Memory Strategies and Metacognition

Chapter 6

Memory: Applications

1. We have looked at working memory and long-term memory as basic scientific constructs. We will now look at practical devices of improving these memories.

2. Different memorization strategies aid recall for a variety of content. An essay type exam may require extensive reading, a math exam, learning abbreviations; and a foreign language memorization of new vocabulary use of acronyms.

Memory Strategies
Memory Strategies

1. When you use memory strategies, you perform mental activities that can help you improve your encoding and retrieval (Bransford et al., 2000; Herrmann et al., 2002).
2. Let us review what we have studied so far in the course and see if they relate to this present topic.

Divided Attention

1. Suppose you were engaged in a divided attention task, like paying attention to your cognitive psychology professor and thinking about the coming weekend. Would you retain all what your professor lectures?
2. The answer probably would be, not all. Research confirms that (deWinstanley & Bjork, 2002; Naveh-Benjamin et al., 1998; Payne et al., 1999).

Divided Attention

3. But divided attention can affect us differently. How about preparing for an exam and listening to music at the same time. Is this a good memory strategy to learn for the exam?
4. The answer “it depends”. Depends on the individual who is learning. If he is an extrovert music will have little interference on memory, however if he is an introvert they are more disturbed by such divide attention tasks.
Levels of Processing

1. Clearly the most effective way to memorize a task is to understand it on a semantic level (deep processing) compared to elementary structural processing which is shallow.

2. Deep processing of material entails elaboration, and shallow only maintenance rehearsal.

3. What affects our depth of processing is distinctiveness of material. If the material stands out, it is processed at deeper levels.

Levels of Processing: Self-Reference Effect

4. Depth of processing using semantic procedures work well for explicit but less for implicit tasks.

5. An extreme form of deep level of processing material is the self-reference effect. In which the material to be learnt is related to your own experience.

Encoding Specificity

1. Encoding specificity principle states that recall is better in a context where the original items to-be-remembered were learned.

2. Scuba divers recalled more words underwater if they learnt the list underwater, and recalled more words on land if they learned the list on land (Godden & Baddeley, 1975).
Overconfidence

1. One problem with retrieval of memory is overconfidence. Many a time when we think about flash bulb (autobiographical) memories, we are confident that we remember fine details of the event.
2. But in most cases such confidence is unwarranted, and our memory may be faulty. If the nature of flashbulb memory is flaky, we should not have a lot of confidence in other forms of retrieval.

Practice: Total Time Hypothesis

1. The amount of learning equals the time devoted to it (Baddeley, 1997) is the total time hypothesis, or in other words practice.
2. If total time devoted to a material involves deep processing retrieval will be more accurate.

Learn by Mental Pictures

Recall!
Mass vs. Distributed Practice

1. **Distributed practice** (spaced learning) is generally better than **massed practice**. One learns more if the material is spread over time than if it learnt all at once.

2. Retrieval of information learnt with distributed practice is better for both recall and recognition (Koriat & Helstrup, 2007).

3. Distributed practice introduces **desirable difficulties**, or challenges that motivate the individual to learn.

The Testing Effect

Learning improves if one tests oneself over the material. This called the **testing effect**. Testing effect lingers for longer duration than merely studying the material.

### Mnemonic Devices

1. **Mnemonics** (pronounced as “ni-mon-icks”) are devices that use mental strategies (Hunter, 2004), organize materials, and improve memory.

2. We engage in visual imagery when mnemonics is used. Representation of objects and events mentally that are not physically present constitutes such imagery, e.g., think of mermaid swimming in the ocean.
Mnemonic Devices

3. Visual imagery is powerful in enhancing memory (Einstein & McDaniel, 2004), especially if items to be remembered interact with one another, e.g., *piano-toast*– a piano eating a toast.

4. One reason why such imagery is powerful in making us remember is level of interest caused by bizarre images we form (Worthen, 2006). Also imagery is motivating in many other ways (Hermann et. Al., 2002).

Keyword Method

1. Keyword method was developed by Atkinson and Raugh (1975), and its original intention was to aid foreign language vocabulary.

