

A Flipped First-Year Calculus Class

Using pre-class explorations to facilitate active learning.

Innovations in New Instructor Training

Brett C. Smith
Yale University

June 22, 2019

Today's Questions.

- Who are our students?
- What type of learning do we expect from pre-class explorations?
- How do we leverage explorations in our classes?

Explorations.

- Accessed on Canvas page.
- Due at 7am on the morning before class.
- One exploration per 50 minutes of class.
- Students have up to 6 attempts to submit (correct answers verified on submission).
- Many questions linked to Desmos for [computing/visualizing concepts](#).

Think - Pair - Share.

What questions do you have about this exploration?

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What questions do you have about this exploration?

- “Doesn't the limit tell you which value the series never passes? Or is it the sum of the whole series??”
- “What's the difference between sequence of partial sums and infinite series? Is there one?”
- “How do we know to find the sequence of partial sums?”

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How much time do you spend on explorations each week?*

Count	Mean	Standard Dev.	Median	Max.
244	1.4 hours	0.82	1.0	5.1

*Self-reported from mid-semester survey.

Interference with Teaching and Learning.

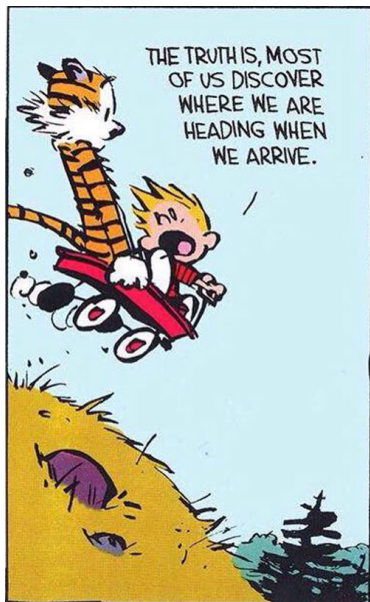
Curse of knowledge:

Tendency to underestimate how long it will take another person to learn something.*

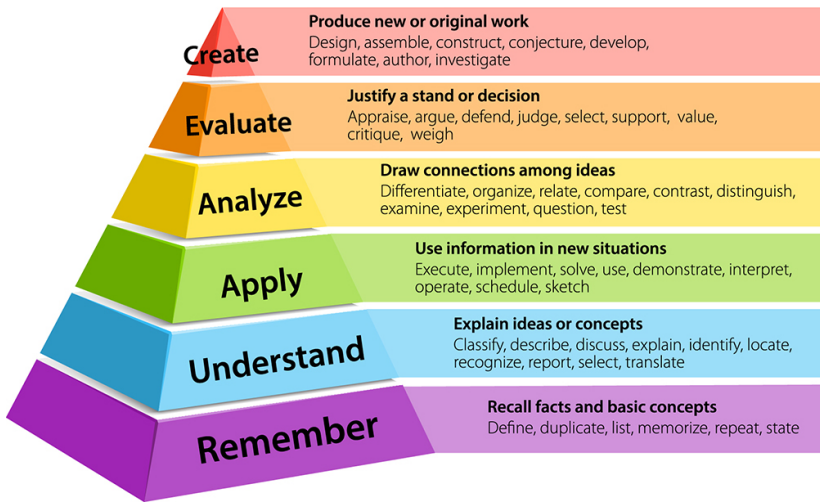
Hindsight bias:

Tendency to view events as more predictable after they occur.*

*D.M. Openheimer, The secret life of fluency, *Trends in Cognitive Science* (2008), 237-241



Bloom's Taxonomy



Poll.

What level of Bloom's Taxonomy is being assessed?

Consider the series, $\sum_{n=1}^{\infty} \ln \left(\frac{n}{n+1} \right)$.

Which expression is the second partial sum?

A $S_2 = \ln \left(\frac{2}{3} \right)$

B $S_2 = \ln \left(\frac{1}{2} \right) + \ln \left(\frac{2}{3} \right)$

C $S_2 = 1 + \ln \left(\frac{1}{2} \right) + \ln \left(\frac{2}{3} \right)$

D S_2 does not exist.

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5. Create

4. Evaluate

3. Analyze

2. Apply

1. Understand

0. Remember

Think - Pair - Share.

What is the effect of adding the hint in this problem?

Think-Pair-Share.

Consider the series, $\sum_{n=1}^{\infty} \ln \left(\frac{n}{n+1} \right)$.

Find a simplified expression for S_n .

Hint: First, simplify expressions for S_2 and S_3 .

Does your answer tell us anything about the value of the series?

5. Create

4. Evaluate

3. Analyze

2. Apply

1. Understand

0. Remember

One Minute Paper.

How does active learning impact the *curse of knowledge* effect when we teach?

One Minute Paper.

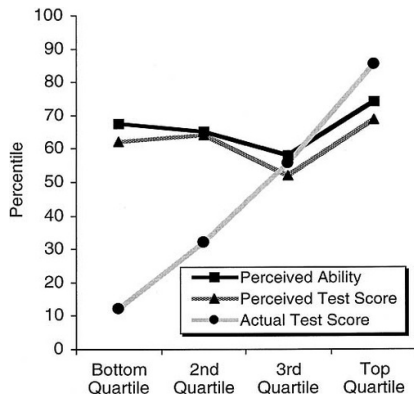
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Think - Pair - Share.

How should we interpret the graph below?

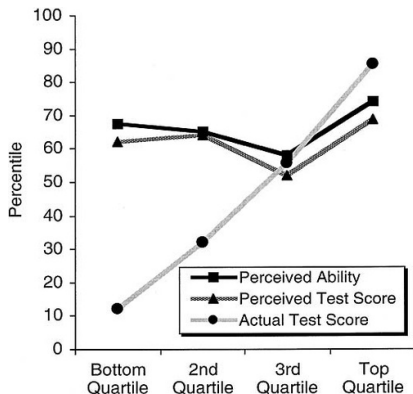


→ Test assessed logical reasoning of undergraduates at Cornell U.

Kruger, J., & Dunning, D. (1999). *Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments*. *Journal of Personality and Social Psychology*, 77(6), 1121-1134.

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Group Work.

Create a “Think-Pair-Share” question about The Divergence Test. Discuss the Bloom’s level(s) assessed in your problem.

The Divergence Test. For any series $\sum_{n=1}^{\infty} a_n$,

if $\lim_{n \rightarrow \infty} a_n \neq 0$, then $\sum_{n=1}^{\infty} a_n$ diverges.