Encoding in Long-Term Memory

EXP 4404 - Psychology of Learning
Chapter 9

Levels of Processing

Craik & Lockhart (1972)

Proposed that memory retention varied with the type of encoding (or depth of processing) rather than with the amount of rehearsal in STM.

Intentional Versus Incidental Learning

Does the intention to learn influence the quality of encoding or duration of memories?

Intentional Learning Tasks

* The participant knows that memory will be tested
* An effort is made to learn the material (intention to learn)

Incidental Learning Tasks

* The participant is asked to do the task for some bogus purpose (e.g., develop norms for stimuli)
* Assume task is done with no intention to learn the material
* Memory test given at the end of the task is a surprise
Effects of Intention to Learn

- Comparisons of intentional and incidental learning tasks suggest that the intention to learn has no effect on memory quality.
- Memory quality is affected by the quality of the processing task performed.
- When we intend to learn material, we tend to select processing tasks that produce better memory performance.
  - Metacognition: our understanding of the relation between processing tasks and memory performance.

Types of Rehearsal

- Maintenance Rehearsal
- Elaborative Rehearsal
- Levels of Processing
  - Shallow processing
    - Focus on sensory qualities only
  - Intermediate processing
    - E.g., phonological recoding of a visual stimulus
  - Deep or semantic processing
    - Focus on the meaning and associations with prior knowledge

Effects of Orienting Tasks on Memory

- Subjects answered 3 types of questions:
  - Shallow Processing: Physical aspects of the stimulus
    - Is the word typed in capital letters?
  - Intermediate Processing: Phonemic processing
    - Does the word rhyme with weight?
  - Deep Processing: Processing the meaning of the word (Semantic Processing)
    - Does the word fit in the sentence: “He met a _____ on the street?”
Memory Performance as a Function of Orienting Task

Current Status of the Levels-of-Processing Approach

- The problem of defining processing depth
  - Baddeley argues that the definition of processing depth is circular
    - depth is defined in terms of its effect on memory performance (which is what it is intended to explain)
  - Differences between memory for “yes” and “no” responses indicate that the semantic depth definition does not explain all memory performance

Transfer-Appropriate Processing

- Sometimes deep / semantic processing does not produce the best performance on a memory task
- If the memory task requires retention of superficial characteristics (e.g., recall all of the words printed in red ink), a task that orients the person to sensory characteristics will produce better performance
- Need a “fit” between the demands of the memory task and the type of processing
Other Encoding Influences on Memory Performance

- Distinctiveness
  - Unusual or distinctive items are remembered better
  - Encoding that makes an item distinctive from other items will improve memory for that item
  - Von Restorff effect (Isolation effects)
    - the distinctive (or isolated) item “stands out” and is remembered better than other list items
- Effort of Processing - Some Tasks Require More Effort
  - semantic processing
  - generating an item from memory yourself (versus simply reading the item)
  - putting a definition of a new item in your own words requires more effort than memorizing a glossary definition

Generation Effects
Slamecka & Graf (1978)

- Generate Condition
  - What is a synonym for SEA that begins with O?
    - OCEAN
  - What is a word that rhymes with SAVE and begins with C?
    - CAVE
- Read Condition
  - SEA - OCEAN
  - SAVE - CAVE
- Test
  - SEA - ???
  - SAVE - ???

Studies of Encoding - Historical Work

- Ebbinghaus’ work on the learning of new material (1885)
  - first application of experimental techniques to the study of learning in humans
- Development of meaningless syllables to control for the effects of prior knowledge
  - trigrams - CCC or CVC
- Spacing effects during learning
- How new associations are formed during learning
- Loss of memories over time (forgetting)
Massed versus Distributed Practice
- Distributed practice produces memories that are retained for long durations
- Massed practice produces memories that are retained well over short intervals (a few days) but are not retained well for longer durations
- Effects of massed vs. distributed practice depend on the timing of the retention test
  - Immediate tests (1 or 2 days) show better performance with massed practice
  - Delayed tests (2 weeks or longer) show better performance with distributed practice

Expanding Rehearsal
- Combines the benefits of massed and distributed practice
- Initial practice is massed
  - This massed practice establishes a memory trace
- Later practice increases the spacing between repeated practice trials
  - Items that have not been learned continue to be practiced at short intervals
  - Items that are better learned are practiced with increasingly longer times between repeated practice
- Similarity between retrieval-practice effects
  - Retrieval trials both test quality of learning and serve as an additional practice trial

Effects of Organization
- Organizing material requires that we attend to the meaning of the material
  - Organization is a form of deep processing
- Value of Organization
  - New material can be fitted into the existing organization
  - Organization allows material to be grouped (chunked) into related clusters of information
  - The organizational structure can serve as a retrieval mechanism
- Subjectivity of Organization
  - Waiters and bartenders develop unique systems for organizing and remembering orders without writing them down
Role of Imagery

- Paivio (1971) Dual Coding Hypothesis
- Proposed two long-term memory systems
  - Verbal Memory - material stored as a verbal code
  - Imaginal Memory - material stored as a visual image
- Evidence to support the use of imagery codes in memory
  - superior memory for pictorial information (Standing, Conezio, & Haber, 1979)
  - value of imagery in mnemonic techniques

Mnemonic Devices

- Method of Loci
  - memorize a walk through a familiar place
  - visit specific locations (loci) in the same sequence on the imaginary walk
  - associate new information with each location on the walk
  - take the walk and retrieve each thing to be remembered as you visit each location
- Common technique used by poets, storytellers, and orators in ancient times

Other Mnemonic Devices

- Pegword Technique
  - like method of loci, but an ordered list of words is used instead of a series of physical locations
  - importance of the use of imagery to connect new information to the peg words
- Keyword Technique
  - used mainly in learning foreign language vocabulary
  - create a visual image that is associated to the sound of the word in the new language
  - connect this image to the meaning of the word in English
  - works best for short-term retention only
Pegwords for Encoding & Recall

- One is a BUN
- Two is a SHOE
- Three is a TREE
- Four is a DOOR
- Five is a HIVE
- Six is STICKS
- Seven is HEAVEN
- Eight is a GATE
- Nine is a LINE
- Ten is a HEN

Role of Imagery & Bizarreness

- Must images be bizarre to be useful as mnemonic devices?
- Wollen, Weber, & Lowry (1972)
  * presented 4 types of images to use as mnemonic aids
  * 2 separate images that were not bizarre
  * 2 separate images that were bizarre
  * 2 interacting images that were not bizarre
  * 2 interacting images that were bizarre
- Interacting images (those that form a unit or chunk) improved memory
- Bizarreness alone did not improve the ability to recall

What Do Mnemonic Devices Tell Us About “Ordinary” Learning & Remembering?

- Importance of organization
- Importance of deep, meaningful encoding
- Mnemonic associations are self-generated
- Interactive images illustrate the value of chunking
- Encoding includes association with a reliable retrieval cue that will be available at test
What can we learn about memory by studying mnemonic devices?

- Increase the number of retrieval cues
  - Use Elaborate Processing
  - Use Multiple Processing Strategies

- Increase trace strength in memory
  - Deeper processing produces stronger memories
  - Practice increases the strength of memory traces

- Select & Encode retrieval cues that are reliable for you
  - Relate information to prior knowledge
  - Self-test the reliability of your retrieval cues