# Linking student mindset, engagement & learning in introductory data science

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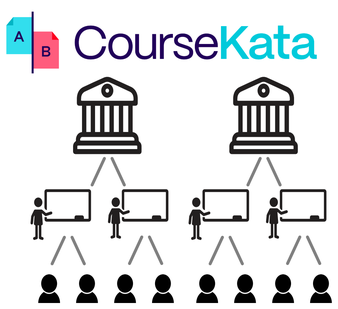
*Supported by:*

## Motivation

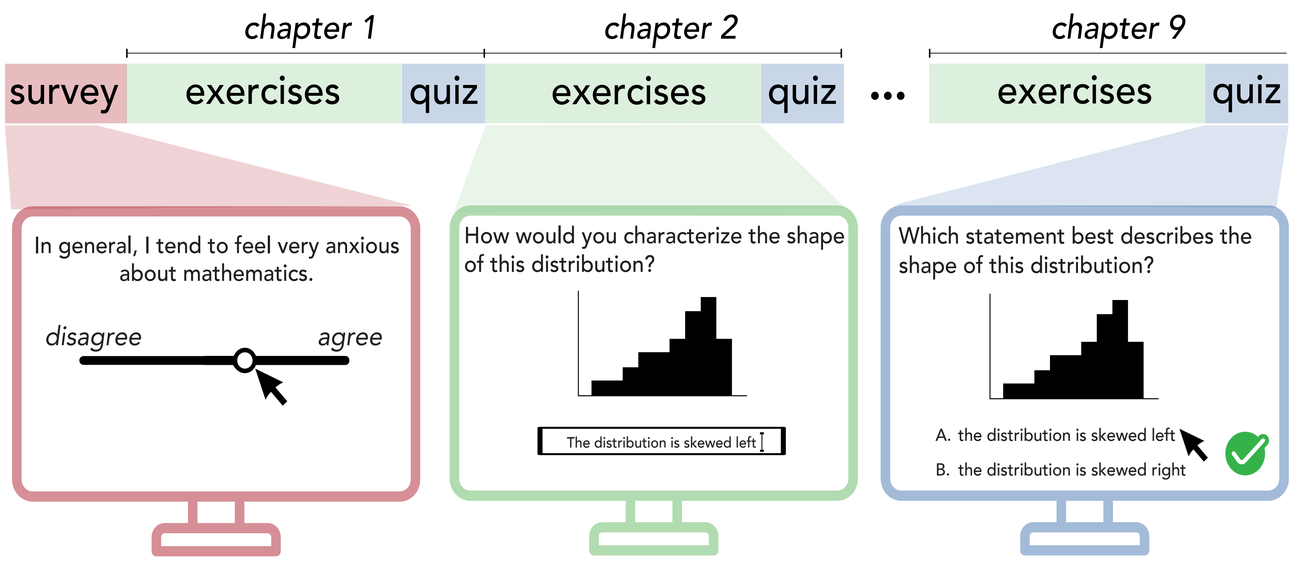
Many factors influence learning in academic settings, but these factors are often not measured or analyzed.
*How will we make further progress on understanding human learning in real-world environments?*

## Study 1: Analyzing Learning Dynamics In Situ

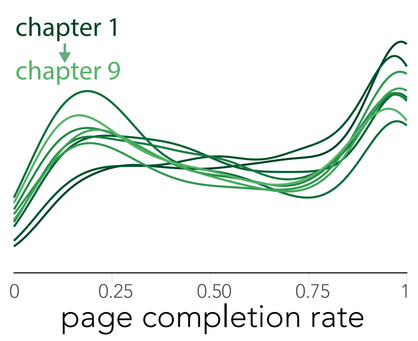
We leverage dense, longitudinal student data from many intro data science courses to jointly investigate mindset & attitudes, engagement, & learning outcomes.



