very fleeting. If attention is not given then it is immediately forgotten.
Slide 9	Next, stage theorists proposed that it is beneficial to point out specific information that is most important. This is especially important for considering learner differences. Some learners will understand more than others initially and you want all learners to attend initially to the most important information.

Slide 10	A concept considered important for parallel-distributed processing and connectionist theorists is the importance of connecting new information to prior knowledge. In fact, pointing out what is already known in preparation for presenting new information is one of the most important learning strategies discovered through empirical research.
Slide 11	Both stage and connectionist theories proposed that organizing information so that is presented in a way that allows for chaining or connecting ideas is extremely important. Systematic presentation is made much easier when new information has been organized well.
Slide 12	The stage theory emphasized that repetition is very valuable. It is first important for keeping information in short-term memory so that it can be worked on. This means repeating information with some short intervals that allows some forgetting to occur.
Slide 13	However, it is also important to engage in repetition over days or weeks or even months. Coming back to the same concepts over an extended period of time allows for more and more of the material to be remembered.
Slide 14	Another principle promoted by the stage and levels-of-processing theorists is the strategy of coding. This is the process of using the first letter of the words to be remembered to create a phrase or sentence that can be learned and then decoded at a later time.
Slide 15	For example, we have been working with the information processing theories of stages, levels of processing, parallel-distributed processing, and connectionist. Taking the first letter of each of these terms we have I, S, L, P, and C.
Slide 16	We might imagine ourselves standing in a field and saying, "I smell lambs, poop, and clover." That is one sentence that can be learned and then decoded into the five terms that we want to remember. The sillier the sentence the easier it is to remember.
Slide 17	Finally, all of the theories agree that some sort of elaboration is the key to remembering information in a way that can be more easily retrieved at a later date. Attention and short-term repetition is a good start, but more elaboration such as coding is required If one wants to easily retrieve information when needed. Some examples of elaboration include

Slide 18	asking questions such as who, what, where, when, why, and how as we were taught in our reading/language arts classes. In fact, engaging learners in a skit or discussion or watching a short video and then asking learners what they already know and what to know about the topic is an excellent way to begin a presentation.
Slide 19	Another elaboration strategy is to have learners simply stop for a brief period and reflect on what has been presented or read and what they think about it. Even 15 to 30 seconds of reflection helps in the encoding and remembering process.
Slide 20	A third elaboration strategy is to spend some time thinking of specific examples of how the concept or principle might be applied. Just taking a minute or two to brainstorm possible applications can be quite helpful in remembering new information.
Slide 21	A fourth elaboration strategy is to look at the details of whatever have been presented or read and how these details might be related to each other. This analysis-level thinking has been shown to be a very powerful strategy for increasing what is to be remembered.
Slide 22	A fifth elaboration strategy is to engage in a discussion with others, perhaps after each individual has had time to reflect independently. The strategy of Think-Pair-Square-Share has learners first reflect on their own, discuss with one other person, then discuss in a group of four, and, finally, share their thinking with the entire group. This provides each individual with an opportunity to reflect and discuss and then listen to the views of others.
Slide 23	If everyone has access to a phone or computer, learners could share their views through a Learning Management System or a service like Google Forms. Participants could then analyze the posts in groups of two and then four, for similarities and differences and create categories for the different views. This combines three different types of elaboration: reflection, discussion, and organization.
Slide 24	These different types of elaboration were considered by Bloom and his associates when they developed a taxonomy of learning objectives for the cognitive domain in 1956. The idea of the taxonomy is that there is a hierarchy from less elaboration to more elaboration with mastery at each lower level required before moving to a higher level.
Slide 25	The first level of Bloom's taxonomy was knowledge.

Slide 26	By this is meant that the learner could write or list or name a specific fact or set of ideas. At this level the learner is simply repeating what has been seen, read, or heard so there is essentially no elaboration. However, this is useful for keeping information in short-term or working memory so that it can be elaborated on.
Slide 27	The next level in Bloom's taxonomy is comprehension.
Slide 28	At this level the learner can explain or summarize or paraphrase. That is, the learner has elaborated enough to put the information into his or her own words based on a connection to the individual's prior knowledge.
Slide 29	The next level in the taxonomy is application
Slide 30	at which point the learner is able to use the information to solve a fairly structured problem or is able to demonstrate understanding by creating a specific example and explaining why that example is relevant.
Slide 31	The fourth level of taxonomy is analysis
Slide 32	at which point the learner is able to compare and categorize by considering the elements or details and developing groups based on similarities and differences. This is a major step from the previous three and learners who have achieved this level for specific information can readily retrieve it months and even years later.
Slide 33	The fifth level of Bloom's taxonomy is synthesis
Slide 34	at which point the learner is able to create or design a new product or service that is original to the learner. This is often referred to as creative thinking in the literature.
Slide 35	The sixth and last level of the taxonomy is evaluation

Slide 36	where the learner is able to critique or justify concepts, principles, or other ideas and products or services based on some a priori standard or criteria. This is often referred to as critical thinking in the literature. Remember the elaboration technique of coding where one takes the first letter of a list and creates a silly sentence. The sentence I created for remembering Bloom's Taxonomy was
Slide 37	Killing Cats Almost Always Seems Evil. Once I memorized that one sentence, I could then decode the first letter of each word back into the levels of the taxonomy.
Slide 38	In 1992, Anderson and Krathwohl revised the taxonomy, changing the original terms into verbs. Their levels were remember, understand, apply, analyze, evaluate, and create. Notice that the levels are in the same order as the original taxonomy with the exception of synthesis and evaluation which are now reversed in order and labeled evaluate and create. Pause the video at this point and create a silly sentence for R, U, A, A, E, and C to help you remember the revised taxonomy.
Slide 39	Did you create something you can remember easily? If it makes you smile that is good; if you laugh out loud that is even better.
Slide 40	Research on the taxonomy since it was originally published has show that the first four levels of knowledge/remember, Comprehension/Understand, Application/Apply, and Analysis/Analyze are definitely a hierarchy. That is one must master a lower level before moving to competency at a higher level.
Slide 41	However, there is no substantial research base for differentiating synthesis/create and evaluation/evaluate as a hierarchy. Both seem to be equally difficult and dependent on analysis rather than on each other. In fact, the research on problem solving suggests that both are needed for solving poorly-structured problems or problems beyond the application level.
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