AGENDA

COMMITTEE ON EDUCATIONAL POLICY

Meeting: **1:00 p.m., Tuesday, July 23, 2019**
Glenn S. Dumke Auditorium

Peter J. Taylor, Chair
Jane W. Carney, Vice Chair
Silas H. Abrego
Rebecca D. Eisen
Douglas Faigin
Debra S. Farar
Wenda Fong
Juan F. Garcia
Lillian Kimbell
Thelma Meléndez de Santa Ana
Romey Sabalius
Christopher Steinhauser

Consent

1. Approval of Minutes of the Meeting of May 21, 2019, *Action*

Discussion

2. Amendment to Title 5 Regarding Student Organizations, *Information*
3. Graduation Initiative 2025, *Information*
4. Special Public Comment Open Forum on Quantitative Reasoning Proposal, *Information*
5. Expanding Opportunity through Preparation in Quantitative Reasoning, *Information*

MINUTES OF MEETING OF COMMITTEE ON EDUCATIONAL POLICY

Trustees of The California State University
Office of the Chancellor
Glenn S. Dumke Conference Center
401 Golden Shore
Long Beach, California

May 21, 2019

Members Present

Peter Taylor, Chair
Jane W. Carney, Vice Chair
Rebecca D. Eisen
Douglas Faigin
Debra S. Farar
Wenda Fong
Juan F. Garcia
Emily Hinton
Lillian Kimbell
Romey Sabalius
Christopher Steinhauser
Adam Day, Chairman of the Board
Timothy P. White, Chancellor

Trustee Taylor called the meeting to order.

Approval of Minutes

The minutes of March 18-20, 2019, were amended to reflect Trustee Abrego's recommendation that representative(s) from the Ed Trust West and Campaign for College Opportunity – who addressed the committee in public comment expressing their concerns on the potential negative impacts of a fourth year of quantitative reasoning – be provided an opportunity to share their data with the board.

The amended minutes were approved.

Graduate Education

Loren J. Blanchard, executive vice chancellor for Academic and Student Affairs, introduced the information item by stating that the CSU offers a number of high-quality, cost-effective graduate programs that provide opportunities for California's diverse populations. These graduate programs are responsive to regional and statewide workforce needs and prepare students to be competitive in the expanding 21st century economy.

Alison Wrynn, interim assistant vice chancellor for Academic Programs and Faculty Development presented the information item, providing an overview of CSU graduate program enrollments, degrees conferred and the disciplines with the greatest enrollments. Additionally, she discussed two systemwide programs – the California Pre-Doctoral Program and the Chancellor's Doctoral Incentive Program – aimed at supporting undergraduate and graduate students as they prepare for and undertake doctoral education.

From California State University, Chico, Colleen Milligan, an associate professor and Mallory Peters, a graduate student presented to the board about the campus' master's program in anthropology. The presentation included details on the hands-on approach for graduate students and the program's benefit to the state of California.

Following the presentation, trustees asked questions on the California Pre-Doctoral Program and the Chancellor's Doctoral Incentive Program, with a specific interest in how those programs help grow the ranks of CSU faculty and if additional funding could be allocated to the programs. Trustees also expressed interest in the CSU offering additional stand-alone doctorates.

Recognition of the S. D. Bechtel, Jr. Foundation's Investment in Educator Preparation

Marquita Grenot-Scheyer, assistant vice chancellor for Educator Preparation and Public School Programs, introduced the information item, stating that S. D. Bechtel, Jr. Foundation has partnered with the CSU for more than a decade, investing more than $20 million to help transform teacher education in the CSU. Two of the largest CSU initiatives supported by the foundation have been the Science Teacher and Researcher Program and the New Generation of Educators Initiative.

Nicholas Kertz, an elementary school teacher in Long Beach Unified School District (LBUSD) and a California State University, Long Beach alumnus, presented about his experience as part of the New Generation of Educators Initiative. He shared that his experience as part of the program enabled him to gain real-world experience and apply his learning in real time, while receiving support and feedback from both his professors and the teachers in LBUSD.

Susan Harvey and Macy Parker with the S. D. Bechtel, Jr. Foundation spoke during the presentation, reflecting on the foundation's support of the CSU's teacher initiatives. They announced a new CSU Residency Year scholarship, which will be initiated with a $3.1 million grant from the foundation and will provide $10,000 to each of 300 aspiring teacher residents with demonstrated financial need.

Following the presentation, trustees expressed appreciation for the S. D. Bechtel, Jr. Foundation's decade of partnership with the CSU.

CSU Institute for Palliative Care

Loren J. Blanchard, executive vice chancellor for Academic and Student Affairs, introduced the information item by stating that the CSU Institute for Palliative Care is one of the CSU's nine multi-campus collaborations that address a breadth of topics. The institute is located at California State University San Marcos in partnership with California State University, Fresno.

Karen Haynes, president of CSU San Marcos, presented the item, explaining that palliative care is a rapidly growing field of specialized medical care for people with serious illness, focused on enhancing quality of life and relieving pain, symptoms and stress. She introduced Trustee Emerita Roberta Achtenberg who spoke about the impetus behind the institute's creation.

Jennifer Ballentine, executive director of the CSU Institute for Palliative Care, provided an overview of the institute, highlighting that it offers professional training, education and awareness about palliative care. Since its founding, the institute has delivered education to more than 300 healthcare organizations and reached more than 11,000 health care professional participants. She also spoke about the future of the institute, including potential federal legislation that, if passed, would authorize up to $20 million a year for five years specifically to support national expansion of palliative care education, faculty preparation, and research.

Following the presentation, trustees expressed support for the importance of palliative care and the CSU Institute for Palliative Care's role in advancing the field.

Trustee Taylor adjourned the Committee on Educational Policy.

COMMITTEE ON EDUCATIONAL POLICY

Amendment to Title 5 Regarding Student Organizations

Presentation By

Loren J. Blanchard
Executive Vice Chancellor
Academic and Student Affairs

Nathan Evans
Interim Assistant Vice Chancellor
Student Academic Services

Summary

Student activities, clubs and organizations are an integral part of the California State University (CSU) student experience. On each campus there are typically hundreds of organizations, covering a wide range of interests and topics. Students who participate in these activities report higher levels of satisfaction with their college experience. Participation also has a number of benefits for students, including:

- Enriching the classroom experience;
- Easing the transition to college;
- Providing connections with the university and available resources; and
- Enabling students to enhance and practice soft skills (leadership, communication, problem-solving, public speaking, etc.)

Student organizations in the CSU are student-led and are independent and distinct from the campus. Recognized student organizations are required to meet and maintain campus requirements, which include:

- A university advisor, who must be either a faculty member or professional staff member;
- A minimum of five CSU students who are currently enrolled in at least one class;
- A signed agreement that the organization does not discriminate on the basis of protected class (in alignment with CSU policy as defined by federal and state law); and
- Membership and leadership that are open to all currently enrolled students at that campus (except that a social fraternity or social sorority may impose a gender limitation for membership as permitted by California Education Code).

Recognized student organizations are eligible for benefits and privileges, including the use of campus facilities, assistance from a campus' student development and leadership department, participation in university activities and programs, and eligibility for funding from Associated Students, Inc.

Proposed Revisions

The proposed Title 5 amendment would align and update CSU policies related to student organizations by conforming the requirement that student organizations cannot discriminate on the basis of any protective class, adding as protective statuses religious creed, medical condition, genetic information, gender identity, gender expression and veteran and military status.