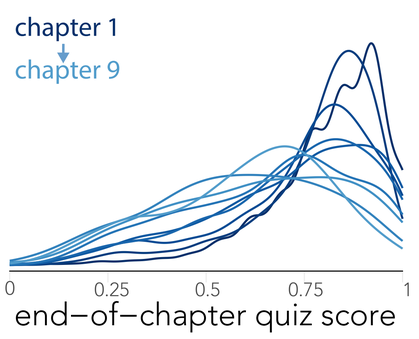

*11 institutions*
*45 courses in 2023*
*1306 students*



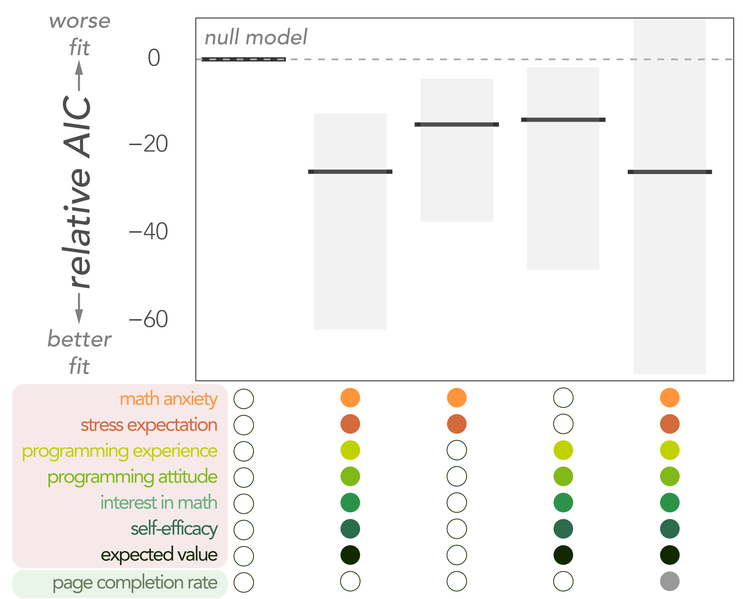

Bimodal distribution in behavioral engagement with learning activities.




Performance generally decreases & becomes more variable.

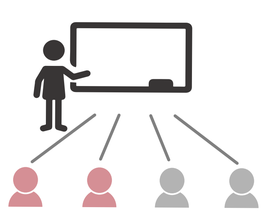



Initial mindsets & attitudes predict learning but the contribution of completing more activities is unclear.




## Study 2: Designing a Novel Mindset Intervention

We are developing interventions to target potential sources of variation in student success, such as the mindset students bring to math and programming courses.



*1 course in 2024*
*146 students*

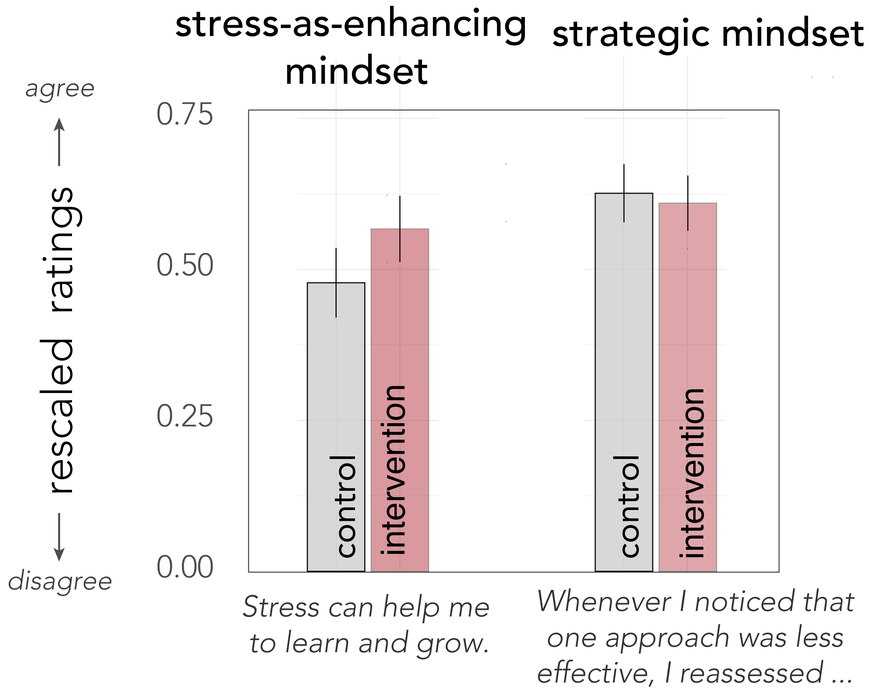
**Mindset Module**
*reframes challenging experiences*

*"Experiencing challenges — and even failure from time to time — can trigger a cascade of beneficial changes in your brain, both helping you to achieve your goals and to prepare to learn new things"*

**Control Module**
*information on biological mechanisms*

*"Neurotransmitters, chemicals that are involved in the communication between neurons, can be released in response to stressful stimuli and potentially enhance the encoding of memories"*

Pilot intervention shows promise for influencing students' expectations about the positive role stress can play during learning.




## Ongoing Work

We are exploring 1) other measures of engagement to better understand the pathways through which mindsets & attitudes shape learning and 2) continuing to develop interventions to support students.