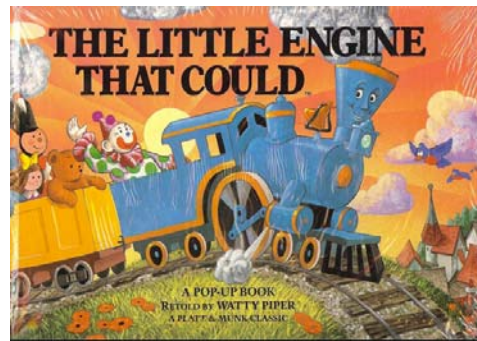


Knowing Self or "Unskilled and Unaware of It?" How Numeracy Contradicts the Behavioral Sciences' Consensus About Human Self-Assessment 10/13/2018

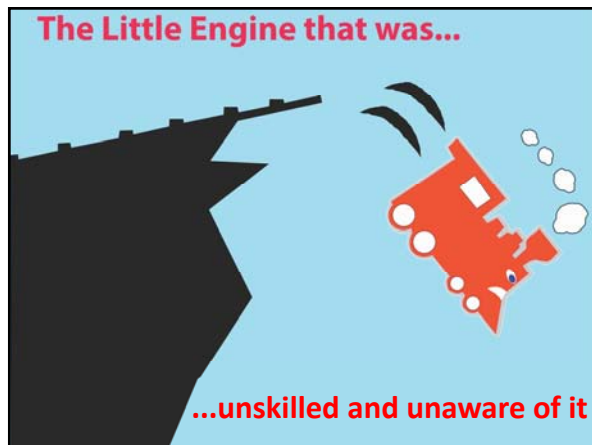
Knowing Self or "Unskilled and Unaware of It?" How Numeracy Contradicts the Behavioral Sciences' Consensus About Human Self-Assessment

Ed Nuhfer enuhfer@earthlink.net
 Prepared for Annual Meeting National Numeracy Network,
 MSU, East Lansing, MI
 October 13, 2018
 See <https://tinyurl.com/NNNself>

We are either mostly like...



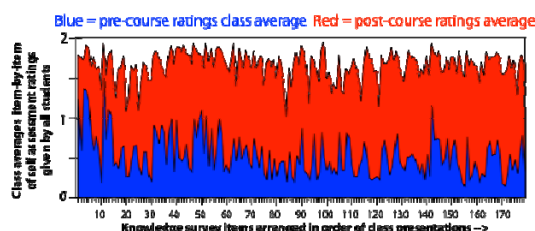
or we are mostly like...



With thanks to co-contributors

- Chris Cogan
- Steve Fleisher
- Eric Gaze
- Kali Moon
- Paul Walter
- Rachel Watson
- Karl Wirth
- Ami Wangeline
- And over 25,000 participants – “Cast of thousands!”

Knowledge Surveys: Self Reported Learning Gains Are They Meaningful?



Self assessment scores given item-by-item by each student:
 2 = I have current ability to address this challenge very well.
 1 = I have partial knowledge/skill and can now only partially address the challenge.
 0 = I currently have insufficient skill/knowledge to address the challenge.

Three Competing Hypotheses Regarding Self-Assessment

1. Self-assessment is just meaningless random noise. Students can't self-assess.
2. People have a strong propensity toward overestimating their abilities. Those least competent exhibit the greatest overconfidence in their actual abilities.
3. Overall, people's self-assessed competence is in accord with the competence that they can demonstrate. They might get even better at it if instructors helped them to develop their skill.

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Seminal Paper 1999
Journal of Personality and Social Psychology

Unskilled and Unaware of It: How Difficulties in Recognizing One's Own Incompetence Lead to Inflated Self-Assessments

Justin Kruger and David Dunning
Cornell University

People tend to hold overly favorable views of their abilities in many social and intellectual domains. The authors suggest that this overestimation occurs, in part, because people who are unskilled in these domains suffer a dual burden: Not only do these people reach erroneous conclusions and make unfortunate choices, but their incompetence robs them of the metacognitive ability to realize it. Across 4 studies, the authors found that participants scoring in the bottom quartile on tests of humor, grammar, and logic grossly overestimated their test performance and ability. Although their test scores put them in the 12th percentile, they estimated themselves to be in the 42nd. Several analyses linked this miscalibration to deficits in metacognitive skill, or the capacity to distinguish accuracy from error. Paradoxically, improving the skills of participants, and thus increasing their metacognitive competence, helped them recognize the limitations of their abilities.

