Teaching Practices for Students with Brains

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Questions

1. ?

2. ?

3. ?

4. ?

1.

Which is the better study technique?

- to **re-read** notes / the text
- to **try to remember** what is in notes/ the text

2.

Which technique will lead to better long-term learning?

- to learn everything in **one** study session
- to learn a little across **multiple** study sessions

4.

Will asking students to **predict** what we are about to teach them help them learn it better?

Agenda

Four learning principles from cognitive psychology

- Retrieval practice (testing effect)

- Spaced learning (spacing effect)

- Interleaving effect

- Prediction

1. Which is the better study technique?

- to **re-read** notes / the text
- to **try to remember** what is in notes/ the text

Retrieval Practice

Improved memory for items following retrieval practice over mere re-presentation.

_____

"Testing effect"
strengthened memory for material that is tested.

Retrieval Practice

"We should input less and output more" - Robert Bjork

Retrieval Practice in the Classroom

- **Opening questions**- ask students to recall material covered in previous lesson or recently completed homework

- **Online reading checks**- pose retrieval-type questions at the end of every page or section

- **Frequent quizzes**- allow retakes if possible

- **The "retrieving syllabus"**- throughout semester, have students return to syllabus, pick a particular day or session, and retrieve everything they can remember

- **Thinking with retrieval**- require students to do some additional thinking along with the retrieval

- *Small Teaching*, Lang (2016)

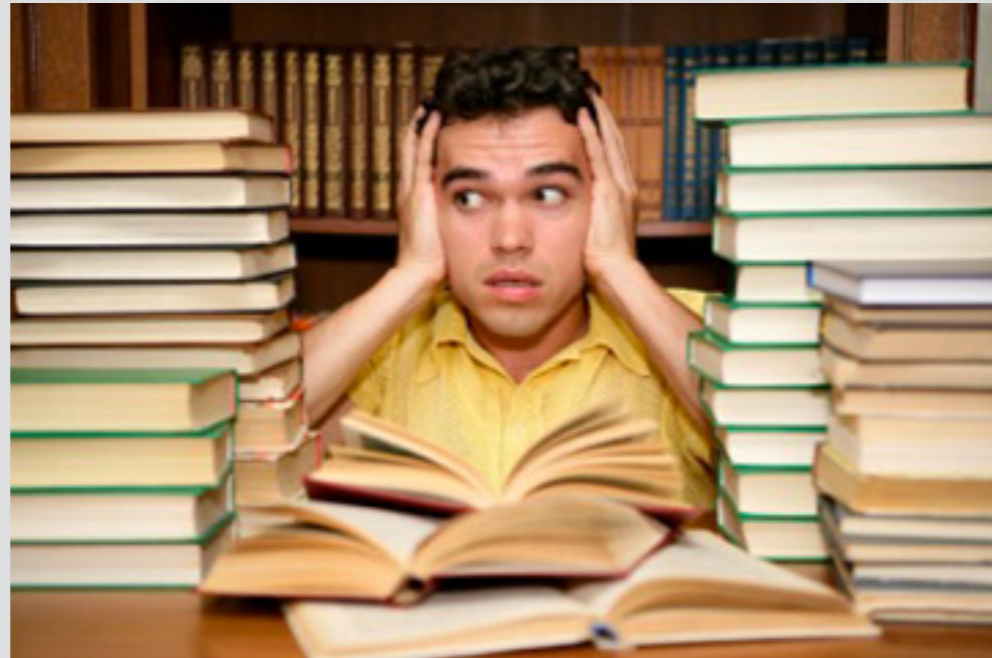**2.** Which technique will lead to better long-term learning?

- to learn everything in **one** study session
- to learn a little across **multiple** study sessions

Spaced Learning

"Spacing effect"

Spaced practice, over massed practice, supports long-term retention

Spaced Learning

- Creates opportunities for retrieval practice.

- More effective consolidation & organization (sleep).

- New learning depends on prior learning.

Spaced Learning

Group 1
Day 1: 30 min

~16/20

Group 2
Day 1: 10 min
Day 2: 10 min
Day 3: 10 min

~16/20

la lune · le télescope · Saturne · la galaxie · le météore · le vaisseau spatial · l'astronaute · la planète · l'étoile
www.FrenchLearner.com

One week later

Group 1
~ 11/20

Group 2
~ 15/20

Bloom & Shuell (1981)

Spaced Learning in the Classroom

Classroom application?

