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Evidence-Based Teaching in Higher Education: Strategies to Improve Student Learning

Presented by:

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2

Presenters



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3

A Conversation Between
Maryellen Weimer
and
Victor Benassi



4

What is the science of learning?

“the scientific study of how people learn” (p. 3)

Mayer, R. E. (2011). *Applying the science of learning*. Upper Saddle River, NJ: Pearson.



5

The work's being done in labs
and labs aren't like classrooms!



6

But that's changing. What's being done in the academic setting confirms the power of the science of learning.

See: Daniel, D. (2012). Promising principles: Translating the science of learning to educational practice. *Journal of Applied Research in Memory and Cognition*, 1, 251-253.



7

Can the science of learning make teaching more evidence-based?

The answer is a resounding yes!



8

Further support of Victor's answer:

Dunlosky, J., Rawson, K., Marsh, E., Nathan, M.J., Willingham, D. (2013). Improving students' learning with effective learning techniques: promising directions from cognitive and educational psychology. *Psychological Science in the Public Interest*, 14, 4-58.

Roediger, H. L., & Pyc, M. A. (2012). Inexpensive techniques to improve education: Applying Cognitive Psychology to enhance educational practice. *Journal of Applied Research in Memory and Cognition*, 1, 242-248.



9

Two science of learning concepts

Desirable difficulties

Techniques for learning from texts



10

One science of learning theory

Cognitive Load

See this free resource: Benassi, V. A., Overson, C. E., & Hakala, C. M. (Editors). (2014). *Applying science of learning in education: Infusing psychological science into the curriculum*. Retrieved from the Society for the Teaching of Psychology website: <http://teachpsych.org/ebooks/asle2014/index.php>



11

Desirable difficulties

(named and defined by Robert Bjork)

A desirable difficulty describes a situation which makes something harder to learn initially but makes it easier to recall and apply at a later time.

Clark, C. M., & Bjork, R. A. (2014). When and why introducing difficulties and errors can enhance instruction. In V. A. Benassi, C. E. Overson, & C. M. Hakala (Eds.), *Applying the Science of Learning in Education: Infusing psychological science into the curriculum*. Retrieved from the Society for the Teaching of Psychology web site: <http://teachpsych.org/ebooks/asle2014/index.php>



12

You'll find a link to a video of Bjork discussing the desirable difficulties concept in the supplementary materials



13

Two questions about errors:

Should teachers try to avoid them at all costs?

What if students explain things incorrectly to each other?



14

When students give inaccurate explanations. . .

The critical factor is whether the erroneous explanations are corrected and not just with correct information, but with an explanation.



15

Three examples of desirable difficulties

Spacing study

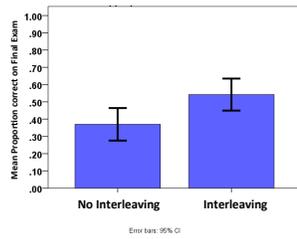
Interleaving

Testing, as in retrieval practice



16

Mean Percent Correct on Final Exam on Choosing the Appropriate Statistical Test



17

Testing, as in retrieval practice

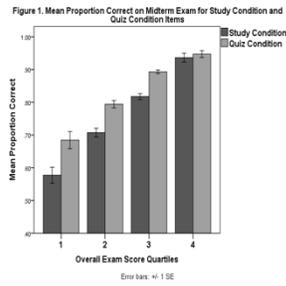


Students can test themselves by answering a question, doing problems or by generating their own questions that they then answer.



18

Research highlights from the work of Roediger and from Benassi and Overson



“Potent Techniques for Learning” chapter by Khugen Nguyen and Mark McDaniel in *Applying the Science of Learning in Education*



What about notetaking when reading texts? Can be helpful, but not always.

What about highlighting? Rarely found to be effective.



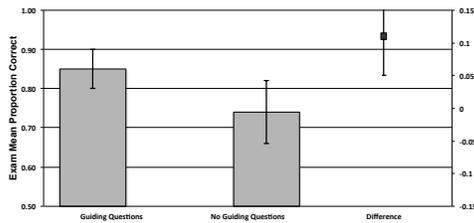
To help students develop college level reading skills consider
Read, Recite, Review (3R)
Relatively low cost in terms of student effort.

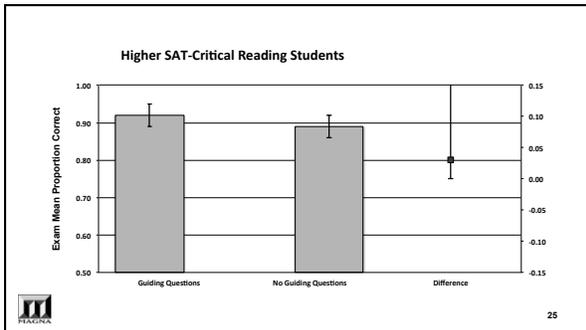


Benefits of adjunct questions for skilled and less skilled readers



Lower SAT-Critical Reading Students





Mean Exam Scores (on left) for questions for which lower SAT-Critical reading (top) and higher SAT-Critical reading students (bottom) either did or did not submit written answers to material assessed on the exam. On the right of each graph is the difference score between the experimental conditions. Error bars are 95% confidence intervals.

Cognitive load –Two definitions

“the demand for working memory resources of a particular learner by specific tasks or activities” (offered by Lee and Kalyuga)

“the amount of concentration required by a task” (offered by Chew)

Working memory is limited

Three kinds of processing “fill up”
working memory

Essential

Extraneous

Generative



28

Cognitive load theory and the amount of
content in courses: any relationship?



29

How can teachers figure out how much
effort a learning task requires?



30

Some suggestions

What we know about desirable difficulties
and the range of proximal learning
The “worked solutions” literature
From cognitive load theory



31

What’s needed to get more teachers
implementing discoveries like these?



32



Tell us what you think

<https://www.surveymonkey.com/r/mos120115/>



Thank you!

33