First serious effort to quantify self-assessment.
First to demonstrate self-assessment is teachable.
We now know more, but only because of the foundation that they began to build.

The Dunning-Kruger Effect

- "People are typically overly optimistic when evaluating the quality of their performance on social and intellectual tasks. In particular, poor performers grossly overestimate their performances because their incompetence deprives them of the skills needed to recognize their deficits" (Ehrlinger, Johnson, Banner, Dunning, & Kruger, 2008).
- "People tend to hold overly favorable views of their abilities in many social and intellectual domains" (Kruger & Dunning, 1999).

The Dunning-Kruger Effect in a K-D Graph

Blue – Self-assessed competency
Red – Measured competency

The Dunning-Kruger effect expresses that relatively unskilled people suffer illusory superiority and mistakenly assess their abilities to be much higher than they really are. Conversely, persons with high ability tend to underestimate their relative competence. "...their incompetence deprives them of the skills needed to recognize their deficits."

We arrive at this interpretation by computing DIFFERENCES as our basis for articulating the Dunning-Kruger Effect.

People with lower ability tend to overestimate their competence; persons with higher ability tend to underestimate their competence.

Our Paired Measuring Instruments

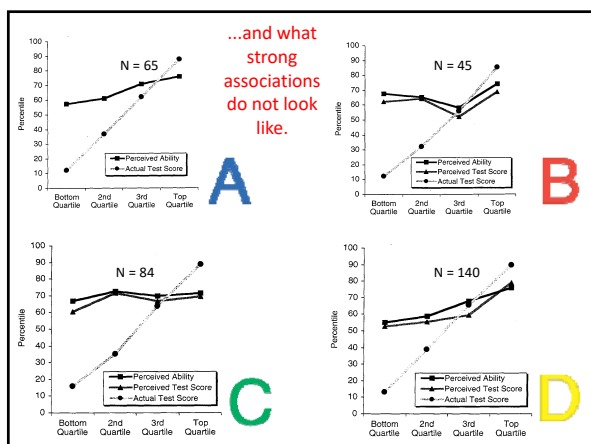
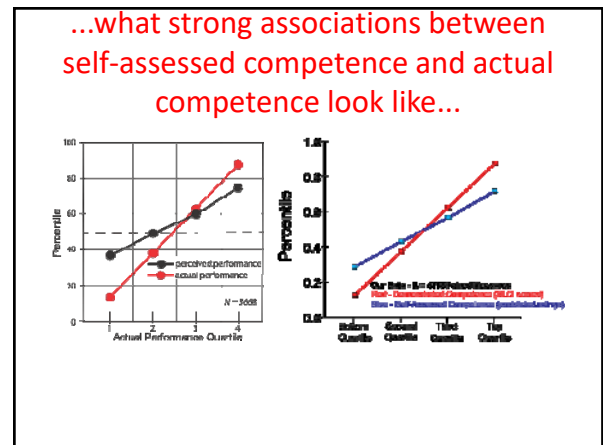
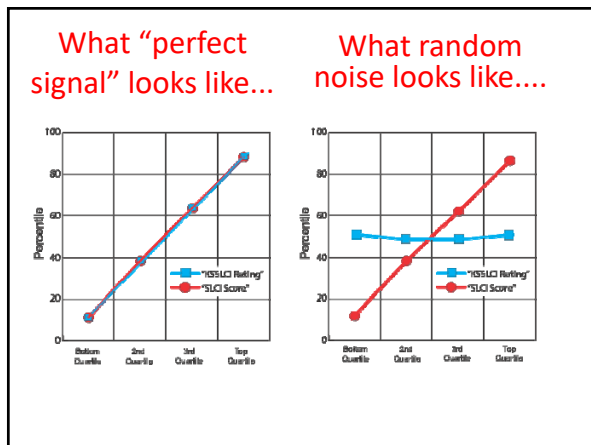
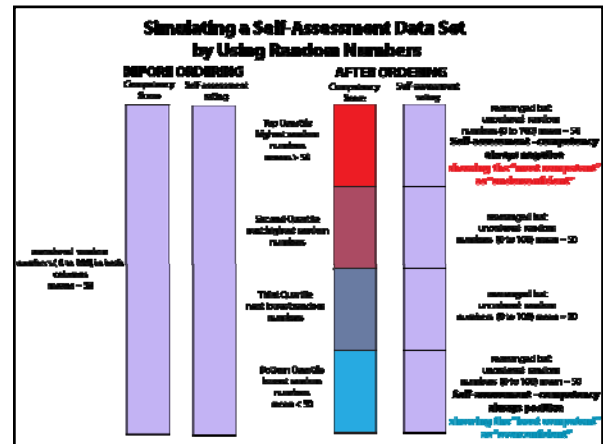
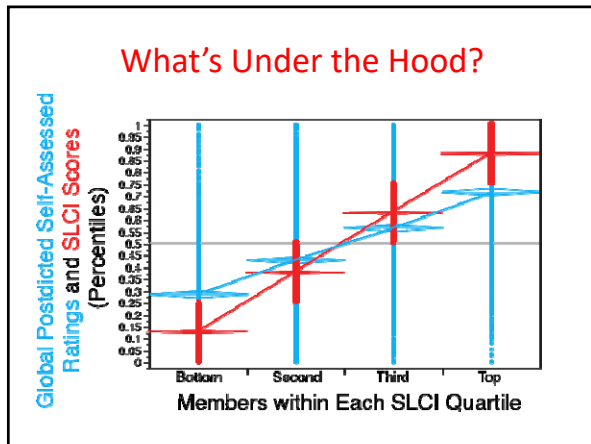
- **Competence: Science Literacy Concept Inventory (SLCI)**
 - 25 multiple choice items address 12 concepts
 - Validated on over 24,000 participants
 - Reliability R = .84
- **Self-assessed competence: Knowledge Survey of Science Literacy Concept Inventory (KSSLCI)**
 - Self Assess competence ratings to address each of 25 items
 - Validated on over 2000 participants
 - R = .93
- **Plus global postdicted query rated after taking SLCI**
 - Over 4000 participants