Spaced Learning in the Classroom

- **Return to topics** multiple times throughout the semester.

- **Frequent, smaller assessments**- rather than one or two major exams for the semester

- **Multiple due dates**- break large projects into parts to be completed and submitted at different times rather than all at once

3. Which is the more effective course design?

A

Week 1	Part 1	Part 2	Part 3
Week 2	Part 1	Part 2	Part 3
Week 3	Part 1	Part 2	Part 3
Week 4	Part 1	Part 2	Part 3

B

Week 1	Part 1	Part 1	Part 2
Week 2	Part 1	Part 2	Part 1
Week 3	Part 2	Part 2	Part 3
Week 4	Part 3	Part 3	Part 3

Topic A   Topic B   Topic C   Topic D

3. Which is the more effective course design?

A

Week 1	Part 1	Part 2	Part 3
Week 2	Part 1	Part 2	Part 3
Week 3	Part 1	Part 2	Part 3
Week 4	Part 1	Part 2	Part 3

B

Week 1	Part 1	Part 1	Part 2
Week 2	Part 1	Part 2	Part 1
Week 3	Part 2	Part 2	Part 3
Week 4	Part 3	Part 3	Part 3

Topic A   Topic B   Topic C   Topic D

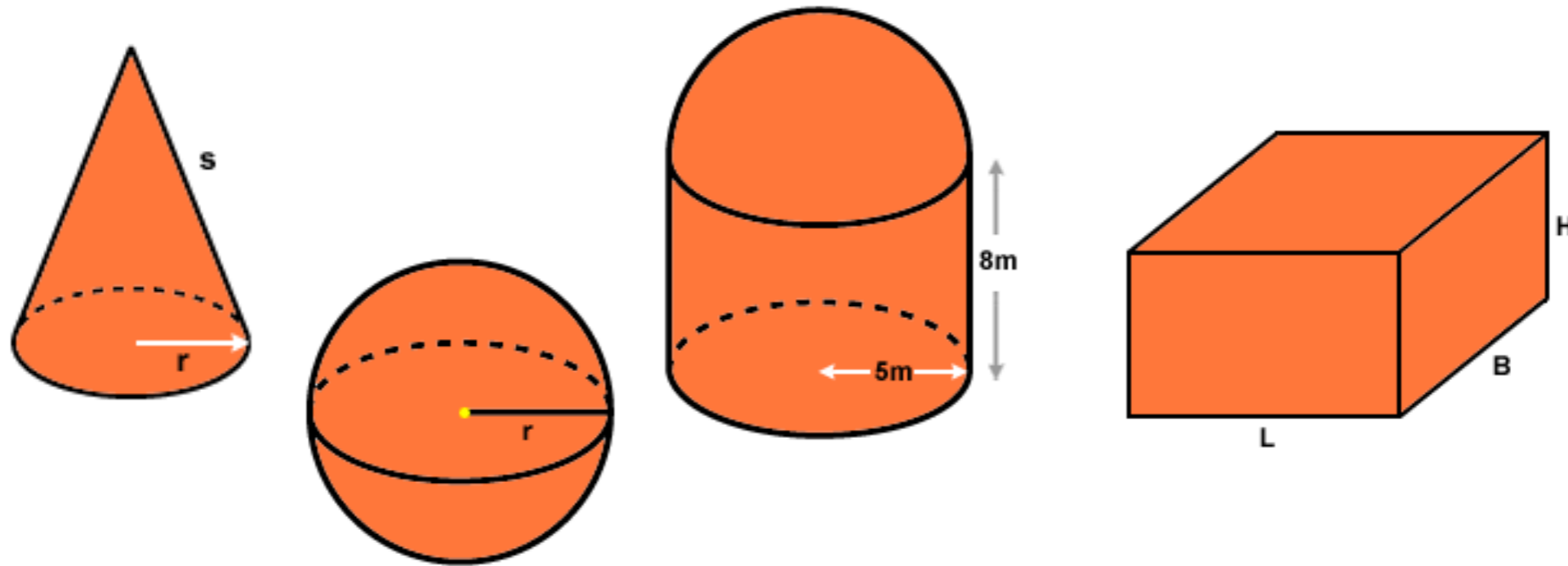# Interleaving

"Interleaving effect"

Mixing related learning activities and topics supports long-term learning and supports transfer to new contexts.