An item will be presented at the September meeting for board action to adopt the following recommended amendment to Title 5.

Title 5. Education
Division 5. Board of Trustees of the California State Universities
Chapter 1. California State University
Subchapter 4. Student Affairs
Article 4. Nondiscrimination in Student Organizations

§ 41500. Withholding of Recognition.

No campus shall recognize any fraternity, sorority, living group, honor society, or other student organization which discriminates on the basis of race or ethnicity (including color and ancestry), religion (or religious creed), nationality~~national origin~~, ~~ethnicity, color,~~ age, medical condition, genetic information, gender (or sex), gender identity (including transgender), gender expression, sexual orientation, marital status, ~~citizenship, sexual orientation,~~ veteran or military status, or disability. The prohibition on membership policies that discriminate on the basis of gender does not apply to social fraternities or sororities or to other university living groups.

Note: Authority cited: Sections 66600, 89030, 89035 and 89300, Education Code. Reference: Sections 66600, 89030, 89300-89302, Education Code.

COMMITTEE ON EDUCATIONAL POLICY

Graduation Initiative 2025

Presentation By

Loren J. Blanchard
Executive Vice Chancellor
Academic and Student Affairs

Jeff Gold
Assistant Vice Chancellor
Student Success Strategic Initiatives

Michelle Rippy
Assistant Professor
California State University, East Bay

Terri Gomez
Associate Vice President, Student Success
California State Polytechnic University, Pomona

Summary

Graduation Initiative 2025 is the California State University's (CSU) signature effort aimed at increasing degree completion rates and eliminating equity gaps, thereby supporting student success and meeting the future workforce needs of California. This information item provides an update on the work that is underway – systemwide and on campuses – to achieve the initiative goals, with an emphasis on systemwide and campus-based actions to close equity gaps for students from historically underserved communities.

Graduation Initiative 2025 Goals

At the September 2016 Board of Trustees meeting, the board heard a detailed report on Graduation Initiative 2025 and voted to approve the CSU's ambitious student completion and equity targets. The targets are:

- A 40 percent 4-year graduation rate goal for first-time students;
- A 70 percent 6-year graduation rate goal for first-time students;
- A 45 percent 2-year graduation rate goal for transfer students;
- An 85 percent 4-year graduation rate goal for transfer students;

- The elimination of equity gaps (the gaps that exist between students who identify as African American, American-Indian or Latino and their peers) throughout the CSU; and
- The elimination of equity gaps (the gaps that exist between Pell recipients and their peers) throughout the CSU.

These system targets are extremely ambitious and, when attained, will place CSU campuses among the very top of comparable institutions across the nation. Nationally, virtually no institutions with profiles comparable to the CSU campuses (funding level, student preparation and diversity) have attained graduation rates at a level consistent with the CSU's new targets. Indeed, attainment of these goals – with the CSU's vibrantly diverse student population – will set new, unprecedented national standards for student success and timely degree completion.

Operational Priorities

At the January 2017 Board of Trustees meeting, Chancellor White outlined five priority areas where focus is needed to achieve the Graduation Initiative 2025 goals: academic preparation, enrollment management, financial support, data-driven decision making and administrative barriers. Based on feedback received from campus constituents, "student engagement and well-being" was added as a sixth focal area.

The following represents the CSU's aspirational goals with respect to each of these areas of focus:

- **Academic preparation:** We will provide CSU students, including those who require additional academic support, the opportunity and support needed to complete 30 college-level semester units – 45 quarter units – before beginning their second academic year.
- **Enrollment management:** We will ensure students are able to enroll in the courses they need, when they need them.
- **Student engagement and well-being:** We will continue to address the well-being of all CSU students while fostering a strong sense of belongingness on campus.
- **Financial support:** We will ensure that financial need does not impede student success.
- **Data-driven decision making**: We will use evidence and data to identify and advance the most successful academic support programs.
- **Administrative barriers:** We will identify and remove unnecessary administrative impediments.

Intentional Focus on Closing Equity Gaps

Given the diverse CSU student population, closing equity gaps will result in the achievement of the four graduation rate goals of Graduation Initiative 2025. All 23 CSU campuses are taking specific steps to support the success of students from historically underserved communities. Additionally, a number of the overarching actions taken by campuses in support of Graduation Initiative 2025 are positively impacting these student populations, further narrowing equity gaps.

The CSU's intentional focus on closing equity gaps reaches across all six operational priorities of Graduation Initiative 2025. Examples are provided below. A more comprehensive – though not exhaustive – report is included as an attachment.

Academic Preparation

Research demonstrates that academic preparation plays an important role in students' ability to earn a degree. Disparities in academic preparation have had a direct impact on progress to degree for students from historically underserved communities.

The CSU is addressing inequities in college readiness head-on in order to close gaps in degree attainment and afford all students the opportunity to succeed. One of the primary initiatives, implemented systemwide, is the 2017 policy change that ensures all students are able to take college-level, credit-bearing courses in mathematics and English beginning their first day on campus. As was presented to the Board of Trustees at the March 2019 meeting, these policy changes are already having a positive impact on students.

Examples of campus-specific actions to close equity gaps through improved academic preparation include:

- Redesigning high-enrollment, low-success courses that have historically had significant equity gaps;
- Enhancing tutoring and expanding peer mentoring for students;
- Supporting faculty in the implementation of equity-minded pedagogy and in the creation and strengthening of faculty learning communities, aimed at identifying and advancing strategies for closing equity gaps in the classroom;
- Developing and expanding summer programming designed specifically to support students from historically underserved communities; and
- Reimagining the first year of college – a critical barrier to student success – to improve the quality of learning and student experience for students from historically underserved communities.

Enrollment Management

Ensuring that CSU students are able to enroll in the courses they need, when they need them, is particularly important for students from historically underserved communities. For example, first generation students often need additional assistance navigating the path to degree, as they do not have a parent or close family member familiar with the process.

Systemwide, the CSU is currently focused on improving the quality of advising that students receive while enrolled at the CSU. To this end, there are four specific components of advising that are being addressed:

- **Accountability –** Ensuring that every student has at least one individual, or office, responsible for monitoring their progress through degree completion.
- **Advising Structures –** Supporting campuses as they rethink and simplify advising structures to improve coordination across the various offices on campus where students receive guidance.
- **Data Integration –** Combining existing data systems to increase the availability and use of real-time information that advisors use to support students.
- **Degree Plans for Students** - Increasing the percentage of students who have a clear degree plan, before they begin their first academic term.

Examples of campus-specific actions to close equity gaps through enrollment management initiatives include:

- Intentionally focusing on the retention of students from historically underserved communities;
- Developing targeted, proactive advising and implementing early alert systems that warn staff when a student is falling behind or is in danger of stopping out;
- Developing advising groups and hiring dedicated positions in academic advising to support students from historically underserved communities; and
- Enhancing new student orientation programs and offering these programs in languages other than English;

Student Engagement and Well-being

The CSU is committed to ensuring that students, regardless of race, ethnicity, background or status, feel a sense of belonging on campus. Closing equity gaps at the CSU requires a focus on fostering engagement and well-being to improve the persistence, retention and completion rates of students from historically underserved communities.

