

“I’VE ALREADY DONE THIS”:
How Prior Exposure Affects Calculus Students’ Mindsets During a Semester of Regular
Reflections

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Historically, Calculus I has been a notorious barrier to many students’ completion of STEM degrees (Weston et. al, 2019). In Fall 2023, we taught a large lecture section of Calculus I (~250 students) at a large R1 public university in the Southeastern U.S., intending to increase the success rate for students by implementing a minor metacognitive intervention called “How’d it go?” prompts after problem sets. In this poster presentation, we investigate the organic manifestation of calculus student mindsets as they occurred in real-time throughout the semester by analyzing short reflective prompts that the students completed voluntarily. Specifically, we answer the research question: *How do university calculus students’ mindsets manifest differently depending on the setting of their first exposure to a calculus class (high school or college)?*

In Psychological Meaning System Theory, *mindsets* are attitudes that people hold about themselves (Dweck, 2000). This study focuses on four established mindset pairings: growth/fixed (Dweck, 2016), mastery-oriented/helpless (Dweck, 2000), strategic/non-strategic (Chen et. al, 2020), and entrepreneurial/non-entrepreneurial (Bosman & Fernhaber, 2018).

The course was conducted in a 2-2 lecture-recitation format. Throughout the semester, students were provided printed packets that contained lecture notes outlines, pre-recitation prep problems, recitation problems, and (in some cases) extra practice problems. The whole semester included 21 packets (called lessons) divided into four units. In this study, we analyzed a random sampling of three packets from each unit. To analyze the data, we used a priori coding (Saldaña, 2013) with codes defined by the described mindsets: (a) growth, (b) fixed, (c) mastery-oriented, (d) helpless, (e) strategic, (f) nonstrategic, (g) curious, and (h) not curious. Note that instead of entrepreneurial and non-entrepreneurial, we only coded for curiosity or explicit non-curiosity because some qualities in entrepreneurial mindset are also qualities of a strategic mindset.

When the data was disaggregated according to students’ high school calculus exposure (or not), results revealed that these groups had antithetical manifestations of mindsets. In particular, students with no high school calculus were as much as seven times more likely to display a growth mindset in Unit 2 than students with high school calculus. Results further suggest that engaging students in regular metacognitive reflection coupled with a strategic framing of calculus may significantly increase course success rates within an exam-heavy, highly coordinated grading structure.

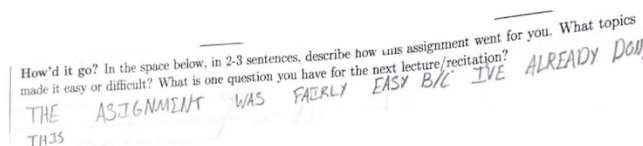


Figure 1. An example of a “How’d it go?” prompt.

References

Bosman, L., & Fernhaber, S. (2018). *Teaching the Entrepreneurial Mindset to Engineers*. Springer International Publishing. <https://doi.org/10.1007/978-3-319-61412-0>

- Chen, P., Powers, J. T., Katragadda, K. R., Cohen, G. L., & Dweck, C. S. (2020). A strategic mindset: An orientation toward strategic behavior during goal pursuit. *PNAS*, 117(25) 14066-14072. <https://doi.org/10.1073/pnas.2002529117>
- Dweck, C. S. (2000). *Self-Theories: Their Role in Motivation, Personality, and Development*. Essays in Social Psychology. Taylor & Francis.
- Dweck, C. S. (2016). *Mindset: The New Psychology of Success*. Random House.
- Saldaña, J. (2013). *The Coding Manual for Qualitative Researchers*. SAGE.
- Weston, T. J., Seymour, E., Koch, A. K., & Drake, B. M. (2019). Weed-Out Classes and Their Consequences. In E. Seymour & A.B. Hunter (Eds.), *Talking about Leaving Revisited* (pp. 197–243). Springer International Publishing. https://doi.org/10.1007/978-3-030-25304-2_7