Announcements

- All readings on e-reserves
- Office hours Kaya F 11-12
- All notes to date on webpage:
  
  http://cogsci.ucsd.edu/~deak/classes/TEP115/index.htm
Check on Byrnes Ch. 3 comprehension

1. True or false: Rehearsing information makes it more likely that you can recall it later.

2. True or False: The sensory buffer stores very little information for long periods (minutes or hours).

3. The two working memory (or “rehearsal”) systems are for ________ information and for ________ information.

4. We forget most of what we will forget during the [a. beginning] [b. middle] [c. end] of a delay period.

5. Why does the method of loci works for recalling items (e.g., vocabulary words)?
The Structure and Function of Human Memory

- **Encoding:** Moving it into working memory
  - The “tape loop” and the “sketch pad”
  - Developmental changes

- **Storage:** A permanent home?
  - What’s the code?
  - How young children remember events
  - Forgetting and interference

- **Retrieval**
  - Context effects
  - Developmental changes
Encoding Information: The Verbal and the Spatial

- The Phonological Loop
  - Interference in remembering:
    - real/nonsense words > instrumental music > pulsed noise = 0
  - Word-length effect

- Visuo-spatial sketch pad
  - Records relative positions of parts and objects; orientation & distance/size
Features of phonological WM

- How large is the loop?
  - Miller: “magic number” 7 ±2 ...units of what?
  - Chunks: meaningful units of information:
    
    | 2 9 5 3 8 4 1 0 5 2 6 9 |
    | 1 4 9 2 1 7 7 6 2 0 0 0 |

- How long do chunks stay in the loop?
  - Up to 1 min

- What gets lost from the loop?
  - Serial position effects: Primacy and recency
Developmental Changes in Memory

- Maturational changes:
  - Processing speed? Capacity?
- Chunks get larger with age (why?)
  - Effects of knowledge acquisition
- Encoding relevant information improves w/age
  - Susceptibility to interference...
- Encoding strategies
  - Rehearsal
  - Elaboration; association (e.g., method of loci)
- Storage & retrieval
- Metamemory
Content Knowledge and Memory: Facilitating Effects of Familiarity

- Can knowledge increase working memory?
- Knowledge and development:
  - Lindberg: Two lists of words to recall:
    - “Adult” words: window; magazine; island; Baroque
    - “Child” words: Red Rover, Star Wars, Mrs. Williams
- Conclusion: Familiarity aids recall
Ericsson: The Case of S.F.'s STS
Lindberg results...

- 3rd graders:
  - Adult words: 16
  - Child words: 7

- College:
  - Adult words: 14
  - Child words: 6
Interference and Memory

Task (Hagen): recall locations of *animals*
Developing Strategies for Encoding: Rehearsal

- Training: 5-yr-olds learn to rehearse but don’t persist
  - Spontaneous rehearsers: 10% 5-yr-olds; 85% 10-yr-olds

- Is rehearsal effective?
  - Yes: Increases 5-yr-olds’ recall, BUT quality increases w/age

- Concept: Utilization Deficiency
Other strategies

- **Elaboration**
  - More cues = more effective
  - Older children make more out of fewer cues
    - Do older children generate their own (covert) cues?

- **Organization:**
  - Learning useful schemes (e.g., alphabet) vs. learning to use them (i.e., utilization)

- **External Aids:**
  - Retrospective and Prospective memory: Who uses them, and how effectively?
    - Using symbols for recall (Vygotsky!): Eskritt & Lee

Do these aid **ENCODING**, **STORAGE**, or **RETRIEVAL**?
1 vs. 3 cues: effect on recall

![Graph showing the effect of 1 vs. 3 cues on recall for 7-Year-Olds and 10-Year-Olds. The graph displays a clear increase in recall with more cues for both age groups, with 10-Year-Olds generally showing higher recall.](image)
Eskritt & Lee: Using symbols to remember

- Concentration: 1st, 3rd, 5th, 7th-graders
- Opportunity to use notations to remember
- What makes a useful notation?
Development of Storage

- What is remembered?
  - Schemas: taxonomies; scripts; models?
  - Distributed patterns of activation & association
    - What is a memory? What is knowledge?
- Do young children remember events?
  - Since Freud: Concept of infantile amnesia
    - Bauer: 1-year-olds can remember events for months
    - Toddlers & preschoolers: How we talk to them about events shapes their memory of the events
Development of Retrieval

- Recalling events: Older children report more
  - Children might not know what adults want to hear
    - Tend to report prosaic rather than distinctive details
- What do children know about their memories?
  - Source monitoring: “Where did I learn that?”
  - Knowing own limits: “How hard will it be to recall?” and “What can I do to remember it?”
- Knowing when to do a task: Prospective memory
  - Develops during late childhood/adolescence, and relies heavily on meta-memory (i.e., cuing)
  - Important part of self-regulation for academic performance!
How do you study? Remember?

Metamemory in action:

- Strategies for:
  - Studying...
  - Remembering...
# Metamemory: What matters?

<table>
<thead>
<tr>
<th>Process &amp; factors</th>
<th>Before learning</th>
<th>While learning</th>
<th>Maintain learned</th>
<th>Retrieve learned</th>
<th>Reporting learned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Monitor</strong></td>
<td>Ease-of-learning</td>
<td>Judging learning progress</td>
<td>Judging memorability</td>
<td>Feeling-of-knowing</td>
<td>Confidence</td>
</tr>
<tr>
<td><strong>factors in monitor.</strong></td>
<td>task clarity motivation</td>
<td>info hard?</td>
<td></td>
<td>knowledge; context cues</td>
<td>feedback; overlearning</td>
</tr>
<tr>
<td><strong>Control</strong></td>
<td>Choose study process &amp; strategy</td>
<td>Allocate time; strategies</td>
<td>Periodic rehearsal</td>
<td>Choose retrieval strategies</td>
<td>Evaluate accuracy</td>
</tr>
<tr>
<td><strong>factors in control</strong></td>
<td>anticipate demands</td>
<td>learning schedule</td>
<td>delay</td>
<td>available cues</td>
<td>determinacy of info; standards</td>
</tr>
</tbody>
</table>
Development of metamemory

- Knowing own limitations on memory
- Knowing strategies and *why* they work
- Knowing conditions that affect learning and retrieval
  - e.g., effects of distraction
  - e.g., effects of having cues
- Most researchers believe that metamemory is closely tied to academic and study skills
  - Link to expert thinking! (ch. 4) - e.g., novice/expert approach
Summary/Review

Developmental changes in:

- **Encoding**
  - Working memory: from encoding to storage...what changes?

- **Storage**

- **Retrieval**

- **Metamemory**

Connected to school performance; expertise & content knowledge; problem-solving