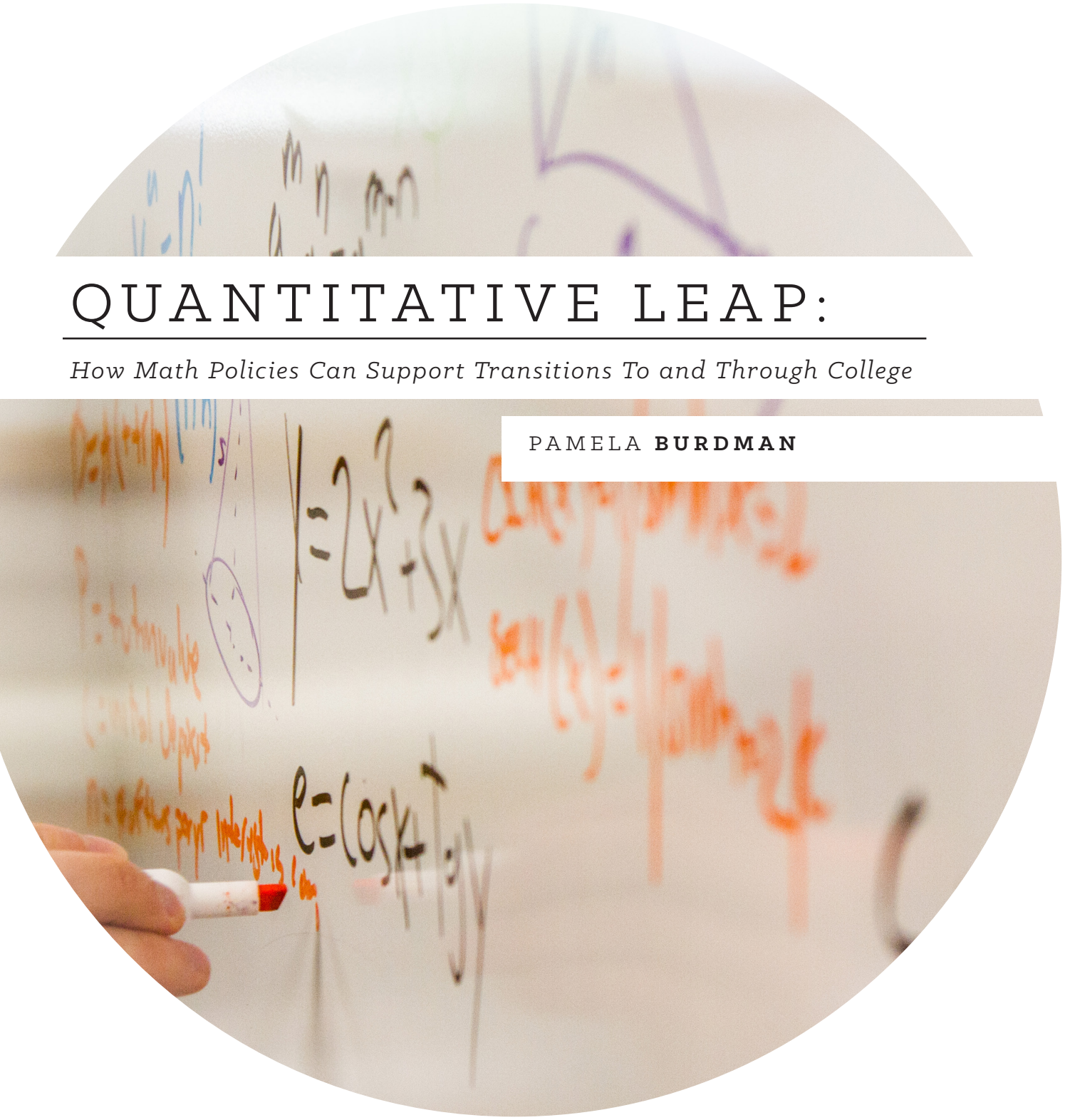

QUANTITATIVE LEAP:

How Math Policies Can Support Transitions To and Through College

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LearningWorks
linking knowledge, policy and practice

As GOVERNOR JERRY BROWN indicated in his 2016 budget proposal, California's support for public higher education is an investment in "students and their successful completion of a degree or certificate." One of the most reliable signs of students' momentum through college is completing a required math course. But too many students fail to complete such a course, in large part because they are deemed unprepared for college-level math from the outset.

