

Designing Courseware for Equitable Access, Engagement and Learning in Gateway Mathematics: Centering the Experiences and Perspectives of Students and Faculty

Ann Edwards
WestEd

Tanner Higgin
WestEd

Keywords: Gateway mathematics, learning technology, user-centered design

Postsecondary math faculty are facing several related challenges that existed prior to but were accelerated by the COVID-19 pandemic (Lopez et al., 2021). At the institutional level, concerns over declining enrollment and budget cuts have led to staffing declines and increased workloads. Faculty have had to teach in a wider array of classroom scenarios, including fully online synchronous or asynchronous, hybrid/hyflex, and in-person, with some teaching courses in all of these scenarios. Furthermore, faculty are finding that, compared to prior to the pandemic, students are entering gateway math courses with greater challenges in mathematical knowledge and skills, surprising gaps in fundamental technology skills, and under-preparation in college-ready organizational skills. Students are also experiencing anxiety and trauma related to mathematics. As a core component of many gateway mathematics courses, digital courseware has the potential to help faculty address these challenges but also presents barriers and challenges to faculty and students (Ganimian et al., 2020; Viberg et al., 2020).

This poster reports on a nationwide study of the perspectives, experiences, and needs of math faculty and students regarding courseware technology (i.e., digital content and tools/platforms designed to support learning) in gateway mathematics courses. The goal of the study, funded by the Gates Foundation, is to inform the design and implementation of mathematics courseware technologies that can improve the mathematics learning experiences and outcomes of Black, Latinx, Indigenous, and low-income students. The study focuses on Quantitative Reasoning, College Algebra, and Calculus and draws upon equity-focused and user-centered design research methods. Data include interviews, surveys, and diary studies, with intentional sampling of the priority student populations (Black/Latinx/ Indigenous/Low-Income) across institution types (2-year and 4-year, particularly TCUs, HSIs, and HBCUs), as well as faculty (teaching, research, adjunct). The analysis draws upon approximately 75 hour long semi-structured interviews of instructors of the selected courses and 75 interviews of students. Seven faculty participated in diary studies, providing daily logs of activities involving mathematics and uses of courseware.

The poster reports on findings from the faculty analysis related to three key themes: (1) Equity: pertaining to issues of access to and proficiency with technology as well as the capacities of courseware to promote inclusion; (2) Engagement: barriers to and features supporting student engagement with courseware content; and (3) Effectiveness: insights related to how courseware can support meaningful mathematics learning and identity development. The poster also presents products to inform design and development of courseware derived from the study analysis, including faculty personas, journey maps, and a map of the ecosystem of resources, supports, barriers, and obstacles in faculty's use of courseware in gateway mathematics.

Acknowledgments

This work was supported, in whole or in part, by the Gates Foundation [INV-069032]. The conclusions and opinions expressed in this work are those of the author(s) alone and shall not be attributed to the Foundation.