Cognitive Psychology & Education

1

Bridging the gap between cognitive psychology and education

- Can we (psychologists) apply what we know about learning and memory to improve educational practice?
- This is also a prime example of the relation between basic and applied research.

2

Test-Enhanced Learning

- Tests are typically thought of as assessment tools in education.
- But tests do more than simply measure the contents of memory; they can also improve retention -- Retrieval modifies memory.
- Think about the processes that go into retrieval...
- What happens when you retrieve something?

Robert Bjork

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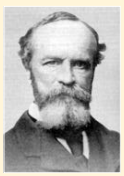
Tests are typically thought of as ASSESSMENT TOOLS.

* But, tests do more than measure the contents of memory; they can also improve retention - retrieval literally modifies memory.

"A curious peculiarity of our memory is that things are impressed better by active than by passive repetition. I mean that in learning by heart (for example), when we almost know the piece, it pays better to wait and recollect by an effort from within, than to look at the book again. If we recover the words in the former way, we shall probably know them the next time; if in the latter way, we shall very likely need the book once more."



William James (1890)

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True retrieval, that is rerieval on your own accord and mind, is far more powerful for increasing memory of said information than that of retreiving the information from another source.

The Testing Effect

Testing has a bad name in education, especially in recent years. Why?

- Testing takes time away from classroom instruction.
- Testing fosters "teaching to the test."
- Testing is bad for creativity and originality.
- Tests are pain in the (_ | _) ... for students, teachers, and TAs.

6

Tests suck: takes time away from classroom instruction, fosters "teaching to the test", testing is bad for creativity and originality, are a pain in the ass for everyone involved.

Spitzer (1939)

- 3,605 sixth-graders (entire pop. in Iowa)
- Given 8 min to read an article on either "Peanuts" or "Bamboo" (~600 words).
- 25-item multiple choice tests
- No feedback

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Spitzer, in 1939, studied 3,605 sixth-graders (all of Iowa). Students were given 8 min. to read about "Peanuts" / "Bamboo". 25-item multiple choice tests, and received zero feedback.

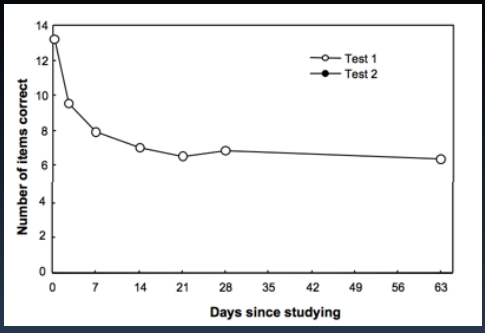
8 Different Testing Schedules

	Time After Studying (Days)						
	0	1	7	14	21	28	63
1	T1	T2					
2	T1		T2				
3		T1		T2			
4			T1		T2		
5				T1		T2	
6					T1		T2
7						T1	
8							T1

8

Students were randomly assigned between 8 different testing schedules.

Test 1



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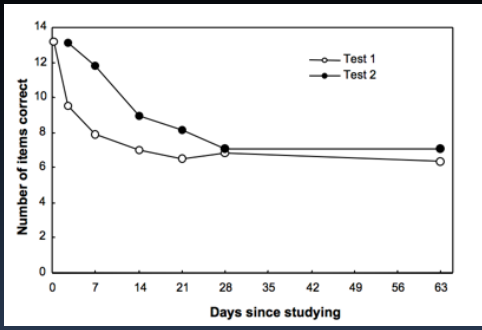
After about two weeks since the first test, the students forgotten nearly everything that they had read prior to the first test.

Test 2



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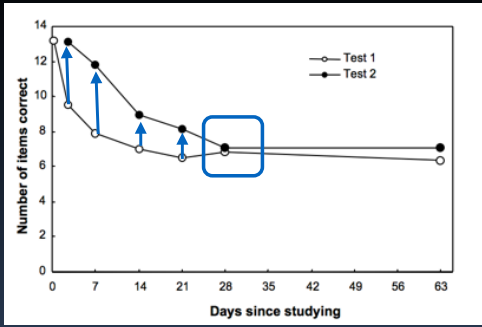
Testing Effect



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The testing effect only really lasts for four weeks before its affects are completely lost.

Why was there no testing effect after 21 days?

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Because those subjects waited too long before taking the initial test.

Testing only provides benefits when you still have information in memory to remember!

The importance of taking the initial test SOON after original learning.

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If you take a test more than two weeks after learning the material or taking a practice test, then you are losing out on the benefits of the testing effect. Testing must not come too soon, but it also cannot come too late after learning the memory.

Try to rehearse new information the day after learning or night of.

The Testing Effect

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Very few things slow forgetting down, but taking a test does.

"A curious peculiarity of our memory is that things are impressed better by active than by passive repetition. I mean that in learning by heart (for example), when we almost know the piece, it pays better to wait and recollect by an effort from within, than to look at the book again. If we recover the words in the former way, we shall probably know them the next time; if in the latter way, we shall very likely need the book once more."