The challenge is greatest at the California Community Colleges (CCC), where more than three-quarters of students test into math courses below the level required for transferring to a four-year university. This may not be surprising, since two-year colleges are open-access institutions. Many community college students haven't taken the college-preparatory math sequence (through Algebra 2) in high school. Others, including many who took a break between high school and college, have completed it, but nevertheless scored low on a placement exam.

But even at California State University (CSU), where most freshmen enroll immediately after completing high school, almost a third of students test below proficient, despite having taken the full high school math sequence, through Algebra 2 and beyond.

In all, an estimated 250,000 California students can end up spending one, two, or more semesters in remedial math courses. This extra time taking courses that don't count toward a degree delays students' progress through college and, in some cases, deters them from earning a degree at all. The courses also are estimated to cost students and the state hundreds of millions of dollars per year.

The state's higher education systems have placed a priority on streamlining remedial education. At CSU, students who are not proficient in math are expected to begin their remedial studies during the summer before their freshman year through a program called Early Start. Community colleges are experimenting with various ways of accelerating students through remedial requirements, including shortening sequences and placing students into higher-level courses with additional "co-requisite" support.

These efforts to advance students' progress through remedial math have shown promising results. But remedial math continues to be a major barrier to students' success in college, especially at two-year institutions. It is therefore essential to re-examine not just the delivery of **remedial math**, but also its underlying premise:

Remedial

Remedial or developmental courses are intended as on-ramps to college success, not detours or barriers. Consider the medical principle "first, do no harm." Physicians are expected to prescribe treatments only after careful diagnosis. Even the best drugs and most advanced surgical procedures can have side effects that interfere with patients' overall well-being. Likewise, remedial courses – which *have been shown* to impede students' educational progress – should be required only when students stand to benefit.

Math

Most colleges and universities require a general education math or statistics course to provide the foundation in quantitative reasoning required for success in college and beyond. Just as literacy involves the ability to read and write with fluency and clarity, quantitative reasoning entails understanding and applying quantitative concepts to interpret data and solve problems in various contexts. Remedial math courses are intended to prepare students to succeed in general education courses. Though the need for quantitative reasoning is often the justification for math requirements, education systems sometimes focus on math sequences while losing sight of the quantitative reasoning goal.

Improving quantitative reasoning levels while avoiding over-prescribing remedial courses entails having appropriate **definitions** of proficiency, accurate **measures** of proficiency, and ample **opportunities** for students to become proficient.

Quantitative Reasoning: Definitions, Measures, and Opportunities

In late 2015, a group of educators from California's K-12, community college and state university systems, as well as researchers and education policy experts, came together to consider how state, system, and institutional policies can help ensure that math expectations lead to more effective transitions from high school to college. Building on *Degrees of Freedom*, a series of reports on college math requirements published by LearningWorks and PACE (Policy Analysis for California Education) and authored by Pamela Burdman, the day-long summit convened about 80 participants.

Called *Testing and Beyond: The Future of College Math Placement in California*, the event was hosted by LearningWorks, with support from the James Irvine Foundation, College Futures Foundation, and California Education Policy Fund. PACE and six other organizations comprised an advisory circle that assisted with the summit's design and facilitation and provided input on next steps. The group included the California Community Colleges' Success Network (3CSN), Career Ladders Project, CORE Districts, Education Insights Center, Educational Results Partnership, and WestEd.

The summit envisioned a future in which:

- Quantitative reasoning requirements support student success and delay students' progression into and through college only when truly necessary, and

- More students enter college with the quantitative reasoning skills they need to be successful in college and life (or have a chance to attain them soon after entering).

Summit participants discussed three key barriers to student success.

Dueling definitions of quantitative reasoning proficiency
California's K-12 system and three higher education systems each have different definitions of the quantitative reasoning skills that equal readiness for college (and, in some cases, the definitions differ from campus to campus within each system). There is also considerable tension between traditional definitions of quantitative reasoning, which rely heavily on algebra, and emerging arguments for prioritizing areas such as statistics, data analysis, and computer science — and even aligning requirements with students' academic majors.

