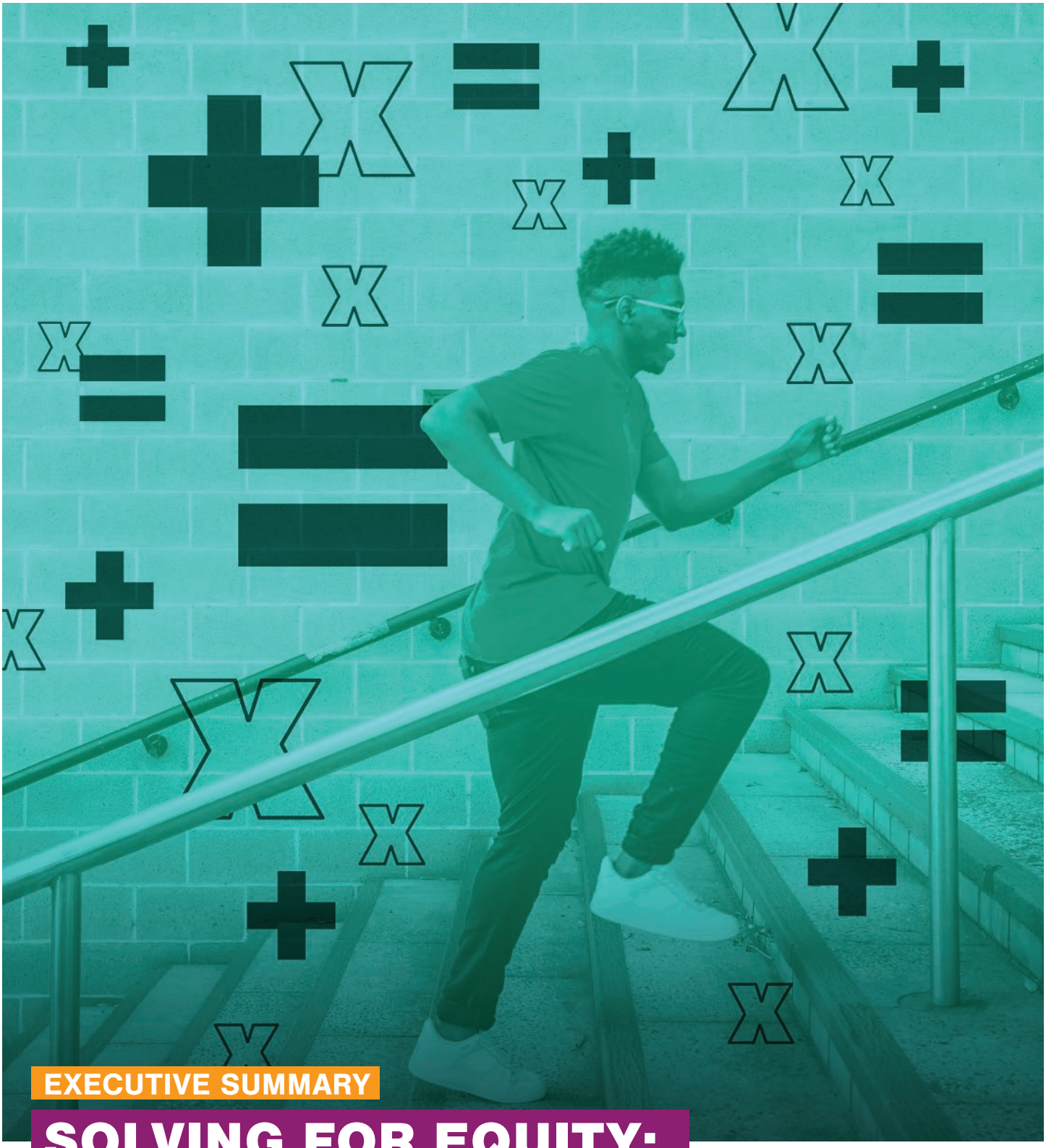

EXECUTIVE SUMMARY

SOLVING FOR EQUITY:

DESIGN AND IMPLEMENTATION OF NEW POSTSECONDARY MATH PATHWAYS

By Mina Dadgar, Dina Buck, & Pamela Burdman

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JUST EQUATIONS

SOLVING FOR EQUITY:

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Mathematics education has been a distinct source of inequity in students' educational journeys, and, as a result, Black, Latinx, and other marginalized students have been filtered out of opportunities due to policies such as tracking. (Burdman, 2018; Daro & Asturias, 2019). Reforms to redesign postsecondary mathematics—including diversifying math pathways beyond the traditional path to Calculus, as well as eliminating stand-alone remedial courses—have the potential to eliminate racial stratification. However, evidence to date suggests that they haven't consistently done so (Brathwaite et al., 2020). Acknowledging this untapped opportunity, this brief highlights key principles for designing and delivering math pathways with an explicit goal of erasing racial inequities in student outcomes.

