

Unnecessarily Hard: How Student Emotions, Course Components and Rigor Collide in Calculus

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Rigor is considered an important component of successful Calculus courses (Rasmussen et al., 2014). The authors provide a definition of rigor adapted from the Dana Center at UT Austin (2019): In a rigorous math classroom, students (a) use mathematical language to communicate their work with clarity and precision; (b) demonstrate that what they have done works within the appropriate context; (c) answer the question, “How do we know?”; and (d) apply their understanding to new contexts and situations. In addition, student emotions are connected to mathematical achievement (Pekrun et al., 2017). Confidence and anxiety play important roles in student success and persistence (Ellis et al. 2016; Barroso et al., 2021).

In this poster, we present a case study of Kappa University (KU), a private institution in the Southeastern United States. Our case study focuses on students’ experiences of their introductory calculus courses, which they often describe as “unnecessarily hard.” There may be a disparity at KU between what instructors and students perceive as necessary for student learning. An investigation of the interactions between student emotions, course components, and instructor conceptions of rigor could help instructors better support students in rigorous courses. We thus chose to investigate the question: How do classroom practices associated with the instructor ideal of rigor align with students’ emotional experiences in introductory math at KU?

To perform this investigation, a team of faculty, undergraduates, and graduate students at KU formed a Networked Improvement Community (NIC) as part of a broader multi-institutional DEI initiative. NIC members conducted 4 hour-long focus groups of 5-8 students each (for a total of 26 student perspectives). All but one participant had taken a single-variable calculus course at KU. The questions asked included, “How did you experience the rigor or challenge of your course? Do you feel like you were challenged appropriately?”

We leveraged Braun et al.’s (2023) reflexive thematic analysis process, which began with open coding. Codes were collected into three categories: course components, student emotions, and rigor. While the method of data collection makes frequency analysis limited in scope, we studied the relative frequency of coincident codes. Preliminary analysis shows that, with access to sufficient resources, students can feel supported in working on challenging novel problems. For example, one student described, “[KU] does give you harder problems, like harder versions of the same concept... and they don't necessarily give you exactly what you need to figure it out... I think that's intentional, so that you like, learn to figure it out, learn to be able to do a problem at that level, so that you could eventually do every and any problem... But I think, yeah, the fact that they have the help room there... made it definitely not as bad as I was expecting.”

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