Student and Instructor Experiences of Equity and Access for Team-Worthy Tasks in Discrete Mathematics

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For many students, discrete mathematics is a first exposure to formal logical reasoning, proofs, and proving. Undergraduates entering discrete mathematics have much experience with procedural problem solving and many attribute the authority for mathematical sense-making to textbook, instructor, or software (Herbel-Eisenmann, 2007). Like calculus courses, discrete mathematics shares a history of enormous disparities in outcomes correlated to demographic variables. For example at one institution, grade point averages (GPAs) in discrete mathematics, disaggregated by demographic groups privileged in society's majority culture and those marginalized in it were, respectively, 2.28 and 1.72 (Hsu, 2020). Yet subsequent course-taking requires at least a C, 2.0 grade points or higher. The 1.72 is a disqualification for further study.

Research in undergraduate mathematics education, notably in calculus, has indicated that disparities can be addressed by changes in student materials and instruction methods (Bressoud & Rasmussen, 2015). Groupworthy learning opportunities for students, and faculty use of socio-culturally informed instructional approaches, build positive relationships among students, between students and institution, and create active engagement in and outside of class (Archie et al., 2022; Johnson et al., 2020; Laursen et al., 2014; Leyva et al., 2022). Decades of reform in calculus has generated rich curricula, client-discipline informed policy, and most recently, instructor preparation to address the disparity (Yoshinobu et al., 2023). Now, in calculus, the GPA for groups privileged in society is above 2.0 *and* the GPA for historically marginalized groups is near 2.0 (Voigt et al., 2023). For calculus it took several generations of scholarly work to transform the system of structures, values, policies, and people to eke out a less inequitable state. No similar reform effort has occurred for discrete mathematics. Yet.

This poster (Campisi et al., 2024) reports on a state-wide effort in California to transform curriculum and instruction in discrete mathematics. Project research examines student and faculty experience of team-worthy lessons (as substitutes for lecture) and scaffolds for use. Early results indicate increases in students' sense of access to, and engagement in, the intellectual work of discrete mathematics, growth in instructor knowledge of equity-supportive practices, and a reshaping of instructors' views of students' capabilities. Ultimately, the project will:

1. generate a collection of seven team-worthy discrete mathematics lessons,
2. create and refine an asynchronous short-course for faculty who teach with such lessons,
3. gather data from students and faculty to inform lesson and short-course revision,
4. examine implementation in a variety of 2-year and 4-year college settings, and
5. participate in the revision of state policy for the content and processes/practices in discrete mathematics and a similar course in computer science called discrete structures.

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