Systemwide, the CSU is creating a framework for addressing student well-being in a holistic manner. As an educational institution, the university is particularly focused on the areas that impact students' ability to be successful, persist and complete their degree. This includes areas such as quality education, food, housing, a sense of belonging and mental and physical health. The CSU is actively developing and strengthening relationships with regional and local agencies and organizations to provide comprehensive care to students, in instances where students' needs go above and beyond campus capabilities.

Examples of campus-specific actions to close equity gaps by fostering student engagement and well-being include:

- Implementing initiatives aimed at ensuring an inclusive campus climate;
- Dedicating resources to provide space, programming and staff to support first-generation students and students of color;
- Hiring counselors dedicated to serving the unique needs of students from historically underserved communities;
- Implementing programs to better inform and engage parents and families in their students' education; and
- Enhancing professional mentoring and leadership and professional opportunities for students from historically underserved communities.

Financial Support

The CSU remains an affordable higher education opportunity for Californians from all backgrounds. Despite this, student financial need can go above and beyond what is available through financial aid. This is particularly true for students from low-income backgrounds.

Systemwide, the CSU is focused on supporting policy initiatives to expand financial aid to reach additional students and to provide financial support when students need it most. This includes the reinstatement of year-round Pell grants and the proposed reforms for the state's Cal Grant program, as reported to the board during the March 2019 meeting.

Examples of campus-specific actions to close equity gaps by providing needed financial support include:

- Implementing programs to increase students' financial literacy to support them in making informed decisions when planning their course schedules and graduation timelines;
- Increasing the number of student job opportunities on campus;
- Offering emergency funds, and retention and summer grants to students in need; and
- Creating initiatives to ensure the affordability of course materials for students.

Administrative Barriers

CSU campuses are focused on closing equity gaps for students from historically underserved communities by identifying and removing unnecessary administrative barriers. This includes breaking down campus silos by bringing together faculty, staff and administrators from across the campus to discuss how best to support these student populations.

Examples of campus-specific actions to close equity gaps by removing unnecessary administrative barriers include:

- Educating campus constituents about the campus' diverse student population;
- Developing cross-divisional workgroups, task forces and college-based teams focused on equity;
- Offering professional development opportunities related to closing equity gaps; and
- Hiring staff to support students from historically underserved communities through administrative processes, including the application, deposit and transfer processes.

Data-Driven Decision Making

The strategic use of data to drive decision making is interwoven with all CSU student success efforts. By advancing programs and initiatives that are proven effective, campuses are making strong progress toward achieving their individual Graduation Initiative 2025 goals. This is particularly true for the goals of closing equity gaps facing students of color, students from low-income backgrounds and first generation students.

CSU Student Success Dashboards

To advance campus efforts to improve student success and close equity gaps, the Office of the Chancellor has developed internal data dashboards to serve as a central resource to assist each campus in identifying and dislodging barriers to student success for its students. These dashboards contain data for all 23 CSU campuses, and can be found at a password protected site at www.calstate.edu/dashboard.

The dashboards provide the CSU community with a set of analytical tools that go beyond descriptive statistics and apply methods such as predictive modeling to give new insights into factors that affect student progress toward a degree. Using the dashboards, campus leaders can monitor on-track indicators and better understand which milestones students are failing to reach and why they are not being reached. Ultimately, this analytical tool can also help campuses design interventions or policy changes to increase student success and gauge the impact of their interventions.

There are four main data dashboards:

- **Graduation Initiative 2025 Dashboard –** This dashboard supports administrators, faculty and staff in tracking their campus progress toward meeting their Graduation Initiative 2025 goals. The dashboard includes linear trajectories for all six goals and provides an assessment of progress made to date.

- **Faculty Dashboard –** Faculty play a critical role in fostering student success in, and out, of the classroom. This dashboard supports faculty in gaining a better understanding of the backgrounds and academic patterns of students. It includes analyses of student progress to degree, identification of low-success courses and courses with large equity gaps, and analyses of students who leave without earning a degree.
- **CSU by the Numbers Dashboard –** This dashboard facilitates a deeper understanding of the backgrounds and academic patterns of currently enrolled and recently graduated students. The dashboard includes an analysis of how CSU student populations are changing, how many students are taking a full-load of classes (15 units per term) and how CSU campus graduation rates compare to national peers.
- **Equity Gaps Dashboard –** The recently developed equity gap dashboard highlights inequitable outcomes in short- and long-term student outcomes while identifying actions that will help close equity gaps on campuses and systemwide. It includes predictive models and innovative visualizations that underscore the imperative to ensure that all students are given equitable opportunities to succeed.

Student Success Analytics Certificate Program

To support CSU administrators, faculty and staff in using the data dashboards and other institutional-level data, the CSU Office of the Chancellor created the Student Success Analytics Certificate Program.

The Certificate Program in Student Success Analytics is an innovative and interactive professional development experience, which provides CSU faculty, staff, and administrators with a set of strategies to better understand what is working well and what needs to be improved to increase student success. Participants develop advanced data literacy skills to glean insights on their respective campuses and engage in hands-on action research projects to help bring these insights into practice.

The eight-session course constitutes a hybrid learning model that includes face-to-face and online learning opportunities. It exposes participants to system and campus data, contextualized within national research studies on student success in higher education. The goal is to help campuses design measurably effective student success interventions in response to the data, particularly on behalf of historically underserved students. To that end, each session is consistently infused with information that helps participants become more intentional and equity-minded practitioners in their area of work at the university.

The first program cohort was in 2018. It was supported by the Stupski Foundation and was a pilot program with participants from California State University, East Bay and San Francisco State University. Outcomes data from the cohort show the program's success. Specifically, four identified goals were achieved:

1. Foster a collaborative inter and intra-campus learning community at San Francisco State and CSU East Bay, with the goal of raising awareness around systemwide and campus-specific data tools that promote student success.
2. Engage participants by growing confidence in the data and increasing readiness to use the data for evidenced-based and equity-minded decision-making in their area of influence on campus.
3. Expose participants to a selection of best practices in student success interventions, especially in regard to the equity gap that exists for historically underserved students in the CSU.
4. Provide a support structure that allowed participants to articulate their own data action research projects.

To evaluate the effectiveness of the program, staff contracted with an independent evaluator, The Center for Evaluation and Educational Effectiveness, to develop quantitative and qualitative progress metrics and issue an independent report. Key findings of this independent evaluation included:

- **Capacity and willingness to create a culture of student success** - Results showed significant increases in participants' confidence in discussing data with others, as well as their preparation and ability to access, analyze and use data to make decisions. Open-ended responses elaborated on participants' willingness to use an equity mindset to identify and disrupt barriers to student success and to create an academic home where students know they belong.

- **Data are more than a program planning tool** - Before the Student Success Analytics Program, most participants regarded data as administrative tools for enrollment management, budget forecasting and measures of program effectiveness. Post-survey responses revealed a shift in how data contributes to student success. Many participants commented that data were both a reliable way of identifying problems otherwise invisible to them and a valid source of evidence to confirm hunches and anecdotes.

A second program cohort was enrolled in the program for 2019. This cohort included teams from eight CSU campuses:

- California State University, Chico;
- California State University, Dominguez Hills;
- California State University, Fresno;
- California State University, Monterey Bay;
- California State Polytechnic University, Pomona;
- California State University, Sacramento;

- California State University, Stanislaus; and
- Sonoma State University.

Additionally, the 2019 cohort included a team from the California State Student Association and from the University of California, Riverside.