We too can show K-D graphs

Our Data - N = 4116 Paired Responses
Red - Demonstrated Competence (SLCI scores)
Blue - Self-Assessed Competence (postdicted ratings)

...but we believe that doing so leads to false conclusions. WHY?

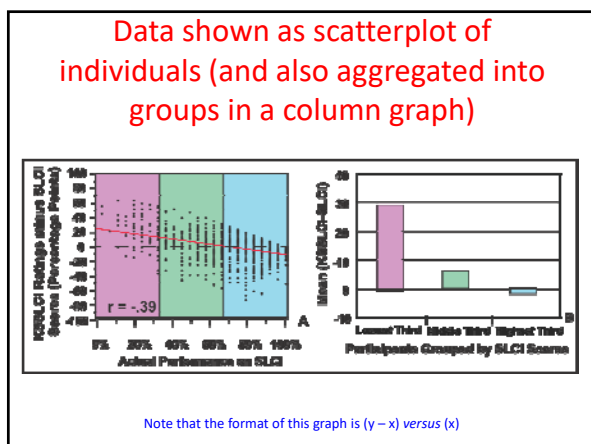
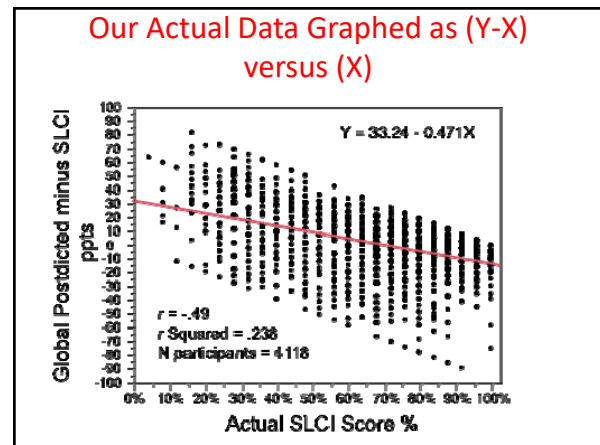
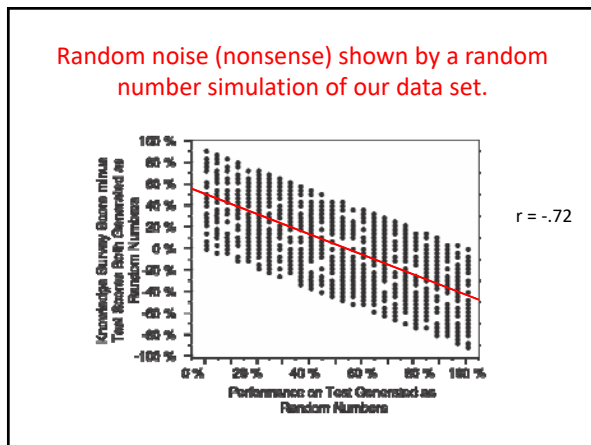
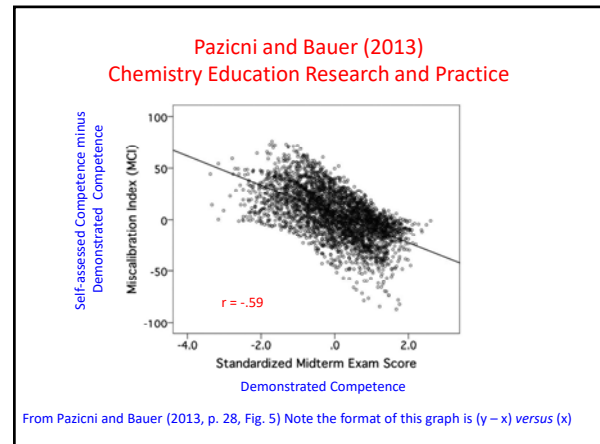