Inaccurate measures of quantitative reasoning
The means of measuring students' proficiency levels also need to be reliable. But the tests and cut scores traditionally used by higher education institutions to determine whether students need remedial coursework are *only weakly predictive* of students' ability to succeed in college-level courses. As a result, tens of thousands of students who could succeed in college-level courses, and others who simply need a refresher, may be spending one or more semesters taking remedial courses they don't really need.

Insufficient opportunities to attain quantitative reasoning
Partly because of inconsistent and opaque quantitative reasoning expectations, not all students receive adequate and equitable preparation before college. Some students take only two math courses in high school, meeting the state's minimum high school graduation requirement. Others take three years of math, though the Common Core state standards recommend four. While students in about 800 California high schools who aren't on track to be college-ready can use their senior year to brush up on English skills and avoid remedial courses in college, almost no offerings exist for high school seniors to do the same with math.

Furthermore, many high schools provide only one pathway for students to acquire and demonstrate quantitative reasoning skills, and no second chance for students who aren't initially successful. Students need more opportunities to move on to higher-level math courses and/or strengthen math skills learned in prior courses.

Changing the Quantitative Reasoning Equation

Ensuring better transitions to and through college will entail keeping an eye on all three of these barriers. Recent reforms have emphasized addressing the third barrier by improving students' high school math preparation – including through new K-12 standards – but have failed to consider the expectations students will face at the college door. Just as the perceived health of the population could decline overnight if health officials were to change the definition of "high cholesterol," changes in definitions and measures of proficiency at the postsecondary school level can radically alter the perceived quantitative reasoning levels of students. Consider two examples:

New measure of quantitative reasoning contributes to improved college readiness. Faced with the fact that a vast majority of students were placing into remedial math courses, Long Beach City College decided in 2012 to adopt a new placement algorithm that de-emphasized placement test scores and instead heavily weighted students' high school grades. The proportion of students starting in college-level math increased from seven to 30 percent. These students succeeded in the college-level course at rates similar to those who had been placed in the course under the old algorithm.

New definition of quantitative reasoning contributes to improved success in completion of college requirements. Community colleges in California and nationally have been experimenting with new remedial sequences for students in non-technical majors. Some colleges have implemented the Carnegie Foundation for the Advancement of Teaching's Statway sequence, several are working with the California Acceleration Project's model, and others have devised their own sequences. Instead of the traditional emphasis on algebra, these new sequences prioritize preparing students for college-level courses in statistics. Research has shown that students in these sequences are three to five times more likely to complete a college-level quantitative reasoning requirement as students in the traditional sequences, and often in less time.

Several themes emerged from the summit discussion that, with input from the advisory circle, led to the development of three anchor recommendations, along with suggested steps for implementing each. Undergirding all three is the need for K-12 and higher education faculty to partner at the local and state levels to make sure that policies and practices don't create unintended obstacles to student progress and achievement.

RECOMMENDATION 1 • **Quantitative reasoning expectations** across California's education systems should be reasonably consistent, evidence-based, and well-aligned with students' courses of study so that they don't constitute arbitrary barriers to academic progress.

RECOMMENDATION 2 • Higher education institutions should rely on evidence to ensure the **validity and efficacy of the placement measures** used to determine students' readiness for college-level quantitative reasoning courses, with an eye toward removing unnecessary barriers to completion.

RECOMMENDATION 3 • High school students should have **opportunities to prepare** for college-level work (and avoid remedial courses) by taking appropriate courses.

1 • Quantitative reasoning expectations

Quantitative reasoning expectations across California's public higher education systems should be evidence-based. They should be transparent across systems and understood by K-12 teachers and counselors. They should also be sufficiently consistent, so that students considered proficient at one college or university can reasonably expect to be considered proficient at other campuses in the state. To ensure this:

The **CCC**, **CSU**, and **UC systems** should – with the support of foundations and technical assistance partners – engage groups of math and non-math faculty, as well as K-12 instructors, in an empirical analysis of the foundational quantitative reasoning skills required for various majors and professions.

External funders should provide independent technical assistance to support the analysis and maintain its focus on educational quality, as well as on student success in college, career, and life.