Conclusion

CSU faculty, staff and administrators continue to work diligently to achieve the goals of Graduation Initiative 2025 and ensure that all students have the opportunity to be successful and graduate according to their own personal goals. This includes a concerted focus on closing equity gaps, a focus that reaches across all of the initiative's operational priorities: academic preparation, enrollment management, student engagement and well-being, financial support, administrative barriers and data-driven decision making. The Office of the Chancellor and all 23 campuses continue to take intentional action to close equity gaps and ensure that the CSU meets all of the Graduation Initiative 2025 goals.

Excerpt from the January 2019 CSU Report to the Legislature:

Graduation Initiative 2025 Progress

Intentional Focus on Closing Equity Gaps

Driven by a recognition of the university's critical role as an engine of social mobility and buoyed by recent progress, the CSU entered the 2018-19 academic year laser-focused on closing equity gaps for students from historically underserved communities.

All 23 campuses are taking specific steps to support the success of low-income students, historically underrepresented students and first-generation students. Additionally, a number of the overarching actions taken by campuses in support of Graduation Initiative 2025 will positively impact these student populations, further narrowing equity gaps. For that reason, it is impossible to separate out actions that will solely close equity gaps from those that will improve overall student success and graduation rates. Given the CSU's richly diverse student population, these goals are too intertwined.

For example, the systemwide policy changes to developmental education that are being implemented on campuses will have a positive impact on all students; however, it is expected to have a particularly significant impact on eliminating equity gaps. This is because students from historically underserved communities were more likely to have their progress to degree delayed under the previous policy.

The following sections represent campus actions that will have an impact on eliminating equity gaps. These actions are categorized by each of the six Graduation Initiative 2025 operational priorities. While these lists provide a thorough overview, they are in no way exhaustive – either in the campuses participating in each action or in listing all of the ways campuses are working to close equity gaps.

1.1 Closing Equity Gaps through Improved Academic Preparation

Research clearly demonstrates that academic preparation plays an important role in students' ability to earn a degree. Disparities in academic preparation have had a direct impact on progress to degree for students from historically underserved communities – those who are first-generation college students, from low-income backgrounds or identify as African-American, American-Indian or Latino.

CSU campuses are addressing inequities in college readiness head-on in order to close gaps in degree attainment and afford all students the opportunity to succeed. One of the primary initiatives, implemented systemwide, is the 2017 policy change that ensures all students are able to take college-level, credit-bearing courses in mathematics and English beginning their first day on campus. Campuses are also enhancing mentoring, supporting faculty in implementing equity-minded pedagogy and redesigning courses that have historically had large equity gaps.

Action	***Campuses***
Replaced stand-alone, developmental education courses in mathematics and English that do not count toward a degree with redesigned classes that have academic support embedded or attached	Bakersfield Channel Islands Chico Dominguez Hills East Bay Fresno Fullerton Humboldt Long Beach Los Angeles Maritime Academy Monterey Bay Northridge Pomona Sacramento San Bernardino San Diego San Francisco San José San Luis Obispo San Marcos Sonoma Stanislaus

Closing Equity Gaps through Improved Academic Preparation (cont.)

Action	***Campuses***
Implemented/strengthened faculty learning communities	Bakersfield Channel Islands Chico East Bay Fullerton Long Beach Monterey Bay Northridge Pomona Sacramento San Bernardino San José San Luis Obispo San Marcos Stanislaus
Redesigned high-enrollment, low-success courses with significant equity gaps	Bakersfield Chico East Bay Fresno Fullerton Long Beach Maritime Northridge Pomona Sacramento San José Stanislaus

Closing Equity Gaps through Improved Academic Preparation (cont.)

Action	***Campuses***
Expanded peer mentoring for students	Channel Islands Chico Dominguez Hills East Bay Fresno Fullerton Humboldt Northridge Pomona Sacramento San Bernardino San Diego San Francisco San José San Luis Obispo San Marcos Stanislaus
Supported faculty in the implementation of equity-minded pedagogy	Chico East Bay Humboldt Los Angeles Monterey Bay Northridge Pomona Sacramento San Francisco San José San Luis Obispo

Closing Equity Gaps through Improved Academic Preparation (cont.)

Action	***Campuses***
Targeted academic and social support services for underrepresented students of color pursuing STEM (science, technology, engineering, mathematics) fields	Channel Islands Chico Dominguez Hills Fullerton Long Beach Monterey Bay Pomona Sacramento San Bernardino San Francisco San Luis Obispo Sonoma
Implemented/strengthened the learning assistant role to support students through interactive, collaborative and engaging classrooms	Chico East Bay Fullerton Pomona Sacramento San Bernardino San José San Luis Obispo
Enhanced tutoring services for students	Bakersfield Dominguez Hills East Bay Fullerton Humboldt Monterey Bay Pomona Sacramento San Bernardino San José San Luis Obispo Sonoma

Closing Equity Gaps through Improved Academic Preparation (cont.)

Action	***Campuses***
Implemented/strengthened supplemental instruction	Bakersfield Chico Dominguez Hills East Bay Fresno Fullerton Humboldt Long Beach Monterey Bay Pomona Sacramento San Francisco San José Sonoma Stanislaus
Developed/enhanced student learning communities	Bakersfield Channel Islands Dominguez Hills East Bay Fullerton Sacramento San Diego San Francisco San José Stanislaus
Developed/expanded summer programming specifically to support students from historically underserved communities	Channel Islands Dominguez Hills East Bay Fresno Pomona San Bernardino San José San Luis Obispo San Marcos Sonoma Stanislaus

Closing Equity Gaps through Improved Academic Preparation (cont.)

Action	***Campuses***
Expanded faculty mentoring for students	Sacramento San José San Luis Obispo San Marcos Stanislaus
Reimagining the First Year initiative	Dominguez Hills East Bay Fresno Fullerton Humboldt Long Beach Monterey Bay Pomona San Francisco

1.2 Closing Equity Gaps through Enrollment Management Initiatives

Ensuring that CSU students are able to enroll in the courses they need, when they need them, is the driving force behind the focus on enrollment management as part of Graduation Initiative 2025. This is particularly important for students from historically underserved communities. For example, first generation students often need additional assistance navigating their path to degree, as they do not have a parent or close family member familiar with the process.

To best support these students and close equity gaps, campuses are focusing on improvements to advising, including the implementation of early alert systems that warn staff when a student is falling behind. Campuses are also hiring dedicated positions in academic advising to support students from historically underserved communities. In addition, campuses are focusing on the orientation process, making these experiences more robust and offering them in additional languages to ensure all students – regardless of background – are prepared with the resources and support they need to be successful.

Action	***Campuses***
Hired/hiring a dedicated position in academic advising to support students from historically underserved communities	Chico East Bay Fresno Fullerton Humboldt Sacramento Sonoma
Focused on the retention of students from historically underserved communities	Bakersfield Channel Islands Chico Dominguez Hills East Bay Fresno Fullerton Humboldt Long Beach Monterey Bay Northridge Pomona Sacramento San Bernardino San Luis Obispo Stanislaus

Closing Equity Gaps through Enrollment Management Initiatives (cont.)

