Retrieval Practice Produces More Learning than Elaborative Studying with Concept Mapping

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Jeffrey D. Karpicke and Janell R. Blunt, Retrieval Practice Produces More Learning than Elaborative Studying with Concept Mapping. Science; 331: 772-75

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Tags
Clinical domain: Medical Expert
Educational domain: Teaching and learning
Educational research

Background
Growing research suggests that simply encoding data (i.e. traditional study – taking notes, generating lists etc.) may not be as effective as concept mapping (i.e. make unique and personalized links between new and existing knowledge - construct a diagram with nodes representing concepts and drawing links between nodes to represent relationships). This construct assumes that learning only occurs with encoding, where elaborate encoding is a more effective way of recalling (i.e. retrieving) information when required later. The assumption is that retrieval (e.g. being asked a question on a test) does not further code information and thus, is educationally neutral in regards to learning.

Purpose
To determine which learning task – traditional study (simple coding), concept mapping (elaborate coding) or retrieval practice (test-retest) – is the most effective for learning.

Type of paper
Research
Key Points on the Methods

- **Traditional study** compared to **concept mapping** compared to **retrieval practice**
- **Experiment #1**
  - 80 undergraduate science students
  - 4 conditions
    - study
    - repeated study
    - concept mapping
    - retrieval practice (study, formative test, restudy, formative test)
  - 1 week later SAQ
    - retrieval practice superior
    - repeated study and concept mapping equivalent
- **Experiment #2**
  - 120 undergraduate science students
  - 2 different educational structures (enumeration – list; sequence – process) to test for generalizability
  - 2 conditions
    - concept mapping
    - retrieval practice
  - 1 week later ½ tested with SAQ; ½ with concept map (to ensure that the testing format did not favour retrieval practice)
    - retrieval practice (significantly) superior
    - interestingly 75% students *predicted* that concept mapping would be superior

Key Outcomes

- Retrieval practice may enhance the diagnostic value of a cue
- Elaboration (concept mapping) increases the number of cues but lessens the diagnostic value of a specific cue
- The long held assumption that ‘measuring memory does not change memory’ may be incorrect.
- Retrieval may be more powerful than encoding.

Key Conclusions

The authors conclude...

“Research on retrieval practice suggests a view of how the human mind works that differs from everyday intuition. Retrieval is not merely a readout of the knowledge stored in one’s mind; the act of reconstructing knowledge itself enhances learning.”
Spare Keys – other take home points for clinician educators

The results are not mutually exclusive, meaning that elaborative coding should not be excluded from educational practice; nor should arbitrary low-order testing simply fill a curriculum. Both concept mapping and retrieval practice may have merit within a curriculum. However, CEs should consider (perhaps counter-intuitively) that practicing retrieval (e.g. repeated testing) is very effective to promote learning.