

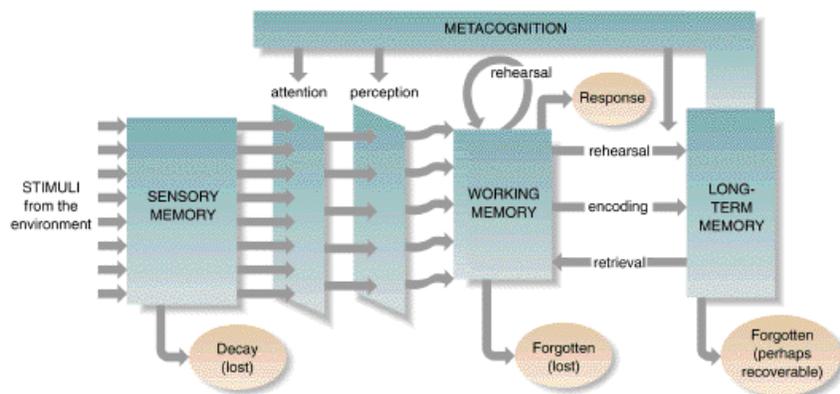
Sensory and Working Memory

- **Cognitive Learning theories “explain learning by focusing on changes in internal mental processes that people use in their efforts to make sense of the world” (Eggen & Kauchak)**
- **Learning is “a change in a person’s mental structures that provides the capacity to demonstrate changes in behavior” (Eggen & Kauchak)**

What Information Processing work has taught us . . .

- Cognitive resources are limited
- Automaticity allows for more efficient use of cognitive resources
- Meaning drives memory

Information Processing Model



Sensory Memory

- A memory buffer holding sensory input
 - *Function*: Gather information from the environment
 - *Capacity*: large
 - *Duration*: short
 - *Getting it in*: sensation
 - **Iconic Memory** (visual)
 - ~ 0.5 seconds (video camera)
 - - **Echoic Memory** (auditory)
 - ~ 4 seconds (tape recorder)

Two important implications of SM:

Teachers should recognize capacity limitations and rate of decay of new information so as not to overload students

Teachers should cue students to focus their selective attention to what is most important

Selective Attention

Strategically allocating our limited resources to important information

Working memory

Rehearsal—retaining information in WM

–**Maintenance rehearsal**—repeating information over and over

- In general: The longer information is held in working memory, the greater the chance it will make it into LTM.

- Repetition*

–**Elaborative rehearsal**—associating information to be learned with information already stored in LTM.

- e.g. -- association between pre-existing meaningful information with new, incoming information.

- More associations = better chance of storage in LTM

- Meaning*

2 Ways to “Beat the Bottleneck”



- Background knowledge and experience-- automaticity
- Organizational strategies-- mnemonics, chunking

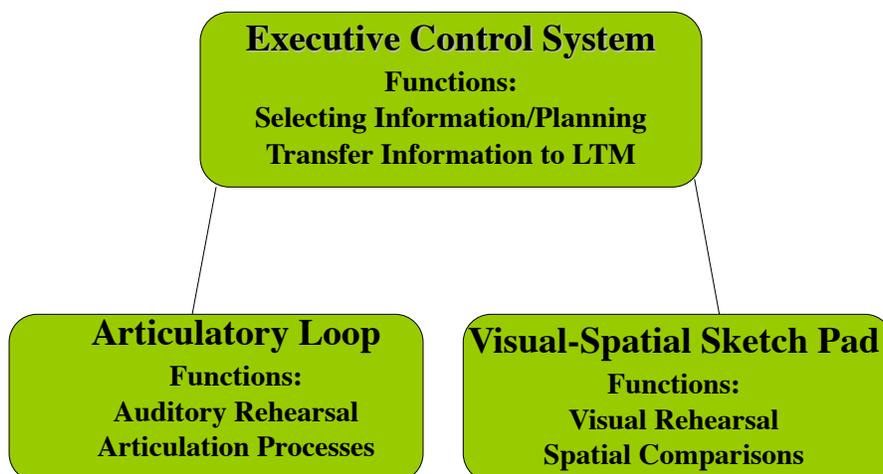
Automaticity

Overlearning information or operations to the point where they can be used with little mental effort

Working memory and reasoning?

- **Some have argued that working memory is the key predictor of intelligence or for performance on intelligence/reasoning tests (Kyllonen & Christal, 1990)**
- **Current theories focus on the effectiveness of processing information while blocking out interference as the best indication of one's working memory ability**

Baddeley's Theory of Working Memory



So What... (instructional implications)

- Use both **visual** and **verbal** format in teaching. Especially for complex information.
- **Automate** basic skills (reading, writing, math)
- Teach students to use **external representations**
 - Relieve pressure on bottleneck so that student can work on individual pieces of the problem
 - notes
 - models

Educational Implications

- Consider engaging multiple modalities, especially for complex information, in teaching and learning activities
- Automate basic skills (reading, writing, math). Automaticity is the key to overcoming resource limitations!
- Teach learners to use external representations
- Assist learners to develop effective elaboration-based strategies
- WM capacity is highly predictive of initial performance on novel reasoning tasks