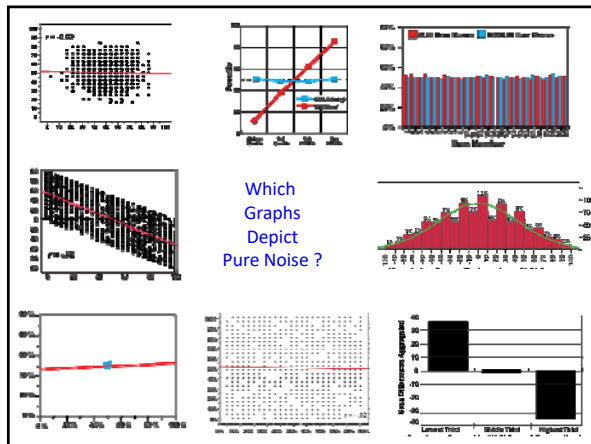
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It's important to know what randomness looks like...

...in EVERY kind of graph used to depict paired measures involving self-assessment.

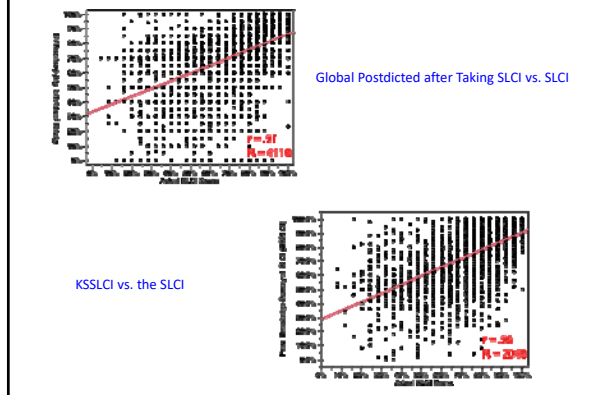
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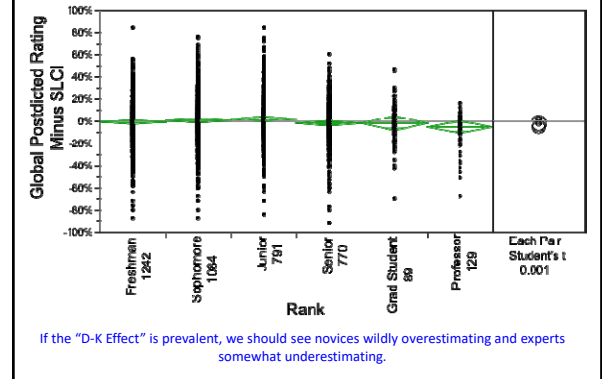
Well, is anything safe?

