Learning is Not Intuitive: How Erroneous Beliefs Lead us Astray & Why Science-Based Interventions Matter

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Is Attitude Important?
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To What Extent and Under Which Circumstances Are Growth Mind-sets Important to Academic Achievement? Two Meta-Analyses

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Is Attitude Important?

• It’s important to believe that what you do matters (to your learning)

There actually are things that you can do to enhance learning!

The Problem:
What exactly one needs to do isn’t intuitively obvious
Learning is Not Intuitive
Learning is Not Intuitive

• There is a pervasive disconnect between people’s beliefs/impressions about learning & the factors that actually help learning
Learning is Not Intuitive

- There is a pervasive **disconnect** between people’s beliefs/impressions about learning & the factors that actually help learning

*One of the biggest obstacles facing successful application of science of learning principles in real learning contexts is the need to **overcome intuition***
Two Examples of the Disconnect

• Learning Styles
• Brain Training Games
Two Examples of the Disconnect

• Learning Styles
• Brain Training Games

81.5% of my Students Endorsed a Statement on the Importance of Adhering to a Student’s Learning Style
Two Examples of the Disconnect

• Learning Styles
• Brain Training Games

47% of my Students Endorsed a Statement on the Benefits of Brain Training Games for Becoming a Better Learner
*It is also a problem of needing to learn not to trust in-the-moment impressions while learning*
Erroneous in-the-moment impressions

- Spacing vs. massing
- Restudying vs. Testing
- Fooled by Fluency/Accessibility
Erroneous in-the-moment impressions

• Spacing vs. massing
• Restudying vs. Testing
• Fooled by Fluency/Accessibility
Erroneous in-the-moment impressions: Spacing

5 hours in one day:
Erroneous in-the-moment impressions: Spacing

5 hours in one day:

1 hour a day across 5 days:
Erroneous in-the-moment impressions: Spacing

5 hours in one day:

1 hour a day across 5 days:

What people *feel* in the moment is leading to more learning
Erroneous in-the-moment impressions: Spacing

5 hours in one day:

1 hour a day across 5 days:

What people *feel* in the moment is leading to more learning

What *actually* leads to more learning
Erroneous in-the-moment impressions: Spacing

5 hours in one day:

What people *feel* in the moment is leading to more learning

1 hour a day across 5 days:

What *actually* leads to more learning

1 hour a day over 5 different days is better than 5 hours in one day
Examples of This Disconnect:
Spacing Flashcards for GRE Vocabulary

Figure 4.2. Participants’ Estimates and Recall for Between-Session Massing Versus Spacing (Kornell, 2009, Exp. 2).

- Massed
- Spaced

Mean Percentage

Estimates    Recall
Examples of This Disconnect: Learning Artists’ Styles from Paintings

Kornell & Bjork (2008)
Examples of This Disconnect:
Learning Artists’ Styles from Paintings

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Examples of This Disconnect: Learning Artists’ Styles from Paintings

What people *think* is most beneficial when asked during learning

Kornell & Bjork (2008)
Examples of This Disconnect: Learning Artists’ Styles from Paintings

What people *think* is most beneficial when asked during learning
Mixing Math

Problem Types

A wedge is the boldfaced portion of the tube. Its bottom is a circle, and its top is a slanted oval. Its volume equals \( \frac{r'h}{2} \pi \).

A spheroid is similar to a sphere. But its height has been squeezed or stretched. Its volume equals \( \frac{4}{3} r'h \pi \).

A spherical cone is the boldfaced part of the sphere. Its bottom is at the center of the sphere. The rim of the cone is on the surface of the sphere. Its volume equals \( \frac{2}{3} r'h \pi \).

A half cone is the bottom half of a cone. Both its top and bottom are circles. Its volume equals \( \frac{7}{3} r'h \pi \).
**Mixing Math Problem Types**

**Blocked Group:** 4 problems all of the same type before 4 problems of the next type.

**Interleaved Group:** 1 of each 4 before another set of 1 of each 4, etc.
Mixing Math Problem Types

![Bar chart showing percentage correct in practice and test.]

- **Practice**
  - Blocked: 89%
  - Interleaved: 60%

- **Test**
  - Blocked: 63%
  - Interleaved: 20%
Erroneous in-the-moment impressions

- Spacing vs. massing
- Restudying vs. Testing
- Fooled by Fluency/Accessibility
Examples of the Disconnect: Restudying vs. Testing

Testing doesn’t FEEL like it is working as well as restudying, yet is more effective than restudying

Kornell & Son, 2009
Erroneous in-the-moment impressions

• Spacing
• Restudying vs. Testing
• Fooled by Fluency/Accessibility
Erroneous in-the-moment impressions

- Spacing
- Restudying vs. Testing
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The most common complaint from students:

“I was shocked I did so poorly on the test. When I was looking at my notes I really felt like I knew this stuff.”
Examples of This Disconnect: Fluency

Rhodes & Castel (2008)

- Predicted Percentage: 49, Recall: 17
- Predicted Percentage: 61, Recall: 17

Mean Percentage vs. Word Size

- Small Word
- Large Word
Examples of This Disconnect: Fluency

Figure 11.2 Mean Predictions and Mean Recall (from Rhodes & Castel, 2009).
Learning is Not Intuitive

• There is a pervasive disconnect between people’s beliefs/impressions about learning & the factors that actually help learning
Does the disconnect lead to poor study habits?

• There is a disconnect between what people think while studying is helping their learning & what actually does help their learning

• This may contribute to poor study habits
Survey of College Students’ Knowledge of Effective Study Strategies

- Test: 67%
- Restudy: 33%

- Space: 90%
- Mass: 10%

McCabe 2011
Survey using Open Ended Questions on Student Study Methods

- 84% of students listed re-reading notes/textbook
- 55% cited re-reading as their #1 strategy
- Practice testing listed by only 11%

Karpicke at al. (2009)
Is Attitude Important?

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What exactly one needs to do isn’t intuitively obvious
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What We Should Do:

• Teach students what is effective
• Provide students with effective learning structures
• Show them that these work