Four Enduring Keys to Adult Learning: What do we know now, that we didn’t know 50 years ago?

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Four Enduring Keys to Adult Learning

Feedback

Prior Knowledge

Testing

Emotions

Adult Learning
Adults also come with prior beliefs.
What if their beliefs are wrong?

The rational brain shuts down when we have strong beliefs about something.

How might we convince them of the error of their thinking?
Consider this:
Introductory physics course to non-science majors

Explained basics of sound
Showed class a violin and explained:

*The strings cannot move enough air to make sound*
*Pointed inside to show strings are attached to the sound post*
*Strings cause back of violin to move; that makes the sound*

*What you hear actually comes from the back of violin*
The sound you hear from a violin comes:

a. Mostly from the strings
b. Mostly from wood in back of violin
c. Equally from both wood and strings
d. None of the above
The sound you hear from a violin comes:

a. Mostly from the strings
b. Mostly from wood in back of violin
c. Equally from both wood and strings
d. None of the above

What % of students got it right?

0%  10%  30%  50%  80%
The sound you hear from a violin comes:

a. Mostly from the strings  
84%

b. Mostly from wood in back of violin  
10%

c. Equally from both wood and strings  
3%

d. None of the above  
3%
What’s going on here?

Telling them involves ‘passive engagement’ of prior knowledge

Unlikely to counter deeply held beliefs or assumptions ...

no matter how credible the source!
What might he have done, instead?

Why might that work better?
Prior knowledge...

Needs to be **actively** engaged, **especially** when it is wrong
Google: “Free ebook on applying science of learning in education”

Prior Knowledge is More Than Content: Skills and Beliefs Also Impact Learning

Susan A. Ambrose
Northeastern University

Marsha C. Lovett
Carnegie Mellon University
Another Recommendation

*How Learning Works: 7 Principles For Smart Teaching*

Four things that influence engagement

- Feedback
- Prior Knowledge
- Testing
- Emotions
What we remember often depends on the emotional significance of an event.
Think back to an emotional experience as a learner.

How long ago?
What happened?
What stands out in your memory?
Relationship between Learning & Emotions

Good Learning & Emotions

Productive Learning Zone

Too Little

Valence?

Too Much

Low --- AROUSAL-EMOTIONS --- High
Emotions vary along two dimensions
Valence also effects learning

Positive

Intensity

Low

High

Valence

Negative

Quadrant A

Quadrant B
Emotions and cognitive engagement

Valence

Positive

Intensity

Low

High

Specific Focus & Recall

Big Picture Focus & Recall

Negative
Emotions and cognitive engagement

Valence

- Positive
- Negative

Intensity

- Low
- High

Global awareness of the situation

Better Transfer

Limited Transfer (Anchoring Bias)

Rigidity of focus on one aspect of information or task at expense of understanding the larger picture
Emotions and cognitive engagement

- **Positive Valence**
  - High Intensity: More creative problem solving, e.g., number of potential solutions
  - Low Intensity: Rely on established problem-solving strategies until given corrective feedback

- **Negative Valence**
  - High Intensity: Rely on established problem-solving strategies until given corrective feedback
  - Low Intensity: More creative problem solving, e.g., number of potential solutions
Emotions and cognitive engagement

They may forget what you said, but they will never forget how you made them feel.
A Recommendation ...

McConnell & Eva.

*The role of emotion in the learning of clinical skills and knowledge.*

*Academic Medicine, 2012, 87:1316-1322.*
A Question:

If your students had only 20 minutes to learn important concepts related to dental practice that had to be recalled accurately a week from now, which of the following would produce the best results? And why?