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Scatterplots of Confidence vs. Competence

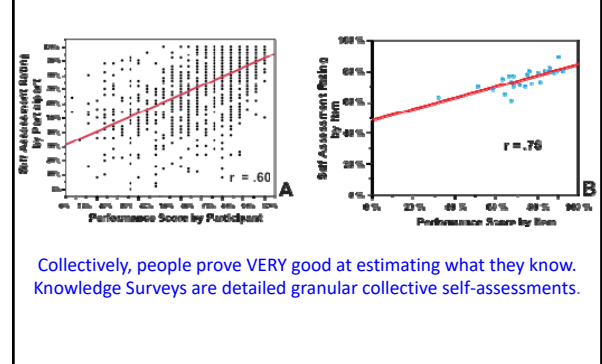


Examine the Data Categorically

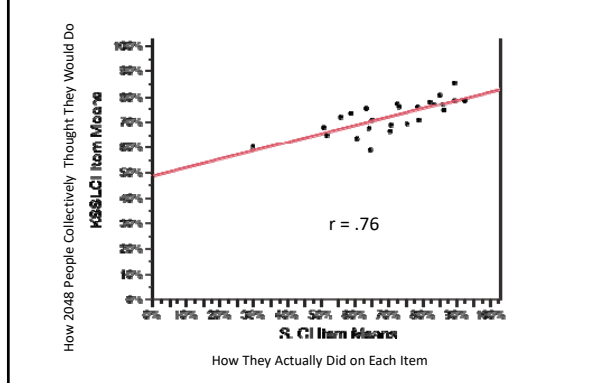


Some applications that we are exploring

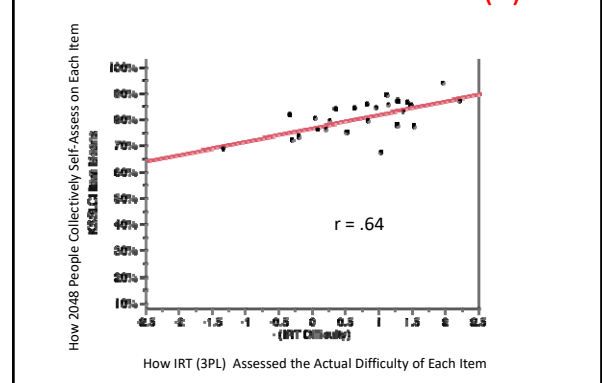
Noise: by Participants and by Items