***Defining and Measuring Equity**. We begin with math-education scholar Rochelle Gutierrez's notion that equity is attained when it is not possible "to predict mathematics achievement and participation based solely on student characteristics such as race, class, ethnicity, sex, beliefs, and proficiency in the dominant language." With respect to student outcomes, our definition of equity suggests a need **not only to close gaps but, in many cases, also to raise the bar for all students**, given the relatively low success rates in college mathematics across the country, particularly at community colleges. In addition, given the expansion of math pathways, it also requires **eliminating disparities in math pathways that lead to STEM degrees**, in order to avoid tracking students by race. Achieving these equitable outcomes entails **intentionally addressing students' mathematics experiences and their social and cultural contexts**.*

STRATEGIES:

ENSURING EQUITY IN MATH PATHWAY IMPLEMENTATION

Four principles stand out as necessary components to solving for equity in postsecondary mathematics:

STRATEGY

DESIGNING PATHWAYS AND COURSES BASED ON INCLUSIVE NOTIONS OF RIGOR AND RELEVANCE

Pathways should be rigorous and relevant, so that all students can benefit from developing quantitative reasoning skills and not be tracked into dead-end sequences. Institutions and states need to develop clear definitions of rigor and relevance to guide this work, to avoid arbitrary requirements that elongate math sequences and delay or deter students' progress. Doing so requires math faculty to work with colleagues from other disciplines and possibly other institutions.

A new, inclusive definition of rigor is needed. Traditional conceptions of rigor have been used to reinforce meritocratic notions about mathematical ability and the standard gatekeeping role of math education. All pathways—not only STEM pathways—should include rich, engaging content and should lead to college degrees or credentials that have high labor-market value. Rigor should include:

- Fostering the problem-solving and reasoning skills that are needed in future courses and careers in engaging ways.
- Emphasizing critical thinking, conceptual understanding, and communication over procedural mastery.

Math content should be relevant to students' social contexts, as well as to their desired area of study. Ensuring relevance entails aligning course content with competencies needed to succeed in higher-level courses or related careers, attending to students' social and cultural contexts, eliminating unnecessary or obsolete content, and shortening course sequences as needed.

STRATEGY

REPLACING PREREQUISITE REMEDIAL COURSES WITH COREQUISITE COURSES AND OTHER TYPES OF EMBEDDED SUPPORT

Statewide efforts to move away from stand-alone remedial courses have yielded promising increases in completion rates of college-level math courses through strategies such as corequisites, in which students can enroll in college-level courses while receiving additional support. In some cases, underrepresented students experienced the greatest gains. Still, the majority of students entering community colleges continue to be placed in prerequisite remedial courses, and that is disproportionately true for Black and Latinx students.

Some institutions have adopted corequisite approaches voluntarily, but, more commonly, state-level leadership or policy change has been required. Approaches have included a governing board decision (as in Tennessee), an executive order (at California State University), and state legislation (including examples in California, Florida, and—most recently—Illinois). In other states, such as Georgia and Ohio, statewide math task forces have been instrumental in placement and corequisite reforms.

STRATEGY

INSTITUTIONALIZE PRACTICES THAT FOSTER STUDENTS' MATH IDENTITY AND SENSE OF BELONGING

Classroom environments have critical implications for the success of racially minoritized students but are often overlooked in colleges' equity initiatives. Research has established that faculty beliefs about students' ability are a powerful predictor of students' performance and can influence students' academic choices, especially for Black and Latinx students. Faculty professional development and shared ownership of courses by departments and institutions are two important levers for institutionalizing effective and equity-focused classroom practices, including:

INSTRUCTION THAT IS CONTEXTUALIZED AND CULTURALLY RELEVANT

The decontextualized, abstract way mathematics is traditionally taught upholds dominant cultural norms, sending messages to minoritized students that they don't belong in mathematics classes, or in STEM fields. Some effective classroom equity practices include using instructional practices that reflect culturally relevant concepts and ways of knowing, engaging students in active learning and discussion that invites them to grapple with problem-solving organically before diving into rules and formulas, and providing writing exercises for students to explore how math relates to their personal experiences.