1. (SSSS) Four study sessions of 5 minutes each;

2. (SSST) Three study sessions of 5 minutes each, plus one 5 minute test of free recall, writing down as much as they can remember;

3. (STTT) One study session of 5 minutes, followed by three consecutive 5 min. tests of free recall, writing down as much as they can remember;

NOTE: No feedback given in any of these options.
One Study (of many):

Three groups of students studied general science concepts:

1. (SSSS) **Four study sessions** of 5 minutes each;

2. (SSST) **Three study sessions** of 5 minutes each, plus one 5 minute test of free recall, writing down as much as they can remember;

3. (STTT) **One study session** of 5 minutes, followed by three consecutive 5 min. tests of free recall, writing down as much as they can remember;

Each group spent a total of 20 minutes with no feedback.

Roediger HL III, Memory Lab at Washington University, St. Louis, MO.
Study Results

Proportion of Idea Units Recalled

SSSS: 83%
SSST: 78%
STTT: 71%

5 minutes
Study Results

Proportion of Idea Units Recalled

SSSS: 40%
SSST: 56%
STTT: 61%

1 week
Study Results

Proportion of Idea Units Recalled

5 minutes

SSSS: 83%
SSST: 78%
STTT: 71%

1 week

SSSS: 40%
SSST: 56%
STTT: 61%
What happens when studying more?
“It keeps me from looking at my phone every two seconds.”
What happens when studying more?

Illusion of Knowing: Belief that because something is easy to remember right now, it will remain that way tomorrow or next week.

**Illusion of knowing** renders us poor judges of what we need to study or practice again.
Getting it wrong improves learning compared to Studying without pre-testing/guessing

Ask them questions before telling them something
Even if they don’t know, encourage them to guess

Pre-testing & Guessing as Active Engagement

Scientific American, Oct. 20, 2009
Making it Stick, Brown, Roediger, & McDaniel, 2014
Exercise in repeated recalling a thing strengthens the memory.

(Aristotle)
To Learn ... Retrieve!

- Repeated & Spaced
- Interleaved & Effortful
- Corrective Feedback

Better:
Transfer to new contexts & problems
Self-assessment & self-regulation
A Recommendation

Make it Stick: *The science of successful learning*

A Question for you:

What does the evidence suggest would be the single most important thing you can do to have a positive effect on students’ learning?

And why?
Research tells us three things about feedback:

1. Teachers say they routinely provide feedback to learners

2. Trained observers report little or no feedback given to learners

3. Learners report receiving little or no feedback to help them learn
Research tells us:

1. Teachers say feedback on learning is routinely provided.
2. Trained observers report low levels or no feedback observed.
3. Students report low levels or virtually no feedback received.

There’s something wrong with this picture.
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Using Feedback to Promote Learning

John A. C. Hattie
University of Melbourne

Gregory C. R. Yates
University of South Australia
Qualities of Effective Feedback:

1. Depends on learner’s interpretation
2. Criteria for success known in advance
3. Focused on task rather than learner
4. Targeted to Zone of Proximal Development
5. Climate where errors are natural and welcomed
6. Difficulties are seen to be normal & productive
That Question:

What does the evidence suggest would be the single most important thing you can do to have a positive effect on students’ learning?

And why?
Feedback that is ...

- **Focused**
- **Frequent**
- **Formative**
- **In advance of high stakes accountability**

Bain 2004

*Medical Education* 45(9) 2011

A Recommendation

Kevin Eva, et al

Factors influencing responsiveness to feedback: on the interplay between fear, confidence, and reasoning processes

Another Recommendation

Ken Bain

What the Best College Teachers Do

Harvard University Press, 2004
Where to from here?
Top Four Recommendations
1st Recommendation

Make it Stick: *The science of successful learning*

2\textsuperscript{nd} Recommendation

How Learning Works: 
7 Principles For Smart Teaching

Jossey-Bass Publishers
3rd Recommendation

Applying Science of Learning in Education:
Infusing Psychological Science into the Curriculum

4th Recommendation

Pratt & Smulders (Fall of 2015).

Five Perspectives on Teaching: Mapping a Plurality of the Good.
For a completely different point of view

The Encultured Brain: An Introduction to Neuroanthropology

Lende and Downey (eds.), (2012).
Thank You