2. The idea is to find a mediating word (say in English) and associate it to the would be learnt word (say in Spanish).


Keyword Method

4. Keyword method can be used to learn pair-associate words, e.g., linking famous people’s names with their accomplishments (Jones & Hall, 1980) or liking cities with their products (Pressley & Dennis-Rounds, 1980).
Method of Loci

1. Method of loci (pronounced, “low-sigh”) uses imagery of locations and words that can be associated with them.
2. For example a grocery list can be associated with many different rooms in the house.
3. A mental walk through those locations later reminds us of the items we need to by on the grocery list.

<table>
<thead>
<tr>
<th>Grocery Items</th>
<th>House Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charcoal</td>
<td>Backyard</td>
</tr>
<tr>
<td>Pens</td>
<td>Study</td>
</tr>
<tr>
<td>Bed Sheets</td>
<td>Bedroom</td>
</tr>
<tr>
<td>Hammer</td>
<td>Garage</td>
</tr>
<tr>
<td>Rug</td>
<td>Living Room</td>
</tr>
</tbody>
</table>

Memory Organization

1. Visual imagery is not the only way to improve memory retention. Organization is another way which helps us in organizing memory.
2. Categorization or clustering is one way to organize information and leads to high recall compared to control.

<table>
<thead>
<tr>
<th>List</th>
<th>Four Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giraffe</td>
<td>Animals</td>
</tr>
<tr>
<td>Plumber</td>
<td>Vegetables</td>
</tr>
<tr>
<td>Owen</td>
<td>Men’s names</td>
</tr>
<tr>
<td>Lettuce</td>
<td>Professions</td>
</tr>
<tr>
<td>Parsley</td>
<td>Zebra</td>
</tr>
<tr>
<td>Donkey</td>
<td>Noah</td>
</tr>
<tr>
<td>Parsnip</td>
<td>Otter</td>
</tr>
<tr>
<td>Otto</td>
<td>Blacksmith</td>
</tr>
</tbody>
</table>
Memory Organization

Memory can be improved by chunking information.

<table>
<thead>
<tr>
<th>Nonsense syllable list</th>
<th>YMC AJF KFB INB CLT DVT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chunked List</td>
<td>AMA PHD GPS VCR CIA CBS</td>
</tr>
</tbody>
</table>

Memory Organization

1. Memory organization can also be achieved through developing hierarchies.
2. Example below shows how a hierarchy can be used for classroom material.

- Minerals
  - Metals
    - Rare
    - Common
  - Stones
    - Alloys
    - Precious
    - Masonry

First-Letter Method

Make a “word” from the first letters of each word you want to learn (acronym).

<table>
<thead>
<tr>
<th>Violet</th>
<th>Indigo</th>
<th>Blue</th>
<th>Green</th>
<th>Orange</th>
<th>Yellow</th>
<th>Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>()</td>
<td>2&lt;sup&gt;n&lt;/sup&gt;</td>
<td>X</td>
<td>/</td>
<td>+</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

“ROY G. BIV” 
“PEMDAS”
Narrative Technique

Make a story that links-up a series of words (Bower and Clark, 1969).

<table>
<thead>
<tr>
<th>List A</th>
<th>List B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure</td>
<td>Tiger</td>
</tr>
<tr>
<td>Law</td>
<td>Grass</td>
</tr>
<tr>
<td>Jay</td>
<td>Fig</td>
</tr>
<tr>
<td>Tree</td>
<td>Jug</td>
</tr>
<tr>
<td>Cream</td>
<td>Dust</td>
</tr>
<tr>
<td>Lion</td>
<td>Foam</td>
</tr>
<tr>
<td>Pill</td>
<td>Bug</td>
</tr>
<tr>
<td></td>
<td>River</td>
</tr>
<tr>
<td></td>
<td>Nose</td>
</tr>
<tr>
<td></td>
<td>Goat</td>
</tr>
<tr>
<td></td>
<td>Blood</td>
</tr>
<tr>
<td></td>
<td>Sky</td>
</tr>
</tbody>
</table>

Memory Improvement

1. Memory can be improved but requires a comprehensive approach.
2. Douglas Herrmann (1991; 1999; 2002) suggests that in order to improve memory comprehensive steps (multimodal approach) need to be taken including:
   a. Getting good sleep.
   b. Optimal daily activity.
   c. Health keeping.

