

The Transition from High School to Postsecondary Mathematics Designing Modernized and Socially Just Pathways through Collaboration

A position statement from the California Mathematics Council

Our Position

The California Mathematics Council (CMC) believes that high school students should be engaged in mathematics courses that are modernized and are socially just. CMC believes that students should be continuously enrolled in mathematics courses throughout their high school experience that are relevant and rigorous and support a smooth transition from high school to postsecondary mathematics. This expectation should be authorized, fortified, and supported by educational policies related to high school graduation requirements. In order to realize this goal, CMC calls for collaboration across education sectors and stakeholders, including, but not limited to, PreK-12 teachers, counselors and administrators, district leaders, county offices of education; private, state and community colleges and universities; and parents, students, communities to expand and unify the efforts to strengthen students' experiences in high school mathematics and a smooth transition to postsecondary mathematics.

A Need to Modernize and Reimagine Mathematics Pathways

CMC believes that students need more relevant experiences of high quality with mathematical reasoning including quantitative reasoning. This statement is a response to the proposal by the California State University (CSU) to require an additional course of quantitative reasoning to meet the minimum qualifications for CSU admissions eligibility and extends CMC's support of Assembly Bill (AB) 1930, which would require a multi-year plan to work with, amongst others, the public elementary and secondary school systems to implement proposed additions to CSU or University of California (UC) admissions requirements.

CMC agrees with the National Council of Teachers of Mathematics (NCTM) and the Conference Board of Mathematical Sciences (CBMS) and other professional mathematics and mathematics education organizations that not all students are well served by the traditional algebraic-intensive pathway that leads to calculus. Mathematics pathways need to be modernized.

In the 2020 publication, *Launch Years: A New Vision for the Transition from High School to Post Secondary Mathematics*, a call for modernized mathematics pathways is made. A modernized mathematics pathway offers multiple pathways that provide mathematically rich and rigorous options for students, that are “personally and socially relevant, and that enable students to move across pathways as their interests and aspirations evolve . . .” (p.3). In modernized mathematics pathways, decisions regarding content are based on evidence rather than traditions and past practice to ensure relevance and high quality. In such a mathematics pathway, students learn to critically analyze the mathematics embedded in social, scientific, commercial, and political systems (Ernest, 2010). Creating modernized mathematics pathways entails updating mathematics courses as well as pedagogy, offering opportunities to empower students to understand and use mathematics in their world (Stinson and Wager, 2012). Modernized mathematics courses would include problem-solving, statistics, mathematical modeling, and other areas of applied mathematics. Modernized mathematics instruction values sense-making, exploration, argumentation, and collaboration more so than rote practice and develops quantitative thinking, structural thinking, and repeated reasoning instead of memorization and mimicking.

Students’ mathematics experiences throughout K-12 and postsecondary should be cognitively demanding, authentic, and meaningful, offering students opportunities to recognize and develop their power to understand and make use of mathematics in their world. Students’ mathematical experiences should be supported by research-based and equitable instructional practices and policies in K-12 and postsecondary education systems. The mathematics that students learn and how they learn that mathematics should propel them to postsecondary options that will increase the opportunity for upward economic and social mobility and empowerment in today’s global society.

While CMC agrees it is beneficial for students to increase their quantitative reasoning skills, we also recognize that the proposed CSU requirement is not neutral in terms of its potential impact on students: It could have negative socio-political and educational consequences for students who do not already have equitable access to rigorous quantitative reasoning courses in high school. Such policies position the CSU as a gatekeeper, a barrier denying marginalized students access to social and economic power. Our support for AB 1930 reflects our understanding that inequities in mathematics course-taking and pedagogy make it essential to initiate a serious discussion among the education sectors in order to achieve the critical mass necessary to catalyze equitable change. We advocate for moving away from top-down policies and call for collaboration amongst stakeholders to ensure that policies do not create barriers for students. Instead, we must build collective awareness, and take actions that support the marginalized as well as the privileged, in order to build a global society where all are considered, represented, and able to equitably participate.

A Call for Collaboration to Support Equitable Access to Postsecondary Success

The California Mathematics Council calls for the creation of an action and implementation plan that addresses needs our membership has identified as barriers to equitable access to post-secondary education and 21st-century careers.

