# The Information-Processing Approach



#### A Model of the Memory System



## Memory's Time Frames

Sensory Memory – Retains information for an instant Visual, Auditory, and other sensations

Short-Term Memory – Limited capacity; 7 +/- 2 bits of information retains for 30 seconds without rehearsal

Long-Term Memory – Unlimited capacity over a long period of time

# Cognitive Resources: Capacity and Speed of Processing

- Developmental Changes Increases in capacity and speed of information processing
- Contributions of **biology** and **experience** 
  - Brain Structure (e.g., changes in frontal lobes)
  - Neural: synaptic pruning fewer but stronger connections
  - Neural: myelination (completed by adolescence) increases speed of electronic impulses
  - Practice of skills: well-learned skills are implemented with greater speed & less demand on cognitive capacity

## Mechanisms of Change

- Encoding: getting information into memory
- *Automaticity:* processing information with little effort
- Strategy construction: discovering new processing procedures
- Self-modification: represented by metacognition, "knowing about knowing"

# The Information Processing Approach: What Is Attention?

Attention is the focusing of mental processes

- Selective attention
- Divided attention
- Sustained attention
- Executive attention

# Developmental Changes in Attention

- Increase in selective attention
- Increase in attention span
- Increase in *cognitive control* of attention; less impulsivity
- Increase in attention to *relevant* stimuli

#### Getting Students to Pay Attention



# Information Processing Approach: What is Memory?

*Memory* is the retention of information over time.



#### Developmental Changes in Memory



# Working Memory Links to Development

- Older children have greater capacity in working memory
- Children who have better working memory are more advanced in reading comprehension, math skills, and problem solving
- Are these differences due to brain maturation or automaticity of cognitive skills?

#### A Model of the Memory System



#### **Encoding Strategies**



## Contents of Long-Term Memory



# Representing Information in Long-Term Memory

#### **Network Theories**

- Nodes stand for labels and concepts
- Network is somewhat irregular and distorted

#### **Fuzzy Trace Theory**

 Both verbatim and "gist" memory traces

#### **Schema Theories**

- Schemas: Concepts,
  knowledge, information
  about events that already
  exist in the mind and
  influence the way we
  encode information.
- Scripts: A schema for an event, e.g., going to a restaurant

#### Classic Problems:

Understanding The Balloon Story



John Bransford Vanderbilt Univ. A Founder of Cognitive Psychology If the balloons popped the sound wouldn't be able to carry since everything would be too far away from the correct floor. A closed window would also prevent the sound from carrying, since most buildings tend to be well insulated. Since the whole operation depends on a steady flow of electricity, a break in the middle of the wire would also cause problems. Of course, the fellow could shout, but the human voice is not loud enough to carry that far. An additional problem is that a string could break on the instrument. Then there could be no accompaniment to the message. It is clear that the best situation would involve less distance. Then there would be fewer potential problems. With face to face contact, the lesser number of things could go wrong.

#### Classic Problems:

Understanding The Balloon Story



#### Watching a Peace March from the 40th Floor

The view was breathtaking. From the window one could see the crowd below. Everything looked extremely small from such a distance, but the colorful costumes could still be seen. Everyone seemed to be moving in one direction in an orderly fashion, and there seemed to be little children as well as adults. The landing was gentle, and luckily the atmosphere was such that no special suits had to be worn. At first there was a great deal of activity. Later, when the speeches started, the crowd quieted down. The man with the television camera took many shots of the setting and the crowd. Everyone was very friendly and seemed glad when the music started.

#### **Space Trip to an Inhabited Planet**

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# Strategies for Helping Students to Improve Their Memory

- Motivate children to remember material by understanding.
- Assist students in organizing what they put into their memory.
- Teach mnemonic strategies
  - Method of loci
  - Rhymes (e.g., alphabet song)
  - Acronyms (e.g., HOMES for the 5 great lakes
  - Keyword method