Chapter 8
Information Processing
Theory
Overview

• The Information Processing View of Learning
• A Model of Information Processing
• Metacognition
• Technology As an Information-processing Tool
The Information Processing View of Learning

- Assumptions
  - Information is processed in steps or stages
  - There are limits on how much information can be processed at each stage
  - The human information processing system is interactive
A Model of Information Processing

- The Sensory Register
  - Capacity
    - Very large
  - Duration
    - 1 to 3 seconds
  - Contents
    - Raw sensory data (encoded in same form as perceived)
A Model of Information Processing

• The Nature of Recognition
  • Noting key features of a stimulus and relating them to already stored information

• The Impact of Attention
  • Selective focusing on a portion of the information currently stored in the sensory register
  • What we attend to is influenced by information in long-term memory
A Model of Information Processing

• Short-Term Memory
  • Capacity
    – 7 +/- 2 chunks of information
  • Duration
    – 20 to 30 seconds
  • Contents
    – What you are currently thinking about
      (information from the sensory register and
      information from long term memory)
A Model of Information Processing

• Rehearsal
  • Maintenance Rehearsal (rote rehearsal, repetition): Information is repeated over and over again with no effect on long-term memory storage
  • Elaborative Rehearsal (elaborative encoding): New information is related to knowledge already stored in long-term memory
A Model of Information Processing

- **Organization**
  - Putting interrelated pieces of information into chunks
- **Meaningfulness**
  - When new material can be related to information in long-term memory
- **Visual Imagery Encoding**
  - Generating images in your mind of objects, ideas, and actions
    - Dual coding theory
## Implications for Instruction: Short-Term Memory and Its Control Processes

<table>
<thead>
<tr>
<th>Research Findings</th>
<th>Implications</th>
</tr>
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<tbody>
<tr>
<td><strong>Rehearsal</strong> prevents the quick disappearance of information from short-term memory. Most children do not begin to rehearse on their own until about age seven.</td>
<td>All children, especially younger ones, can benefit from being taught rehearsal techniques.</td>
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<tr>
<td><strong>Organization</strong> of material into chunks makes it much easier to remember.</td>
<td>Teachers can aid students by presenting material in logical chunks and by showing students how to organize information on their own.</td>
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## Implications for Instruction: Short-Term Memory and Its Control Processes

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<td><strong>Meaningful learning</strong> occurs when the learner relates new information to prior ideas and experiences.</td>
<td>Teachers should mediate learning by relating new information to students’ cultural knowledge and by helping students to learn techniques of self-mediation.</td>
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<td><strong>Visual imagery</strong> is easier to recall than abstractions.</td>
<td>Teachers should help students develop learning skills that incorporate visual imagery and other memory-aiding techniques.</td>
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A Model of Information Processing

• Long-Term Memory
  • Capacity
    – Unlimited
  • Duration
    – Permanent, long-term
• Contents
  – Schemata
A Model of Information Processing

• How Information is Organized in Long-Term Memory
  • Schemata
    – Interrelated networks of associated ideas into which new knowledge is assimilated
A Model of Information Processing

• How Well Do We Remember What We Learn in School?
  • More than 7 out of 10 studies reported less than a 20% loss of what was learned.
  • Subject matter that had a higher than average level of unfamiliar facts and for which students would have little relevant prior knowledge was associated with increased levels of forgetting.
  • Most of the forgetting of information occurred within 4 weeks after the end of a unit of instruction.
A Model of Information Processing

• How Well Do We Remember What We Learn (cont’d)?
  • Less forgetting occurred among students who learned the material to a high level either by being required to achieve a high score, teach it to less knowledgeable students, or take advanced courses.
  • Less forgetting occurred in classes where students were more actively involved in learning.
Metacognition

• The Nature and Importance of Metacognition
  • Metacognition is our knowledge about attention, recognition, encoding, storage, and retrieval and how those operations might best be used to achieve a learning goal
Metacognition

• The Nature and Importance of Metacognition
  • contains what we know about how person variables, task variables, and strategy variables affect learning
  • thus determines the extent to which students can be strategic learners
Metacognition

• Age Trends in Metacognition
  • Primary grade children have limited knowledge of:
    – their memory capability
    – factors that affect reading comprehension and recall
    – the need to tailor learning tactics to task demands
    – when they have learned something well enough that they can pass a test
  • Metacognitive knowledge develops with age, experience, and instruction
Technology as an Information-Processing Tool

- Technology Tools for Writing
- Technology Tools for Reading
- Technology Tools for Science and Math
- Technology Tools for Art and Music
- Multimedia, Hypermedia, and Virtual Environments