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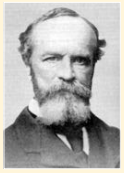

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Does testing enhance retention simply because of the extra time one spends on the material?

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Roediger & Karpicke (2006)

- College students learned two topics.
  - S then restudied the passage (7 min). SS condition

  or
  - S then took a free recall test (7 min). ST condition
- Everyone then took a final test after...
  - 5 min
  - 2 days
  - 7 days

Henry Roediger

Jeffrey Karpicke

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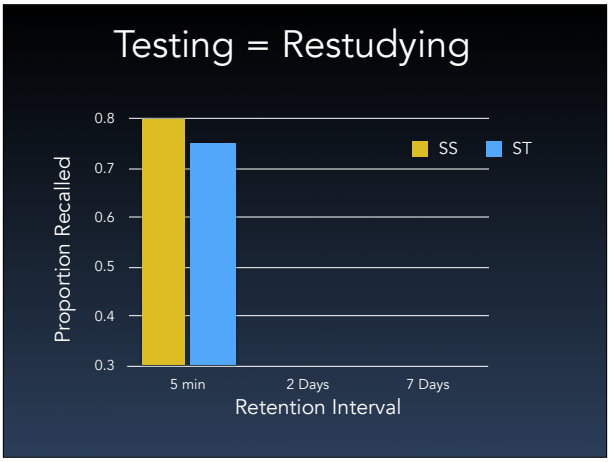
Roediger & Karpicke, 2006, college students learned two topics:

* After reading their assigned topic, one group of students was given an extra seven minutes to reread the article, while the other group was given a free recall test during the same amount of time.

Everyone then took a final test after: 5 min, 2 days, 7 days.



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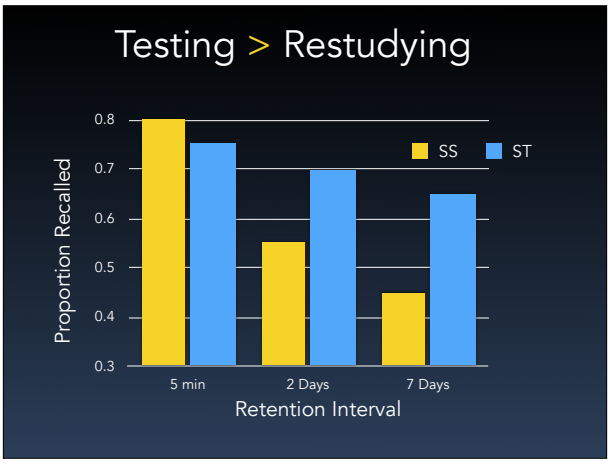
Cramming is only good when you have NO TIME to self test.

* Use it as a final resource.



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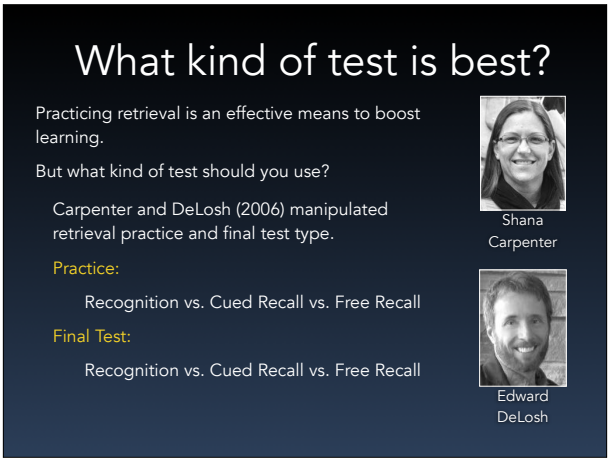
Testing slows down forgetting information by 30%.



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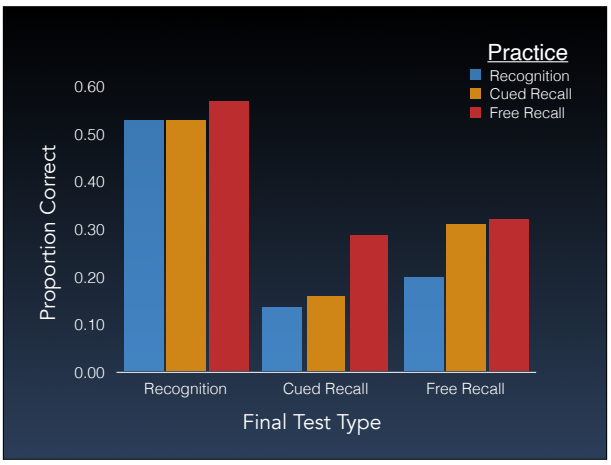
Carpenter & DeLosh, 2006: practicing retrieval is the best means to boosting learning, but what kind of test is best?

Manipulated retrieval practice and final rest type.

* Practice: recognition vs. cued recall vs. free recall.

