

Using Language to Measure Student Beliefs about Intelligence

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Introduction

Holding a *growth mindset*—believing that intelligence as a trait can be grown and developed—has powerful impacts on academic success, increasing motivation, learning goals, and self-esteem.

Intelligence mindset is typically measured with the four-item Theory of Intelligence Scale (TOI; 1 *disagree a lot* to 6 *agree a lot*). Sample items:

My intelligence is something very basic about me that I can't change very much.
 No matter how much intelligence I have, I can always change it quite a bit.

Using student data to teach about mindsets

Student distributions on the TOI scale and their responses to the open-ended prompts were incorporated into a lesson on intelligence.

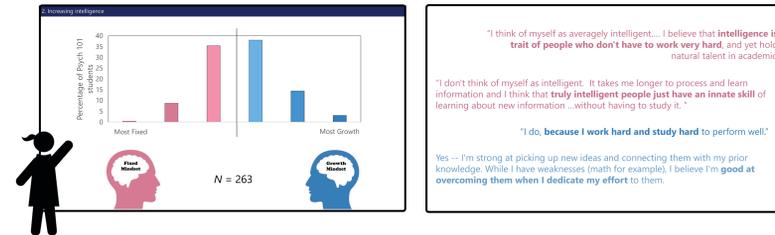


Figure 2. Excerpt of slides from an Intelligence lecture in a large Introductory Psychology Course

Comparing measures of mindset

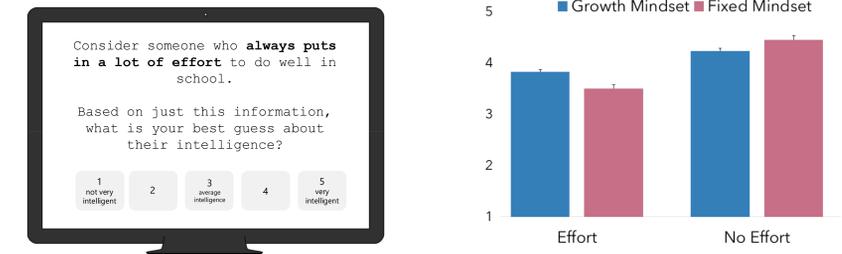


Figure 4. Students' beliefs about intelligence predict how they view academic effort

Can we measure mindsets from language?
 What are the pedagogical and research outcomes of this naturalistic approach?



Using open-ended text responses to explore mindset in STEM courses

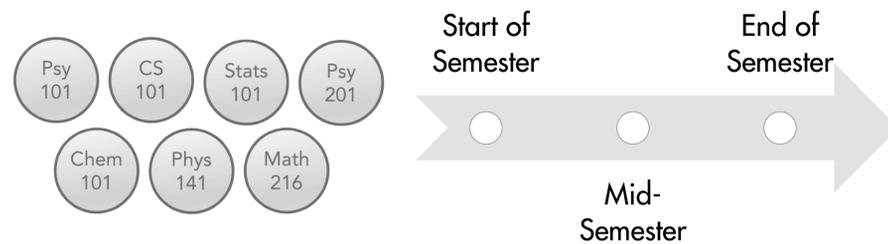


Figure 1. Approach to data collection in STEM classes

Student perceptions of activity

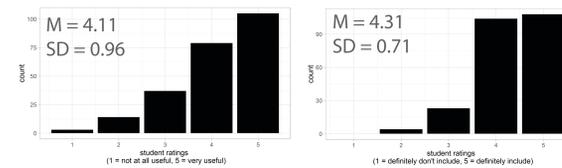


Figure 3. Histograms of student responses to "How useful was it to see student responses from the class?" and "Would you advise the instructor to include this activity in future lessons on intelligence?"

"I think it was useful because it really showed how different people think and what different people believe. We often live in a bubble, feeling or believing that others feel that same what we do. It is good (and interesting) to see other perspectives."
 "When I came into Duke, I often questioned whether I was intelligent enough to be here. I saw so many intelligent people and thought my intelligence was fixed. After learning about Carol Dweck, I adopted the growth mindset and started believing that I was good enough and can improve my intelligence."

Mindset beyond the classroom

We developed a library of words and phrases (n-grams) that are predictive of fixed and growth intelligence mindsets to automate naturalistic measurement. Try it yourself using the beta version of our web application:

mindsetmapper.org

fixed n-grams

easily, naturally, talent, talented, IQ, memory, fast, quickly, easy, born, gifted, ease, innate...
 no effort, rarely studies, doesn't need, never studies, book smart, good grades
 too much time, always does better

growth n-grams

dedicated, passion, studious, practice, motivated, driven, diligent, thorough, eager, curious, interest, open-minded, adapt, flexible, malleable, explore challenge, improve, ...
 push through, work hard, lifetime learner, open minded, love of, try again, tries again, give up, desire to...
 willing to learn, strive to understand, excited about learning, learn from mistakes...

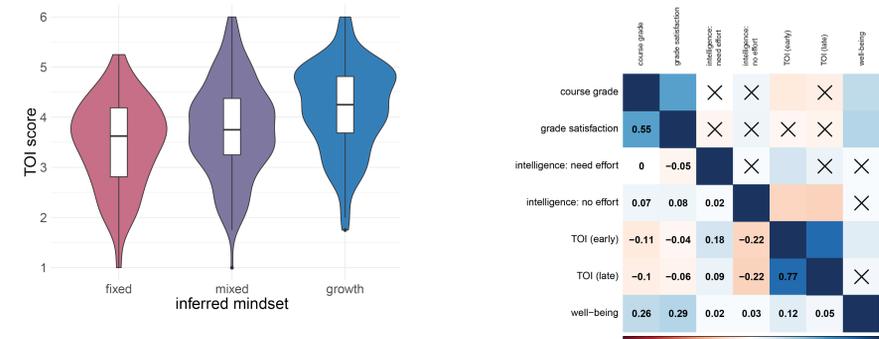


Figure 5. Inferred mindset is statistically related to mindset measured by TOI

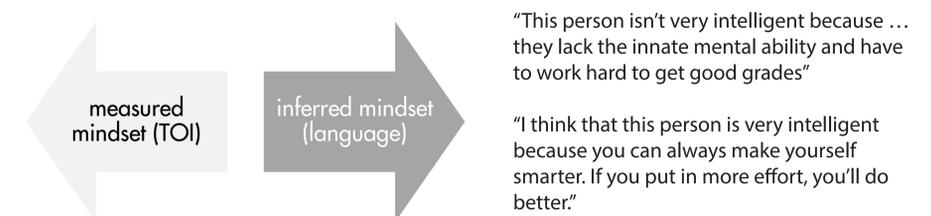
Figure 6. Correlation matrix of classroom measures. X indicates $p > .05$.

Naturalistically measuring mindset is a rich pedagogical and research approach

Our pedagogical activity encouraged students to work harder in their classes, focus more on the level of effort they expended than performance metrics like grades, and acknowledge their failures as lessons rather than definitive markers of intelligence.

Multiple measures of intelligence mindset can offer greater insight into academic achievement and motivation. Future analyses will explore predictions of achievement, grade satisfaction, and well-being.

Future directions: False Growth Mindset?



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