Interleaving

- Participants learned painter styles in blocked & interleaved sessions.

- Despite better learning with interleaved sessions, participants *still* reported blocked learning as helping them to learn better.

Kornell & Bjork (2008)

Interleaving

Participants asked to learn formulas for calculating volumes of different solids, either in blocked or interleaved fashion.
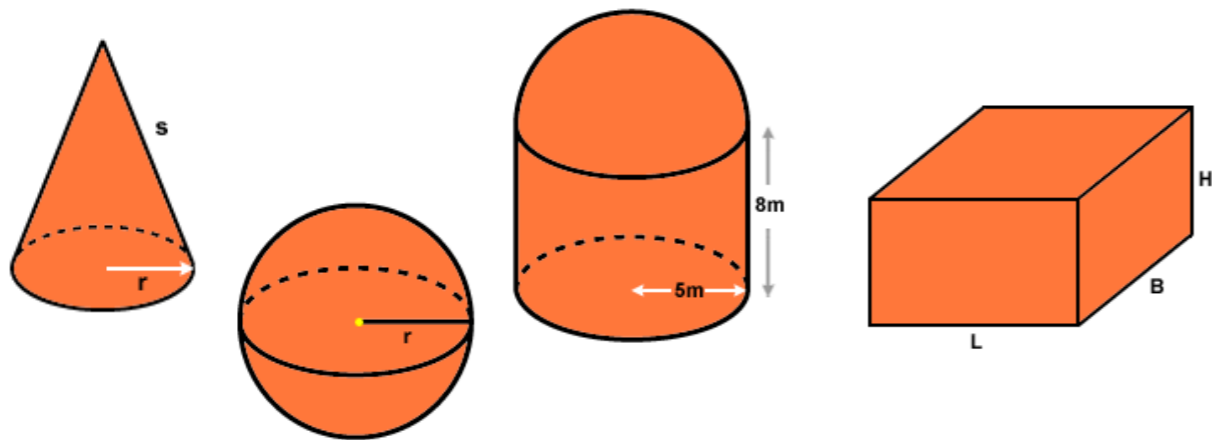
Initial test: Blockers: 89%   Mixers: 60%

1 week later: Blockers: 20%   Mixers: 63%

Rohrer & Taylor (2007)

Interleaving

- Group 1: practiced from a set distance
- Group 2: practiced from closer and further away

- Groups 1 & 2: tested from the set distance after a delay

Kerr & Booth (1978)

Interleaving

- Aids ability to **discriminate** concepts

- Varied practice improves **transfer** to new situations

Kerr & Booth (1978)

Interleaving

The fish is the last to know that he is in water.

Interleaving in the Classroom

- **Don't totally remove blocking**- just add in interleaving

- **Return to course concepts/topics** multiple times throughout semester

- **Cumulative tests & assignments**

- **Provide an agenda/ preview**

- **Provide variation**- lots of examples

quick retrieval practice

What three effects have we learned about so far?

4.

Will asking students to **predict** what we are about to teach them help them learn it better?

Prediction

Making predictions about material to be learned increases the ability to understand that material and to recall it later.

- Activates existing frameworks of knowledge

- Prepares brain to embed the answer into a more richly connected network of knowledge

Prediction

whale   —   mammal

freckle   —   mole

olive   —   branch

mouse   —   hole

Group 1
Each pair: 13 seconds

Group 2
1st word: 8 seconds
Pair: 5 seconds

~55%

~67%

Kornell, Jensen Hayes, & Bjork (2009)

Prediction in the Classroom

Classroom application?

Prediction in the Classroom

- **Pre-learning questions to answer**

- **Pretests**

- **Clicker questions** during class

- **Incorporate critical thinking**
  What would theory, group, or historical person predict?

- **Let students try it out**, even if they are not ready

Resources

Brown, P. C., Roediger III, H. L., & McDaniel, M. A. (2014). *Make It Stick: The Science of Successful Learning.* Cambridge, MA: Harvard University Press.

Lang, J. M. (2016). *Small Teaching*. San Francisco, CA: Jossey-Bass.

Oakley, B. (2014). *A Mind for Numbers*. New York, NY: TarcherPerigee.

Willingham, D. T. (2009). *Why Don't Students Like School?* San Francisco, CA: Jossey-Bass.