Action	***Campuses***
Increased diversity in faculty hiring	Dominguez Hills Fullerton Humboldt Long Beach Los Angeles Pomona San Bernardino San José San Luis Obispo Sonoma Stanislaus
Developed college-specific plans to close equity gaps	Fullerton Long Beach Monterey Bay Pomona Sacramento San Francisco San José San Luis Obispo
Developed targeted, proactive advising	Channel Islands Chico Dominguez Hills East Bay Fresno Humboldt Pomona Sacramento San Bernardino San Francisco San José San Luis Obispo San Marcos Sonoma

Closing Equity Gaps through Enrollment Management Initiatives (cont.)

Action	***Campuses***
Implemented/improved the use of predictive analytics and early alert system for advising	East Bay Fullerton Humboldt Maritime Monterey Bay Northridge Pomona Sacramento San Bernardino San Francisco San José San Luis Obispo Sonoma Stanislaus
Offered new student orientation sessions in a language other than English	Chico Fresno Sacramento San Francisco Stanislaus
Enhanced orientation programs	Channel Islands Chico Dominguez Hills East Bay Fresno Fullerton Monterey Bay Pomona San José San Luis Obispo
Developed advising groups for students from historically underserved communities	Channel Islands Dominguez Hills Fresno Long Beach Sacramento San Luis Obispo

1.3 Closing Equity Gaps by Fostering Student Engagement and Well-being

The CSU is dedicated to fostering the success of all students both inside – and outside – the classroom. This includes ensuring that students, regardless of race, ethnicity, background or status, feel welcome and accepted on campus. Closing equity gaps at the CSU requires a focus on fostering engagement and well-being to improve the persistence, retention and completion rates of students from historically underserved communities.

Campuses are implementing a number of initiatives aimed at ensuring an inclusive campus climate, including dedicating resources to provide space, programming and staff to support first-generation students and students of color. Recognizing the unique needs of historically underserved students, campuses are hiring counselors dedicated to serving these populations and are implementing programs to better engage parents and families.

Action	***Campuses***
Created a dedicated space for students from historically underserved communities	Bakersfield Dominguez Hills East Bay Fresno Fullerton Humboldt Sacramento San José Stanislaus
Hired staff dedicated for programs and initiatives that support students from historically underserved communities	Channel Islands Chico Dominguez Hills East Bay Fresno Humboldt Maritime Sacramento San Francisco San José San Luis Obispo San Marcos Sonoma Stanislaus

Closing Equity Gaps by Fostering Student Engagement and Well-being (cont.)

Action	***Campuses***
Implemented initiatives to empower, guide and support men of color	Chico Dominguez Hills Fresno Fullerton Monterey Bay Pomona Sacramento San José San Luis Obispo
Convened a Council on Diversity and Inclusion	Channel Islands Chico Dominguez Hills Fullerton Humboldt Long Beach Los Angeles Monterey Bay Sacramento San Bernardino San Luis Obispo Stanislaus
Hired/ hiring a Chief Diversity Officer	Bakersfield Chico Dominguez Hills East Bay Fullerton Los Angeles Monterey Bay Sacramento San Bernardino San José San Luis Obispo

Closing Equity Gaps by Fostering Student Engagement and Well-being (cont.)

Action	***Campuses***
Conducted/conducting a campus climate survey	Chico Dominguez Hills East Bay Humboldt Long Beach Sacramento San Francisco San José San Luis Obispo Stanislaus
Hired/hiring a full-time counselor to serve students from historically underserved communities	East Bay Fresno Fullerton
Developed/enhanced professional mentoring for students	Channel Islands East Bay Monterey Bay San Diego San Luis Obispo
Worked to increase the number of historically underserved students who participate in international exchange and study abroad programs	Fullerton San Francisco
Developed campus programming on topics that impact students from historically underserved communities	Bakersfield Chico East Bay Fresno Monterey Bay Sacramento San Francisco San José San Luis Obispo San Marcos Sonoma Stanislaus

Closing Equity Gaps by Fostering Student Engagement and Well-being (cont.)

Action	***Campuses***
Developed/enhanced parent and family engagement programs	Channel Islands Fresno Sacramento San Bernardino San José San Luis Obispo
Facilitated leadership and professional opportunities for historically underserved student leaders	Chico Sacramento San Francisco San José San Luis Obispo San Marcos

1.4 Closing Equity Gaps by Providing Needed Financial Support

The CSU remains an affordable higher education opportunity for Californians from all backgrounds. Despite this, student financial need can often go above and beyond what is available through financial aid. This is particularly true for students from low-income backgrounds.

To help close equity gaps, CSU campuses are implementing programs to increase students' financial literacy so that they can make informed decisions when planning their course schedules and graduation timelines. Campuses are also providing a bevy of resources aimed at alleviating additional financial need for students in crisis, such as on-campus job opportunities, emergency funds, retention grants and services, such as food pantries and emergency housing.

Action	***Campuses***
Efforts to increase the financial literacy of students through presentations, workshops and education	Bakersfield Chico East Bay Fresno Fullerton Humboldt Long Beach Maritime Pomona Sacramento San José San Luis Obispo Sonoma
Increased the number of student job opportunities on campus	Humboldt Maritime Sacramento
Offered emergency funds to students in need	Chico Fresno Fullerton Monterey Bay Pomona Sacramento San José San Luis Obispo Stanislaus

Closing Equity Gaps by Providing Needed Financial Support (cont.)

Action	***Campuses***
Redeployed existing housing scholarships to students facing housing insecurity	Fresno Humboldt Monterey Bay Sacramento
Created initiatives to ensure the affordability of course materials for students	Channel Islands East Bay Monterey Bay San José San Marcos
Developed an Economic Crisis Response team	Fresno Fullerton Sacramento San Bernardino San José
Developed/enhanced a campus food pantry	Bakersfield Chico Fresno Fullerton Humboldt Long Beach Pomona Sacramento San Bernardino San Francisco San José San Luis Obispo
Offered retention and/or summer grants for students	Chico East Bay Fresno Fullerton Long Beach Pomona Sacramento San Bernardino San José

1.5 Closing Equity Gaps through Data-Driven Decision Making

The strategic use of data to drive decision making is tightly interwoven with all CSU student success efforts. By advancing programs and initiatives that are proven effective, campuses are making strong progress toward achieving their individual Graduation Initiative 2025 goals.

This is particularly true for the goals of closing equity gaps facing students of color, students from low-income backgrounds and first generation students. To advance these efforts, campuses are engaging in detailed analyses of equity gap data to identify where improvements must be made. On some campuses, this includes the funding of dedicated faculty and staff to identify where, and why, historically underserved students are not being best served by the institution. Other campuses have participated – or will be participating – in the Student Success Analytics Certificate Program, a program housed in the Office of the Chancellor and designed to help campuses develop effective student success interventions, particularly on behalf of historically underserved students.

Action	***Campuses***
Funded/funding a position in Institutional Research to better understand where and why historically underserved students are falling behind	Chico East Bay Fullerton Humboldt Sacramento
Reviewed data for a detailed analysis of equity gaps	Bakersfield Chico Dominguez Hills East Bay Fresno Fullerton Long Beach Maritime Pomona Sacramento San Bernardino San José San Luis Obispo Stanislaus

Closing Equity Gaps through Data-Driven Decision Making (cont.)

Action	***Campuses***
Participated/participating in the Certificate Program in Student Success Analytics	Chico Dominguez Hills East Bay Fresno Monterey Bay Pomona Sacramento San Francisco Sonoma Stanislaus

1.6 Closing Equity Gaps by Removing Unnecessary Administrative Barriers

CSU campuses are focused on closing equity gaps for students from historically underserved communities by identifying and removing unnecessary administrative barriers. This includes breaking down campus silos by bringing together faculty, staff and administrators from across the campus to discuss how best to support these student populations.