This action and implementation plan would call for us to:

- ***Collaborate across the system.*** Collaborate across all segments of the education system to work towards alignment of policies and practices. We need collaboration across education sectors and stakeholders, including, but not limited to, PreK-12 teachers, counselors and administrators, district leaders, county offices of education; private, state and community colleges and universities; and parents, students, communities
- ***Engage all stakeholders.*** Seek and value the voice of students, parents, community members, workforce, teachers, administrators, counselors, professors, admission officers, etc.
- ***Align policies and funding.*** Align K-12 policies and funding to reflect the prioritization of mathematics as an undeniable civil right to have students mathematically ready for the 21st century (i.e. align state graduation requirements for high school mathematics with college and career readiness).
- ***Develop meaningful coursework.*** Courses, programs, and formative assessment-aligned curricula that are relevant and cognitively demanding are critical components of this effort. We must ensure that all students have equitable access to modernized mathematics throughout the state, including high need areas such as rural and urban communities.
- ***Ensure equitable opportunities.*** Assess the equity of current placement policies and practices and revise these to ensure that all high school students have equitable opportunities to enroll in a range of modern mathematics courses.
- ***Increase the number of mathematics teachers.*** Support efforts to increase the number of qualified K-12 mathematics teachers in the state.
- ***Offer compelling and engaging professional learning.*** Provide mathematics teachers, leaders, and decision-makers with compelling and engaging professional learning through collaborative partnerships. This learning should be focused on equitable instructional practices and content that focuses on problem-solving, modeling, statistics, and other areas of applied mathematics needed in order to be able to prepare students to read and write the world (Gutstein, 2013).
- ***Modernize university and college mathematics programs.*** Offer university and community college mathematics programs that model modernized mathematics and instructional practices to their students who will carry their experiences to the K-12 classrooms.

- **Update admissions criteria.** Define and align a definition of postsecondary readiness that includes multiple measures for determining postsecondary readiness. Adopt university admission criteria that encourage multiple rigorous pathways through mathematics.
 - **Communicate the value of mathematics.** Work to shift and expand beliefs towards valuing the role of mathematics across numerous fields and recognizing the urgency of developing individuals who are mathematically proficient.
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Leveraging Existing Efforts

California has already made efforts and investments to develop new high school mathematics pathways and to strengthen the articulation between K-12 education and postsecondary institutions to support success in mathematics. Such efforts include the California Mathematics Readiness Challenge Initiative (CMRCI) and the California Mathematics Education Collaborative (CMEC).

- The California Mathematics Readiness Challenge Initiative (CMRCI) was designed to provide in-depth professional learning opportunities for collaborative teams of secondary educators, their school-site administrator, and faculty from their partner institution(s) of higher education to support the implementation and evaluation of grade 12 experiences that are designed to prepare pupils for placement into college-level courses in mathematics (<http://cmrci.csu-eppsp.org/cmrci>)
- The California Mathematics Education Collaborative (CMEC) was created to support discussions and alignment of mathematics pathways from high school into post-secondary education. The CMEC team is an intersegmental team of mathematics educators composed of representatives from UC, CSU, California Community Colleges, California Mathematics Project, CMC, K-12 districts, Curriculum and Instruction Steering Committee, County Offices of Education, and the California Department of Education. The CMEC has three working subgroups focused on mathematics pathways development, educator professional development, and educational policy and alliances.

CMC calls on all education sectors inclusive of PreK-12 teachers, counselors, and administrators; instructors at community colleges, private and state universities, parents and students, county offices, community, etc., to advocate for partnerships and to leverage existing partnerships, to expand the efforts to strengthen students' modernized mathematics experiences. In order to build a relevant and sustainable mathematics program that meets the 21st century needs, the education sectors must collaborate to build well-informed and flexible policies, procedures, and practices that will grow with the diverse cultural, social, and political needs of our communities.

CMC's Commitments For Moving Forward

CMC believes that we must work together to uncover inequitable policies, practices, and procedures that may, on the surface, appear to be normal and good. It is our belief that as a community of mathematics educators we must work together to dismantle these inequitable systems that deny all students mathematical access, achievement, identity, and power. It is also our belief that we must work together to build humanizing mathematics programs that empower our students to improve their lives and communities. Moving forward, CMC invites collaboration with partners from the different education sectors in order to begin to modernize mathematics pathways for all students.

We commit to:

- Advocate for continuous enrollment in high quality and modernized mathematics courses in high school and support the implementation of multiple pathways toward post-secondary mathematics.
- Increase collaboration across education segments and include a variety of stakeholders with multiple perspectives and experiences.
- Develop learning opportunities for K-12 teachers, administrators, community members, students, and families.
- Support the awareness and adoption of courses developed through CMRCI throughout the state to expand the influence and possibility of this work.

CMC would like to enlist the support of the State Superintendent of Public Instruction and State Board of Education to create a space for this collaboration and articulation about the need for modernized mathematical pathways needed to meet the diverse 21st century needs of California.

Concluding Thoughts

We close this statement by posing a question: If the inequities and barriers listed are resolved would there be a need for CSU to enforce a quantitative reasoning requirement for the reasons listed in their proposal? CMC believes that if the barriers are addressed with integrity, students would be ready for college, career, and civic life. Until these barriers are resolved additional quantitative reasoning requirements would be yet another barrier for marginalized students, positioning the CSU as a gatekeeper limiting opportunity instead of an avenue to increased social and economic power.

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