* Final test: recognition vs. cued recall vs. free recall.



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For every single kind of final exam, both versions of recall (cued & free) cause better affects for retaining information than recognition.

The reason that this difference is not as great for a final test of recognition is because of the fact that recognition allows for random chance at getting an answer correct.

Free recall >= Cued recall > Recognition.

More effortful retrieval leads to better retention.

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What is a good way to study?

How about flashcards?

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3 **Write the answer on the other side.** On the *other side*, write "Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune".

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6 **Test yourself.** When you have made multiple cards, it's time to test yourself. Here's how you do it:

- Pick up the first card and read the key words / phrase;
- Try to recall as much of the information as you can;
- Flip over the card and see if you got the answer(s) right;
- If you're happy you got the information right, put that card on the 'right' pile. If you got the information wrong or incomplete, put it on the 'wrong' pile;

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Edit step

7 **Do this for all the cards.** When you've gone through all the cards, go to the 'wrong' pile, and repeat the process. Keep going through the 'wrong' pile until you get the information right, and there are no cards left in the 'wrong' pile.

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8 **Complete the process.** Then go through the whole lot again for good measure.

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Karpicke & Roediger (2008)

Subjects learned foreign language vocabulary (Swahili - English word pairs) in 1 of 4 conditions.

1) Repeated study and test on all word pairs
2) Once an item is recalled it is dropped from further studying
3) Once an item is recalled it is dropped from further testing
4) Once an item is recalled it is dropped from further studying or testing

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Karpike & Roediger, 2008:

1) Repeated study and test on all word pairs.

2) Once an item is recalled it is dropped from further studying.

3) Once an item is recalled it is dropped from further testing.

4) Once an item is recalled it is dropped from further studying or testing.

Learning Phase

S	T	S	T	Repeated Study and Repeated Test
S	T	S_d	T	Repeated Test Only
S	T	S	T_d	Repeated Study Only
S	T	S_d	T_d	Flash Card Method

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Subjects were also asked to predict how well they will do on a test that will occur one week later.

One week later, all subjects took a final test.

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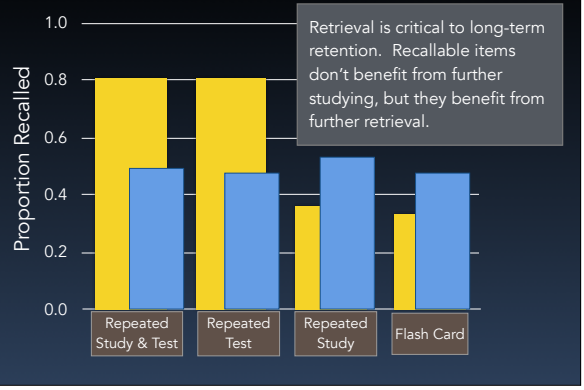
Final Test Performance



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Repeated Study & Test: 80% information remembered.

Repeated Test: 80% information remembered.

Repeated Study: 37% information remembered.

Flash Card: 35% information remembered.

Retrieval is critically important for long-term retention.

What about the nontested stuff?

Given that memory tests change memory performance, an implication for the classroom is that to the extent that questions on a self-test overlap with those on the exam, performance on the exam should be better for students who have self-tested than students who have not.

But what about the questions that appear on the exam but were never self-tested?

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Does testing affect memory for nontested material?

Global warming is caused by increased concentration of CO_2 in the atmosphere.

Burning fossil fuels is one of the main contributors to CO_2 emissions.

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Chan, McDermott, & Roediger (2006)

Day 1

- Read two articles
- For the experimental article, took an immediate test with 12 questions.
- For the control article, no immediate test.

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Chan, McDermott, & Roediger (2006)

Day 2

- Took a final test for each article.
- Each test contained 24 questions.
  - Experimental article:
    - 12 old questions
    - 12 new questions
  - Control article:
    - 24 new questions (because subjects did not take a test on Day 1 for this article)

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Does testing affect memory for nontested materials?

Test this on Day 1 → Old Q: Global warming is caused by increased concentration of CO_2 in the atmosphere.

What happens to this on Day2? → New Q: Burning fossil fuels is one of the main contributors to CO_2 emissions.

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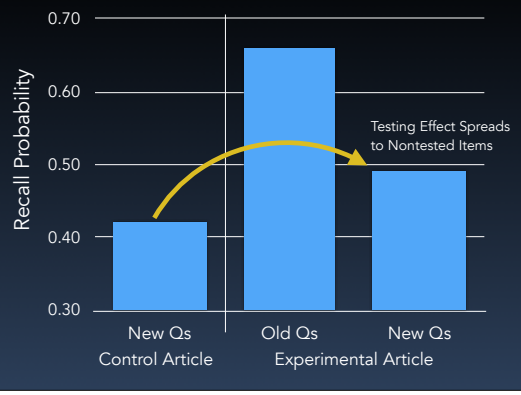
Testing Enhances Retention of Nontested Items



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