Action	***Campuses***
Developed presentations to better educate campus constituents about the student population	Chico East Bay Fresno Fullerton Maritime Pomona Sacramento San Bernardino San Luis Obispo
Developed a cross-divisional workgroup/task force focused on equity	Fresno Fullerton Humboldt Pomona Sacramento San Bernardino San Luis Obispo
Developed/developing college-based student success teams	Bakersfield Chico Fullerton Long Beach Pomona Sacramento San Bernardino San Francisco San Luis Obispo

Closing Equity Gaps by Removing Unnecessary Administrative Barriers (cont).

Action	***Campuses***
Hosted/hosting an event for faculty and staff on the topic of closing equity gaps	Chico Fresno Fullerton Los Angeles Northridge Pomona San Bernardino San José
Hired a staff position to support historically underserved students through administrative processes (i.e. application, deposit, transfer, etc.)	Fresno Humboldt Sonoma

COMMITTEE ON EDUCATIONAL POLICY

Special Public Comment Open Forum on Quantitative Reasoning Proposal

Presentation By

Peter J. Taylor
Trustee
California State University Board of Trustees

Summary

The CSU is considering a proposal to expand the a-g requirements that determine minimal eligibility for CSU admission by requiring the completion of an additional year of quantitative reasoning. The additional year could be fulfilled by taking an additional high school course from area "c – mathematics," "d – laboratory science" or a quantitative reasoning course from the "g – college preparatory elective."

On August 29, 2019, the California State University (CSU) Board of Trustees' Committee on Educational Policy is holding a special public forum on the topic of quantitative reasoning for first-year admission. This publicly-noticed, live-streamed meeting will provide the opportunity for organizations and individuals to offer professional viewpoints and practical perspectives on the CSU's quantitative reasoning proposal. The CSU Board of Trustees will also have the opportunity to engage with presenters on this topic.

Special Public Comment Open Forum Format

The Special Public Comment Open Forum on the quantitative reasoning proposal is scheduled for August 29, 2019 from 10:00 a.m. to 1:30 p.m. in the Dumke Auditorium of the CSU Office of the Chancellor. This meeting will be livestreamed.

The meeting will begin with an overview of the quantitative reasoning concept by staff from the Office of the Chancellor. The overview will be followed by three sessions:

- Session 1: Academic Preparation
- Session 2: Admission
- Session 3: Post-Secondary Success

Each session will feature three presentations from individuals and organizations representing all viewpoints. Following each presentation time is allotted for trustee questions. The meeting includes opportunity for public comment and will conclude with remarks from Loren J. Blanchard, executive vice chancellor, Academic and Student Affairs and Peter J. Taylor, chair of the Committee on Educational Policy.

Conclusion

This Special Public Comment Open Forum held by the CSU Board of Trustees' Committee on Educational Policy will provide an opportunity for the board to hear from the numerous individuals and organizations with interest in a CSU quantitative reasoning proposal.

Following this meeting, CSU Office of the Chancellor staff will present a formal proposal before the Board of Trustees as an information item during the September 24-25, 2019 meeting and as an action item during the November 19-20, 2019 meeting.

Expanding Opportunity through Preparation in Quantitative Reasoning

Presentation By

Loren J. Blanchard
Executive Vice Chancellor
Academic and Student Affairs

James T. Minor
Assistant Vice Chancellor and Senior Strategist
Academic and Student Affairs

Marquita Grenot-Scheyer
Assistant Vice Chancellor
Educator Preparation and Public School Programs

Neal Finkelstein
Co-Director, Innovation Studies
WestEd

Summary

One of the greatest academic hurdles to college degree attainment is a lack of the fundamental skills associated with quantitative reasoning. Too often, equity gaps are exacerbated by quantitative reasoning disparities in PK-12 schools that follow students to college and influence their academic and career options. Increased preparation in quantitative reasoning supports success in the first year of college and creates more equitable opportunity in science, technology, engineering and mathematics – collectively known as STEM – majors and careers.

As the largest and most diverse four-year public university system in the nation, the California State University (CSU) is committed to closing equity gaps – the gaps between students from historically underrepresented communities and their peers – at all levels of the university. The CSU is considering a recommendation that would require incoming high school students, beginning with the entering first-year class of 2026, to complete one additional course of quantitative reasoning to meet the existing minimum qualifications for CSU admission. The recommendation is grounded in a report by the Academic Senate CSU Quantitative Reasoning Task Force and is supported by CSU data and a growing body of research linking quantitative reasoning preparation with college success.

This requirement could be fulfilled through high school coursework in mathematics, science or an elective course with a quantitative reasoning foundation. Students could also meet the requirement with some Career and Technical Education courses or with appropriate dual enrollment courses at a local community college. The CSU would provide an exemption for any student who could not fulfill the requirement because of a lack of resources at their high school.

This information item provides background and context for the CSU's consideration of a quantitative reasoning admission requirement, particularly a review of the data and research supporting expanded quantitative reasoning preparation and an overview of other states and institutions that have implemented similar requirements. This item also details the central tenets of what would become the proposal.

This information item does not include a formal proposal. Following a special convening of the Committee on Educational Policy on August 29, 2019, devoted to this topic, a formal proposal would then by brought before the Board of Trustees as an information item during the September 2019 meeting and as an action item during the November 2019 meeting.

Background

Quantitative Reasoning

Quantitative reasoning is the ability to think and reason intelligently about measurement, dimensions, design, capacity or probability in the real world. The National Council of Teachers of Mathematics defines quantitative reasoning as:

> …the developed ability to analyze quantitative information and to determine which skills and procedures can be applied to a particular problem to arrive at a solution. Quantitative reasoning, both generally and for assessment purposes, has an essential problem-solving focus. It includes the following six capabilities: reading and understanding information given in various formats; interpreting quantitative information and drawing inferences from it; solving problems using arithmetic, algebraic, geometric, or statistical methods; estimating answers and checking for reasonableness; communicating quantitative information; and recognizing the limitations of mathematical or statistical methods.

In a 2014 edition of the Association of American Colleges and Universities *Peer Review*, editor Shelley Johnson Carey wrote the following about quantitative reasoning:

> While not every student will use complex math skills professionally, in this data-rich era when information from the Internet is available instantly, all students must graduate with the ability to analyze and synthesize knowledge of the world around them. From deciding whether it is more advantageous financially to buy or lease a car to understanding the devastating effects of greenhouse gases on climate change, graduates need the ability to process quantitative information. This capability is called many things: *quantitative reasoning*, *quantitative literacy*, and *numeracy*.

Disparities in STEM

Careers in STEM have grown dramatically. According to a 2018 report by Pew Research Center, since 1990, STEM employment has grown 79 percent (from 9.7 million to 17.3 million). The report authors write that "STEM jobs have relatively high earnings compared with many non-STEM jobs, and the earnings gap persists even after controlling for educational attainment. Among workers with similar education, STEM workers earn significantly more, on average, than non-STEM workers."

Despite the growth in STEM jobs, there are well documented disparities. In the Pew Research Center report, the authors find that "Black and Hispanic workers continue to be underrepresented in the STEM workforce. Blacks make up 11% of the U.S. workforce overall but represent 9% of STEM workers, while Hispanics comprise 16% of the U.S. workforce but only 7% of all STEM workers."