With the support of **technical assistance partners**, the **higher education systems** should support their institutions in revising expectations based on the empirical evidence so that students' chances of proficiency across institutions are reasonably similar.

Higher education systems and institutions should also assess and revise their math readiness policies — including admissions standards, proficiency/placement standards, developmental education requirements, and general education requirements — to better help students to attend and finish college with the quantitative reasoning skills they need.

Students should be able to find more than one pathway to develop quantitative reasoning skills in high school and/or college. To ensure this:

To the extent supported by the evidence, the **higher education systems** should support the development of differentiated pathways that meet the quantitative reasoning needs of students in a range of non-technical majors. They should also expand their capacity to align students' quantitative preparation with their intended majors.

2 • Validity and efficacy of placement measures

The measures used to assess students' readiness for college-level work should be as valid as possible. To this end:

The **CCC system**, **CSU system**, and **UC campuses** that use tests for placement should regularly conduct independent validity studies of the tests (CCCAssess, ELM, UC campus tests) and cut scores, including predictive validity studies, and share the results openly.

Placement policies and practices should take into consideration students' high school performance, including coursework, grades and test scores, to the extent supported by evidence. Students whose high school performance indicates they have met the minimum requirements should be eligible for exemption from college remedial courses. To ensure this:

With support from the **California Community Colleges Chancellor's Office (CCCCO)** and **independent researchers, community colleges** should continue to pilot various "multiple measures" and evaluate their effectiveness for maximizing student success in college. The CCCCO should support and encourage colleges to adopt evidence-based measures, and colleges should adopt them while continuing to monitor their effectiveness.

The **CSU system**, with the support of **independent researchers**, should investigate through research and experimentation the use of high school coursework and grades for placing students and encourage or require campuses to adopt measures supported by evidence.

State policymakers should enable and support effective sharing of transcript data between K-12 and higher education (particularly community colleges) so that all colleges have the data in a timely way to use for effective placement.

CSU and **community colleges** should review other placement policies (including test waiver policies, re-take policies, testing locations, and access to refresher courses) to eliminate policies that unnecessarily or unintentionally hinder student success.

3• Preparation opportunities

All high school students should have the opportunity to take the courses they need to be prepared for college-level work at any of California's higher education institutions. These offerings should include senior-year courses for students who have shown success in their prior math sequences as well as courses for students who need to strengthen their quantitative reasoning skills to be considered college-ready. Students should have more than one way of acquiring and demonstrating these skills. To ensure this:

State policymakers should make improving the availability, variety, and quality of senior-year math courses a state priority, by supporting and encouraging innovation and experimentation in the development of such courses – particularly for students who need to strengthen their quantitative reasoning skills in order to be considered college-ready. The courses should include more than one option, so that students can choose a course that aligns with their aspirations. They also should be aligned with the expectations of the higher education systems. (As revised and aligned expectations become available, these courses should be modified, as needed, to reflect those expectations).

K-12 schools, with assistance from **higher education faculty** and **technical assistance** providers, should expand implementation of senior-year quantitative reasoning courses and work with **researchers** to evaluate their efficacy.

State policymakers, the **education systems**, and individual **school districts** should adopt and revise policies to encourage student participation in senior-year quantitative reasoning courses. Examples of such policies include opt-out policies and dual-enrollment offerings.

Students should be given a second chance to become college-ready while still in high school, especially through fourth-year math courses.

The **CSU system,** together with **CCC leaders**, should revise the policies for approving high school senior-year courses that exempt students from remedial math and/or grant them college credit to include as many of these courses as evidence supports. More **community colleges** should accept high school senior-year courses to exempt students from remedial coursework.

To be sure, these recommendations don't represent an exhaustive summary of all the components necessary to enhance students' quantitative reasoning skills in high school and college. There is no question that excellent instruction, high-quality textbooks, strong student supports, and effective professional development are all essential inputs. On their own, however, these elements don't guarantee student success. Misalignment and policy incoherence can place needless obstacles in students' way. Disjointed pathways create barriers to college access and completion, costing students and the state both time and money. The recommendations in this policy brief focus on how the state and its education systems must work together to eliminate those barriers.

These recommended changes won't guarantee quality instruction, but acting on them will create a solid foundation for educators to help more students achieve the quantitative reasoning skills they need for college and for life.

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