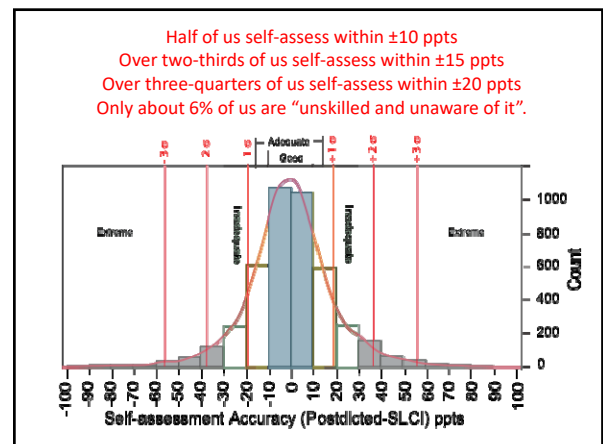
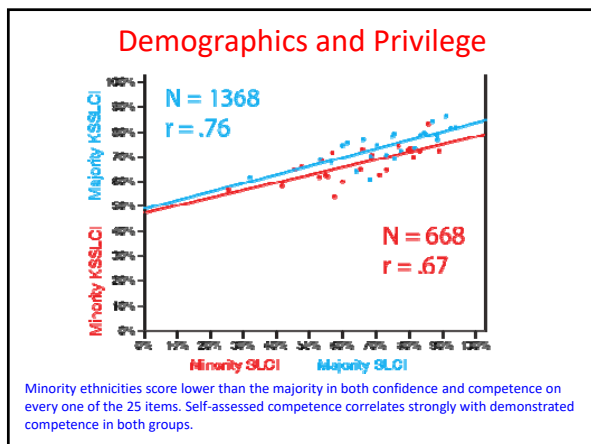
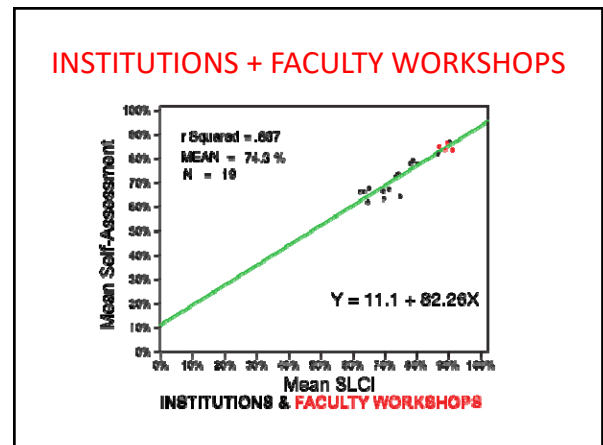
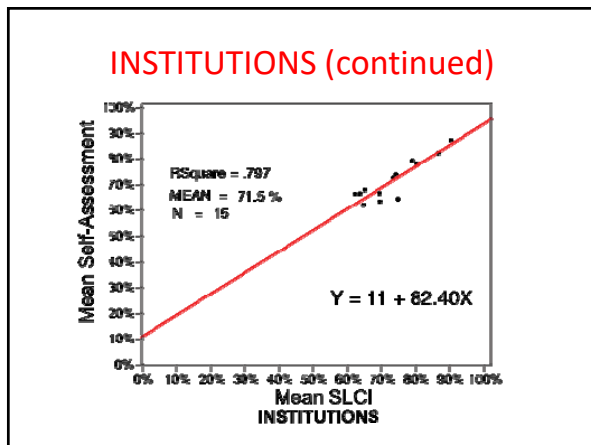
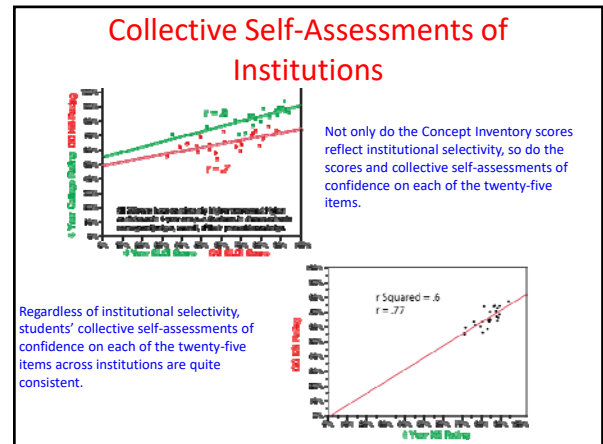
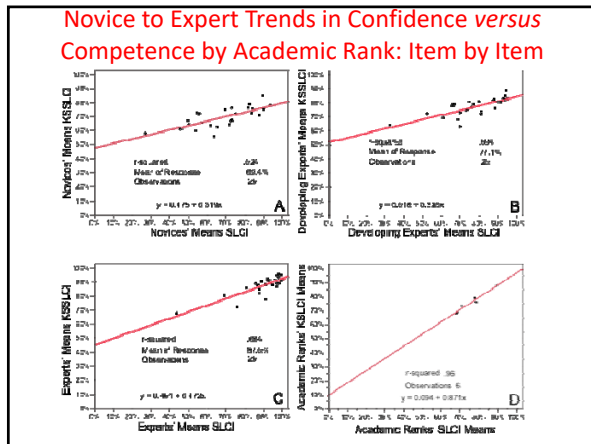
Collective Self-Assessment



Collective self-assessment (2)



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End