The disparities in STEM also exist at the university level. As noted in a 2017 Brookings Institute national report examining quantitative reasoning disparities beginning in middle school, "STEM college graduates are predominantly white or Asian, a pattern that has persisted for years despite historically high black and Hispanic college attendance and completion rates."

This disparity exists at the CSU, despite progress in closing equity gaps. In 2017-18, 23.8 percent of students who self-identified as Asian and 22.7 percent who identified as white earned a baccalaureate degree in a STEM field. However, only 14.3 percent of Hispanic or Latino students and 10.3 percent of African American students earned a similar degree.

Additionally, students identifying as African American and Hispanic or Latino are proportionately underrepresented as STEM graduates compared to total overall degrees earned.

Race/Ethnicity	Percent of STEM Graduates	Percent of Total CSU Graduates
African American	2.1%	3.9%
Hispanic or Latino	27.7%	37%
Asian	21%	16.9%
White	31.9%	26.8%

Data Supporting Additional Preparation in Quantitative Reasoning

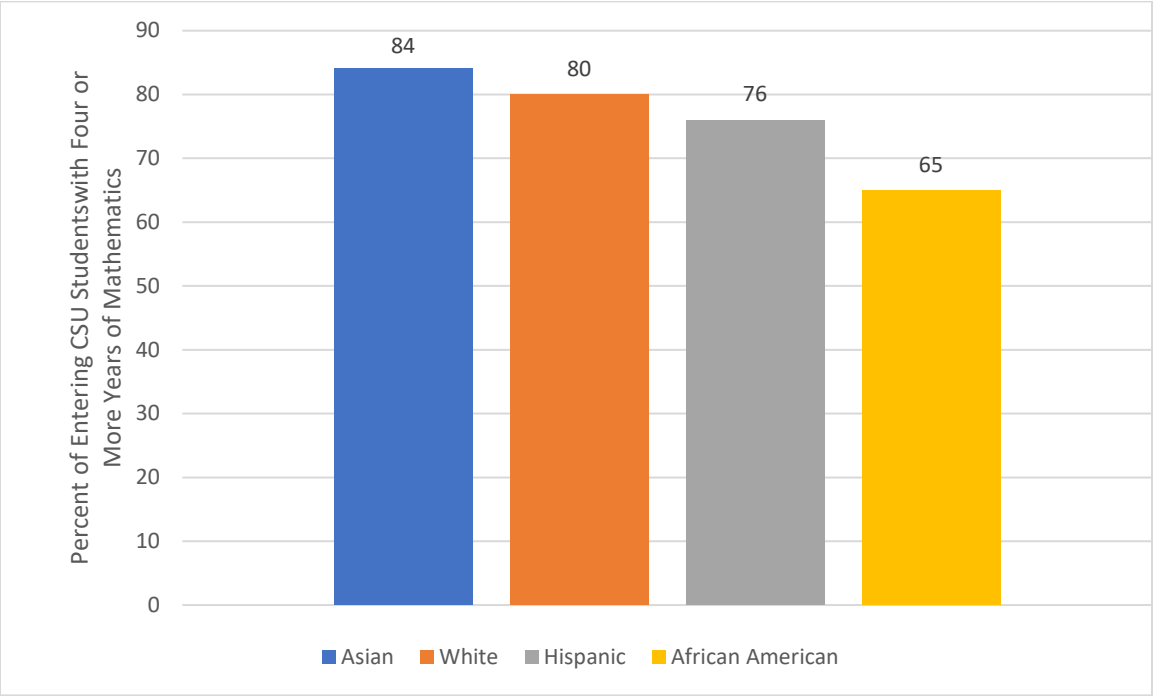
CSU-specific data and a growing body of national research suggest that additional quantitative reasoning preparation is associated with improved outcomes in college. Below are several examples of this research. A summary list of other relevant studies is included as an attachment.

CSU Data

The data in this section reflect area "c-mathematics" completion for students who enroll in the CSU from California high schools. Staff from the Office of the Chancellor are working with colleagues at the California Department of Education to expand the data evaluation from area 'c' courses to include a broader selection of quantitative reasoning courses from areas 'c,' 'd' and 'g' (mathematics, science or an elective course with a quantitative reasoning foundation).

Currently, 78 percent of students entering the CSU as first-year students complete four or more years of area "c-mathematics" courses, however there are disparities by race. Sixty-five percent of African American students and 76 percent of Hispanic students arrive at the CSU with four years of mathematics. Comparatively, 80 percent of white students and 84 percent of Asian students arrive at the CSU with four years of mathematics. These disparities are perpetuated in access to prerequisites for particular majors, pass rates in the first mathematics course, major selection, credit accumulation in the first year of college and time to degree.

Percent of Entering CSU Students (as First-Year Students) With Four or More Years of Mathematics Preparation



Data for new students who enter the CSU having completed four or more years of existing area "c-mathematics" courses consistently demonstrate improved retention compared to students who completed three years of mathematics. Nearly 70 percent of fall 2017 CSU first-time students who completed four or more years of high school mathematics earned a passing grade in a baccalaureate quantitative reasoning course during their first year in college, compared to fewer than half of students who completed only three years of mathematics in high school.

It is important to note that 57 percent of students with three years of high school mathematics attempted a lower division mathematics course in their first year at the CSU, compared to 76 percent of those with four or more years.

Years of High School Mathematics	Headcount	Percent attempted a baccalaureate mathematics course in 2017-18	Earned a passing grade in a baccalaureate mathematics course in 2017-18
Less than 3	231	39%	31%
3 – 3.5	14,463	57%	47%
4 or more	51,048	76%	69%

Students with four years of high school mathematics are retained at higher rates at the CSU after their first year. For example, the first-year retention rate for the 2017 fall cohort of first-time, full-time CSU students was approximately 85 percent for those with four or more years of high school mathematics, but only 79 percent for those with three years.

This trend continues for four- and six-year graduation rates. For the fall 2014 cohort, the four-year graduation rate for first-time, full-time CSU students who had four or more years of high school mathematics was 26.3 percent, but only 16.6 percent for those with three years. And, the six-year graduation rate for the fall 2012 CSU cohort was 64.3 percent for students with four or more years of high school mathematics, but only 52 percent for those with three years.

Across all three metrics, there are positive differences in outcomes for every racial and ethnic group.

National

National data support the correlation between increased quantitative reasoning preparation and college success. More than a decade ago, Clif Adleman – a researcher and policy analyst at the U.S. Department of Education for more than 30 years – examined the association between high school mathematics course-taking and college completion. He wrote:

> "The Toolbox Revisited is a data essay that follows a nationally representative cohort of students from high school into postsecondary education and asks what aspects of their formal schooling contribute to completing a bachelor's degree by their mid-20s. The universe of students is confined to those who attended a four-year college at any time, thus including students who started out in other types of institutions, particularly community colleges. The core question is not about basic 'access' to higher education. It is not about persistence to the second term or the second year following postsecondary entry. It is about completion of academic credentials—the culmination of opportunity, guidance, choice, effort, and commitment."