APPROACHES THAT MITIGATE SYSTEMIC RACISM AND TEACHERS' IMPLICIT BIASES

Research confirms that instructors can, and do, act out biases toward their students, however unconsciously and unintentionally. Nonacademic features—including appearance, race, gender, and economic status—can influence instructors' assessments of students' aptitude, as well as the opportunities students receive. Biased social messages, or "cues," can cause Black and Latinx students to contend with "stereotype threat"—the fear of being judged negatively by others due to belonging to a particular group—and math anxiety, both of which interfere with student performance. Traditional grading and assessment practices can also be a locus of systemic bias. Practices that elicit student thinking and allow students to revise their answers provide more opportunities for students to learn—and demonstrate their learning.

SUPPORT FOR EFFECTIVE USE OF STUDENT SOCIAL NETWORKS

Student social networks, such as study groups and learning communities, have been shown to support success in undergraduate math contexts. However, ensuring that such networks are developed and that they function in inclusive ways requires awareness and skill.

STRATEGY

ACTIVELY RECRUIT AND PROVIDE SUPPORT FOR BLACK, LATINX, AND OTHER STUDENTS TRADITIONALLY UNDERREPRESENTED IN STEM PATHWAYS

Because Black and Latinx students are nationally underrepresented in STEM pathways, part of the work of creating diversified math pathways is to ensure that all students who are potentially interested in STEM fields can pursue them. In addition to K-12 tracking and college instructional practices, insufficient opportunity to explore academic and career options also contributes to the underrepresentation of Black and Latinx students in STEM. There are several approaches that postsecondary institutions can implement to mitigate this problem:

EXPANDING CAREER EXPLORATION OPPORTUNITIES

Since many colleges do not offer in-depth career exploration opportunities, there is a risk that students from disadvantaged backgrounds will either select short-term credentials that require less time and money to complete or "default" into a liberal arts pathway. Students often express the desire for in-depth career exploration, to help them understand which careers different majors lead to and the competencies needed for each career.

ACTIVE RECRUITMENT OF BLACK AND LATINX STUDENTS INTO STEM AND IMPLICIT BIAS TRAINING FOR ALL INDIVIDUALS WHO INTERACT WITH STUDENTS

Institutions should take responsibility for actively recruiting Black and Latinx students into STEM pathways, to counter educational structures that discourage participation. Ideally, such engagement would begin with partnerships when students are still in high school, through faculty outreach or peer mentors. Additionally, institutions can train staff, faculty, and advisors who interact with students, with a goal of instilling a growth mindset and minimizing implicit bias, especially with respect to STEM fields.

ALIGN RESOURCE-INTENSIVE SUPPORTS WITH STUDENT NEED

High-touch supports should be prioritized based on students' needs. This would ensure opportunities and support for populations that have historically had lower rates of postsecondary success. The most effective approaches take advantage of peer support—examples include learning communities and peer mentors—given that some students are more comfortable seeking help from peers.

RECOMMENDATIONS

Existing research and knowledge in the field validate the notion that redesigning postsecondary math pathways can be a strategy to enhance educational equity. Yet this won't occur unless institutions and states exercise leadership around solving for equity, as outlined below. Many of the recommended steps align with work that states and institutions may already be doing in the context of implementing other initiatives, such as creating guided pathways, establishing completion goals, reforming developmental education, and improving alignment and articulation across institutions and segments.

STATES SHOULD:

1. Take a leadership role in coordinating cross-discipline and cross-institutional efforts to align curricula.

2. Disincentivize the offering of prerequisite remedial courses, in order to avoid tracking students.

3. Provide funding and opportunities for effective professional development for faculty and other individuals interacting with students, while also investing in the racial diversity of faculty.

4. Support research on equitable math instructional practices in the higher education context and incorporate equity into access and success metrics. The following benchmarks should be considered for examining colleges' success in equitable design and implementation of math pathways:

    - High rates of participation and success in gateway math courses, such as Statistics, Quantitative Reasoning, and Calculus.

    - Demographics of students successfully completing specific gateway math courses, including Calculus, that closely represent institution or state demographics.

    - Demographics of students attaining degrees and credentials in fields requiring Calculus that closely represent the institution or state demographics.

INSTITUTIONS SHOULD:

1. Create opportunities for cross-functional and cross-departmental collaboration.

2. Replace prerequisite remediation with corequisite supports.

3. Provide staff with ongoing, discipline-specific and well-facilitated professional development focused on equity and implicit bias, and institutionalize effective classroom practices through shared ownership of courses.

4. Develop strategies to actively recruit Black, Latinx, and other marginalized student groups in STEM pathways and offer resources to ensure their success.

Postsecondary math pathways will not reach their highest potential—or ensure students can do so—unless they are implemented in equitable ways. Solving for equity in the implementation of postsecondary math pathways is an unfinished project. But the practices and strategies needed to ensure more equitable math outcomes are within the reach of postsecondary institutions and states, if they direct their resources toward the goal of racial equity.

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