Evidence-Based Teaching Strategies and the Research Behind Them

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Objectives

• Describe 5 evidence-based teaching strategies.
• Explain the research that supports them.
• Discuss applications and adaptations.
I Tried To Kill Personality Tests. I Failed.

This piece appears on the NPR website as part of a package on personality psychology put together by the producers of the show Invisibilia. Twelve years ago, I tried to drive a stake into the heart of the personality-testing industry. Personality tests are neither valid nor reliable, I argued, and we should stop using them — especially for making decisions.

Blog Posts from the Summer Institute on Scientific Teaching

To learn more about the Summer Institutes on Scientific Teaching, visit its website.

What Role Do You Play in a Group? Time To Throw Out the "Leaky Pipeline" Metaphor in STEM To Help People Learn, Go Backwards It's OK For Teachers To Know More Than Their Students Why Students Don't Like Active Learning Why Professors Resist Inclusive Teaching Group Work

Group Work Doesn't Have To Be Annoying and Pointless

My series of posts from the Northeast Summer Institute on Scientific Teaching (collected here) have generated a number of interesting responses from readers—the one titled "Why Students Don't Like Active Learning" in particular. In that post, I noted that research has shown that people are generally poor monitors of how well they're learning and how much they know, and
Why successful strategies work

When they work

How to adapt them to new contexts
Exam Wrappers
Think of a challenging task

- How did you prepare?
- What mistakes did you make?
- How would you change your strategy?
Strategy: Exam Wrappers

Ask students to reflect (in writing) on their study strategies immediately after an exam and when they get the exam back.

Wrapper A

- How do you think you did on this exam?
- How did you study for it?
- Do you think your study strategies were effective?

Wrapper B

- Compare how you thought you performed with how you actually performed.
- How effective do you think your study strategy was?
- Is there anything you’d do differently next time?

Lovett, 2013
Ambrose et al, 2010
Achacoso, 2004
Metacognition

1. Assess the task
2. Assess yourself
3. Plan strategy
4. Monitor strategy
5. Reflect and adjust

Carey et al., 1989
Dunning, 2007
Chi et al., 1989
Dunning-Kruger Effect

- Individuals with low ability overestimate competence.
- Individuals with high ability underestimate competence.

Kruger & Dunning, 1999
Why do exam wrappers work?

• More accurate self-assessment
• Opportunity to reflect and adjust
We don’t learn from experience. We learn from reflecting on experience.

John Dewey
Reappraisal
Reappraisal

I'm nervous about this exam/presentation.

I'm excited about this exam/presentation.
Cognitive Reappraisal

When a high-arousal emotion such as anxiety is redefined as another high-arousal emotion such as excitement, it reduces stress and improves performance better than simply trying to calm down (emotional suppression.)

Cutuli, 2014
Brooks, 2013
Why does reappraisal work?

• Cognitive consistency (unlike suppression)
• Threat mindset → opportunity mindset
Collaborative Testing
Strategy: Collaborative Testing

Use exams as a learning opportunity and put students in groups to take them collaboratively.
Research on Collaborative Testing

Students who take tests collaboratively learn more and develop better critical thinking skills than students who take tests individually.

Eastridge, 2014
Rivaz et al, 2015
Rao et al, 2015
Gilley & Clarkston, 2014
Meseke et al, 2010
Pandey & Kapatinoff, 2011
Why does collaborative testing work?

- Reduces test anxiety
- Builds communication skills
- Builds listening skills
- Leverages “Protégé Effect”
Tip #1: Include an individual component.
Tip #2:
Use for complex content.
Desirable Difficulties
Which is better...

Slides that (A) articulate compete ideas or (B) provide an outline but require students to fill in missing pieces?
Strategy: Use Skeletal Slides

Use slides that compliment lecture but don’t stand alone to make students engage in deeper cognitive processing.
Research on Desirable Difficulties

Students learn more deeply and retain what they learn longer when learning is (reasonably) difficult.

Bjork, 1994
Roediger & Karpicke, 2006
Rohrer & Taylor, 2007
Yue et al, 2013
Bjork & Kroll, 2015
McDaniel et al, 1994
Examples of desirable difficulties

- Testing > restudying
- Generating answers > identifying answers
- Mixed ("interleaved") practice > blocked practice
- Spaced practice > "massed" practice
- Slides that don’t match speech exactly > slides that do
- Imperfect outlines > perfect outlines

Commonality: require deeper cognitive processing.
Caveat #1:
Too much difficulty is not desirable
Caveat #2: Distraction is not a desirable difficulty.
Caveat #3: Desirable difficulties are not always desired.
Why is difficulty desirable?

• Deeper cognitive processing
• More elaborated encoding
• Better learning and retention
Growth Mindset
Avoid talking about intelligence as a fixed trait. Instead, emphasize that intelligence is malleable and evolving.

Strategy: Emphasize a growth mindset
Research on Mindset

People who believe that ability is innate (fixed mindset) are significantly less resilient than those who believe it can be developed with effort (growth mindset.)

Minor interventions can help create a growth mindset.

Carol Dweck, 2006
Research on Stereotype Threat

When individuals from a stereotyped group are anxious about confirming a negative stereotype, it impedes cognitive processes and performance.

Steele & Aronson, 1995
Aronson et al, 1989
Gonzales, Blanton, & Williams, 2002
Franceschini et al, 2014
Ex. Steele & Aronson, 1995

- Black and white Stanford students given a challenging multiple choice test.
  - Group 1: Race was cued
  - Group 2: Race was not cued
- Black students in group 1 showed significantly depressed performance relative to group 2.
Replicated extensively

• Older people and memory tasks
• Women and math/entrepreneurship/science
• Southerners and intellectual ability
• White men and basketball...
Stereotype Threat occurs...

• When the stereotype is relevant to the task at hand
• When the task is challenging
• When the task matters to the individual’s self-identity.
• Whether or not the individual believes the stereotype.
Why does a growth mindset help?

• Emphasizes factors students have power over
• Helps to overcome stereotype threat
Recap

• Use exam wrappers (metacognition, Dunning-Kruger)
• Train students to reappraise anxiety (cognitive reappraisal)
• Consider group testing (collaborative testing)
• Use skeletal slides (desirable difficulties)
• Cultivate a growth mindset (mindset and stereotype threat)
Thoughts?
Questions?
Applications?
Take-aways?
Thank you!
References