Mindfulness

1. Mindfulness is another way to comprehensively improve memory.
2. Ellen Langer (2000) suggests that in order to improve memory comprehensively one needs to get sensitive to new things and an appreciation for new ways of approaching a problem.
Retrospective vs. Prospective Memories

<table>
<thead>
<tr>
<th>Retrospective</th>
<th>Prospective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remember events from the past</td>
<td>Remember to perform actions in the future.</td>
</tr>
</tbody>
</table>

### Similarities
- Distinctive Encoding
- Effective Retrieval Cues
- Frontal Lobe of the Brain

Prospective Memory: Research

1. Students were asked to list activities they had planned for 7 days.
2. Only 13% of these activities were forgotten. Users of daily planners not different from control (Marsh et al., 1998).

Prospective Memory: Absentmindedness

1. Absentmindedness adversely affects prospective memory.
2. Absentmindedness for a prospective memory task occurs due to divided attention.
3. Customary schema or habit interferes with a prospective memory task. The individual succumbs to his customary habit and is mentally absent for the memory task.
Improving Prospective Memory

1. Create a vivid, interactive mental image to prompt future recall.
2. Create a specific reminder or an external memory aid.

Metacognition

Metacognition is knowledge, awareness and control of cognitive processes.

a. Knowledge of contents of memory.
b. Awareness of when you are using memory.
c. Control of factors in utilizing contents of memory.
Metacognition: Problems

At times we may not be completely aware of some of the cognitive processes and may have little control over them.

a. Knowledge about the contents of consciousness may be few.
b. Awareness of conscious processes may be arbitrary.
c. Control of consciousness may be weak.

Domains of Metacognition

Three domains of metacognition are:

a. Metamemory
b. Tip-of-the-tongue phenomenon
c. Metacomprehension

Metamemory

1. Under what circumstances does metamemory predict memory performance?
2. Under what condition are you sure that you will be able to remember what you learnt?
   a. Metamemory item-by-item.
   b. Metamemory total score.
Metamemory item-by-item

Subjects rated the word-pairs in terms of future recall. Higher rating led to better recall (Lovelace, 1984).

<table>
<thead>
<tr>
<th>List</th>
<th>Disease</th>
<th>Railroad</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anger</td>
<td>Bridge</td>
</tr>
<tr>
<td></td>
<td>Clear</td>
<td>Hefty</td>
</tr>
<tr>
<td></td>
<td>Heifer</td>
<td>Blatant</td>
</tr>
<tr>
<td></td>
<td>Sallow</td>
<td>Pungent</td>
</tr>
<tr>
<td></td>
<td>Haughty</td>
<td>Jewel</td>
</tr>
</tbody>
</table>

Metamemory and Delay

1. Metamemory is more accurate with delay. Delay provides accurate judgments about contents of memory that are committed to LTM.
2. Practical applications: Making judgments on topics that need more attention... wait a while and then make your assessment. Retention improves.

Metamemory & Total-Score

When people make estimates of their metamemory for the total scores on a test many tend to be overconfident about the scores than being accurate (Dunning et al., 2003).
Tip-of-the-Tongue (TOT)

1. Subjective feeling that you know the word and try searching for it but are unable to recall.
2. Recall of the word may occur later. One TOT a week and perhaps more as we grow old.
3. Brown and McNeill (1966) Gave an obscure definition of a word and asked the subjects to figure out the word that definition asked about.
4. The red coloring matter in the red blood cells.

Hemoglobin

Retrieval

Participant’s recall of the word was better than chance (Brown and McNeill, 1966).

Metacomprension

1. Thoughts about comprehension is called metacomprension. Majority of research on metacomprension is based on reading comprehension.
2. Accuracy about material read for an exam is low for many test taking students. This would represent poor metacomprension.
Certainty & SAT Scores

Students were asked to make judgments about how certain they were on the correctness of answers on SAT. They were similarly certain for both correct and incorrect answers.

![Certainty & SAT Scores chart]

Improving Metacomprehension

1. **Pretest**: Test yourself before you take the real test.
2. **Wait and Summarize**: After reading a passage wait and recollect words and phrases that summarize what you have read.
3. **Elaborative rehearsal**: Use elaboration on your reading material when you commit it to memory.