Research on Learning:
From the Cognitive Psychology Lab to the Classroom

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CONCENTRATE
Focus on one thing and one thing only.

REPEAT, REPEAT, REPEAT!
If you have to remember a list of words, for example, read it once and do this over and over again until you know it. Repeating what you have to remember can help burn the information into your memory.
Memory Laboratory:

Repeat, repeat, repeat --NOT supported!

Implication for Education:

1. Study activities that repetitively “recycle” information may not effectively promote learning and retention.
   - Rereading text
   - Rereading lecture notes

2. Survey of Washington University students (177)
   - 84% reread notes or textbook
   - 55% rate rereading as their #1 study
Rereading Textbook Chapters

Experiment:

- Students read textbook chapters either once or twice.
- Students were given a test consisting of 22 multiple choice questions and 4 short-answer questions requiring explanation.

Callender and McDaniel (2009)
<table>
<thead>
<tr>
<th></th>
<th>Multiple Choice</th>
<th>Short Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immediate Test</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Times Read</td>
<td>58%</td>
<td>38%</td>
</tr>
<tr>
<td>2 Times Read</td>
<td>48%</td>
<td>39%</td>
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</tbody>
</table>
### Results

**Biopsychology Text**

<table>
<thead>
<tr>
<th>Multiple Choice</th>
<th>Short Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Day Delayed Test</td>
<td>23%</td>
</tr>
<tr>
<td>1 Times Read</td>
<td>43%</td>
</tr>
<tr>
<td>2 Times Read</td>
<td>39%</td>
</tr>
<tr>
<td>2 Times Read</td>
<td>27%</td>
</tr>
</tbody>
</table>
Favored repetitive study methods of many undergraduates are not especially potent.

If Not Rereading, Then What Techniques Are Desirable?
The short man bought the broom
The brave man gave the money to the robber
The fat man read the sign
The tall man bought the crackers
The thin man found the scissors
The rich man picked up the chair
The dying man used a feather
The kind man ate dinner
The bald man used the phone
The frightened man ironed the sheet
The dishonest man looked closely at the wrapper.
The smart man went to work
Memory Test
Perspective from Cognitive Psychology

- To students, new information to be learned is arbitrary
- Reduce arbitrary nature of the information

Find ways to relate new (arbitrary) information to what you already know
Answer WHY? (try to explain)

Produces learning and retention
Elaborate by generating a reason for the man—action relation

The hungry man got into the car ... 
*to go to the restaurant.*

The brave man ran into the house ... 
*to save the boy from the fire.*
The sad man looked at his new boat.
The artistic man put down the knife
The sleepy man bought the mug
The evil man wound up the clock
The blind man hit the flea
The bearded man threw out the coupon
The crippled man flicked the switch
The religious man used the saw
The long-haired man looked for the pole
The Irish man counted the leaves
The weak man thanked the check out girl
The patriotic man memorized the words
Memory Test
Cognitive Psychologist: Implications for Undergraduate Education

- It is valuable for students to engage in elaborative learning processes, especially those that reduce arbitrary nature of target information.

Faculty: Implementation

Instructional vehicle?
What content?
Potential penalties for elaborating incorrectly?
Function Learning

Your prediction was 3 units off. Your accuracy score is 91. GOOD JOB!
A graph shows the relationship between the input (absorption of element x) and output (excretion of element y). The graph includes actual output values, predictions from function abstractors, predictions from exemplar learners, and the training range. The x-axis represents the input values ranging from 0 to 160, and the y-axis represents the output values ranging from 0 to 150.
Implications for Basic Learning:

May be principled individual differences that prevail across different high level conceptual tasks (for laboratory materials and tasks):

Some learners tend to orient toward exemplar based representations/processes

Other learners prefer extraction of summary representations (rules)

Implications for Undergraduate Education:

Fruitful to recognize these individual tendencies at outset of a course for more appropriate teaching interventions?