Psychological Research on Student Learning: Basic Principles and Classroom Strategies

Michael B. W. Wolfe

GVSU Fall Conference on Teaching & Learning
August 24, 2011
How does student learning happen?
Traditional answer from Psychology: From studying eg. Tulving & Patkau (1962)
Fundamental assumption: Study episodes elicit learning

Experimental setup:
Study-Test . . . Study-Test . . . Study-Test

Tests are merely assessment tools. They measure learning during study periods, but do not influence learning.
Is studying the primary (or only) means by which students learn?
- Question suggests a new experimental setup.

Part 1:
  Study (read) and more study
  Study (read) and recall what they read

Part 2:
  Wait some amount of time, and see what students can recall.
Effects on memory of studying vs. testing
Roediger & Karpicke (2006)

Expt. 1 Method:
Part 1:
A. Study 2 expository texts
B. 1 text: Study again
   1 text: Recall text content

Part 2: Recall text content
   - 5 min. later
   - 2 days later
   - 1 week later
Effects of testing vs. studying on memory
Roediger & Karpicke (2006)

Results: Part 2 recall performance
Effects of testing vs. studying on memory
Roediger & Karpicke (2006)

Results: Part 2 recall performance
Effects of testing vs. studying on memory
Roediger & Karpicke (2006)

Expt. 2 Method:
Part 1:
   A. Study texts 4 times (SSSS)
   B. Study 3 times / 1 test (SSST)
   C. Study 1 time / 3 tests (STTT)
End of pt. 1 - predict memory one week later

Part 2: Recall text content
   - 5 min. later
   - 1 week later
Effects of testing vs. studying on memory
Roediger & Karpicke (2006)

Results: Memory predictions (1-7 scale)

<table>
<thead>
<tr>
<th></th>
<th>Memory predictions (1-7 scale)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSSS</td>
<td>4.8</td>
</tr>
<tr>
<td>SSST</td>
<td>4.2</td>
</tr>
<tr>
<td>STTT</td>
<td>4.0</td>
</tr>
</tbody>
</table>
Effects of testing vs. studying on memory
Roediger & Karpicke (2006)

Results: Part 2 recall performance
What if instead of just reading, students use an “active” study strategy?
Karpicke & Blunt (2011)

Part 1: Study science text.
A. Study text once
B. Study text four times (repeated study)
C. Study | make concept map of text
D. Study | recall | study | recall
End of pt. 1 - predict memory one week later

Part 2: Short answer test one week later
Memory and inference (application) questions
Karpicke & Blunt (2011)

Concept map:

Blood

- Plasma
  - 90% water
  - Chemical compounds
    - Nitrogen system
  - Made of
    - 9% solids
      - Minerals
      - Protein
    - Vitamins

Cell-like grains

White blood cells

- Disease fighters
  - In bacteria & organisms causing disease
  - Destroy bacteria & organisms

Red blood cells

- Hemoglobin
  - Carries oxygen
  - In veins & arteries
  - Oxygen in lungs
  - Carries oxygen
  - Release to cells
Effects of studying vs. testing on memory
Karpicke & Blunt (2011)
Effects of studying vs. testing on memory
Karpicke & Blunt (2011)
Effects of testing vs. studying on memory

Conclusions:
The “testing effect” - being tested (retrieving info.) improves memory.

- Not present immediately after studying.
- Present after two days / stays big as time passes.
- Helpful for memory and application of knowledge.

Students don’t understand the testing effect.
How to use this information

Inform students of testing as a study strategy.

“Retrieval practice” questions - post open-ended questions at the end of each week.

Low stakes tests - multiple tests, each worth few points.

In-class verbal testing - ask questions of the class.