Adleman's findings on the association between high school mathematics course-taking and college completion are shown below:

Highest Mathematics Course Completed in High School	Percentage of College Students Who Completed a Bachelor's Degree
Calculus	81.6
Pre-Calculus	73.7
Trigonometry	65.1
Algebra II	44.4
Geometry	28.5
Algebra I	11.9
Pre-Algebra	5.1

Verifying Adelman's 2005 research, in 2014, a Policy Analysis for California Education (PACE) brief examined course-taking patterns of community college-bound students. The findings indicated that not taking a mathematics course in 12th grade was a significant predictor of not being college ready. The policy brief found that "all other factors being equal, students who took no mathematics in Grade 12 were 58 percent more likely to place 2-levels below [readiness] than into college-level mathematics." The brief also corroborated Adelman's 2006 findings that every class beyond high school Algebra II increased the probability of a student earning a bachelor's degree.

Overall, the research on mathematics and quantitative reasoning course-taking in high school and college success is clear. The more mathematics or quantitative reasoning a student completes in high school, the better prepared they are to pursue a multitude of pathways once they begin their postsecondary studies.

CSU Approach to a Quantitative Reasoning Requirement

The development of the CSU's approach to a quantitative reasoning admission requirement has been informed by ongoing consultation and collaboration with a diverse range of CSU constituents and community partners. The concept benefits from the extensive work of the Academic Senate CSU Quantitative Reasoning Task Force that included participation from state government, the California Department of Education, the California Community College Chancellor's Office, the University of California Office of the President and technology organizations and companies. The task force report recommendation "that four years of high school quantitative reasoning coursework be required as part of the CSU admission criteria" is included as an attachment.

In advancing this concept, the Office of the Chancellor has facilitated conversations with a number of organizations, including:

- Academic Senate CSU (Committee on Academic Preparation and Education Programs)
- California Department of Education
- California State Board of Education
- California PK-12 school districts
- California Community Colleges
- University of California
- Campaign for College Opportunity
- Ed Trust West
- Parent Institute for Quality Education
- Just Equations
- Public Advocates
- Children Now
- LULAC
- College Futures Foundation

Central Tenets of a CSU Proposal

The CSU is proposing to expand the a-g requirements that determine minimal eligibility for CSU admission by requiring the completion of an additional course of quantitative reasoning that could be fulfilled from area "c – mathematics," "d – laboratory science" or a quantitative reasoning course from the "g – college preparatory elective." Such college preparatory courses in area "g" could include computer science, coding, finance and some Career and Technical Education courses with quantitative reasoning content. The proposal will strongly recommend that the additional quantitative reasoning course be completed during the senior year.

The current a-g admission requirements are included in the first figure below. The second figure shows the addition of the quantitative reasoning requirement in red.

Existing CSU College Preparatory Course Requirements for First Year Admission

Area	Subject	Courses
a.	**History and Social Science** (including 1 year of U.S. history or 1 semester of U.S. history and 1 semester of civics or American government AND 1 year of social science)	2
b.	**English** (4 years of college preparatory English composition and literature)	4
c.	**Mathematics** (4 years recommended) including Algebra I, Geometry, Algebra II, or higher mathematics (take one each year)	3
d.	**Laboratory Science** (including 1 biological science and 1 physical science)	2
e.	**Language Other Than English** (2 years of the same language; American Sign Language is applicable - See below about a possible waiver of this requirement)	2
f.	**Visual and Performing Arts** (dance, drama or theater, music, or visual art)	1
g.	**College Preparatory Elective** (additional year chosen from the University of California "a-g" list)	1
Total Required Courses		**15**

Proposed CSU College Preparatory Course Requirements for First Year Admission

Area	Subject	Courses
a.	**History and Social Science** (including 1 year of U.S. history or 1 semester of U.S. history and 1 semester of civics or American government AND 1 year of social science)	2
b.	**English** (4 years of college preparatory English composition and literature)	4
c.	**Mathematics** (including Algebra I, Geometry, Algebra II, or higher mathematics or a comparable integrated pathway; take one each year)	3
d.	**Laboratory Science** (including 1 biological science and 1 physical science)	2
e.	**Language Other Than English** (2 years of the same language; American Sign Language is applicable - See below about a possible waiver of this requirement)	2
f.	**Visual and Performing Arts** (dance, drama or theater, music, or visual art)	1
g.	**College Preparatory Elective** (1 year selected from “c – mathematics”, “d – laboratory science”, or a quantitative reasoning course from the “g – college preparatory elective” areas AND 1 additional year chosen from the University of California "a-g" list)	2
Total Required Courses		**16**

Multiple Paths to Completion

High school students could fulfill the requirement with a more traditional mathematics course, such as calculus (area 'c'), depending on their sequence of prior courses and intended college majors. Other students could fulfill the requirement with a science course (area 'd') or with a college preparatory course (area 'g') that includes quantitative reasoning content (e.g., data science, statistics). The proposed requirement could be met with a quantitatively-based course offered through Career and Technical Education programs or dual enrollment in partnership with local community colleges.

School districts that adopt a three-year sequence of science courses as recommended under the Next Generation Science Standards would offer a curriculum in which two courses satisfy the area 'd' laboratory science requirement, while the third science course would then satisfy the new proposed quantitative reasoning requirement.

Partnering with School Districts to Prepare

Today, based on data from the University of California a-g database, approximately 96 percent of comprehensive California high schools offer a mathematics course beyond Algebra II that would fulfill a quantitative reasoning admission requirement. Of the schools that do not currently offer a qualifying mathematics course, the majority are charter or alternative schools. When expanding the courses to include area 'd' or area 'g' courses with a quantitative reasoning component, it is reasonable to expect that students could meet the requirement with a range of courses currently offered in their high schools.

Additionally, the CSU will support school districts and PK-12 schools that need assistance developing qualifying courses. This work will encompass many components, including collaboration with educator preparation program providers to ensure the number of needed instructors can be met and to provide assistance for professional development for in-service teachers, administrators and counselors. As the institution that prepares the majority of California's teachers, the CSU is also working to meet the ongoing need for additional teachers in STEM fields.

Since 2016, the CSU Center for the Advancement of Quantitative Reasoning staff have been working with the California Department of Education and PK-12 and community college partners to develop a "bridge" or transitional course from high school to higher education through the California Mathematics Readiness Challenge Initiative (CMRCI). Transitional mathematics, defined as courses or curriculum needed to successfully transition to college-level mathematics, is crucial for student success. Analogous to the development of the Expository Reading and Writing Course for English language arts, five CMRCI sites are working in more than 150 schools. These courses are approved in area 'c' of the a-g requirements. Because the proposal would not take effect until 2026, the CSU will continue to partner with school districts to ensure the course is available in the places where it is most needed.

The description of the CMRCI bridge course is provided in an attachment.

Institutions that have Implemented Similar Requirements

States

Recognizing the importance and power of quantitative reasoning preparation, a growing number of states now require four years of quantitative reasoning courses for a high school diploma:

- Alabama
- Arkansas
- Connecticut
- District of Columbia
- Florida
- Georgia
- Louisiana
- Maryland
- New Mexico
- Virginia

Five states go further, requiring four years of quantitative reasoning in high school and specifying that students take a course during the senior year to minimize skills gaps:

- Delaware
- Michigan
- Ohio
- Tennessee
- West Virginia

Charts detailing the requirements for each state are included as attachments.

Higher Education Institutions

A number of universities and university systems require four years of mathematics as an admission requirement, including Arizona State University, the Texas State University system and comprehensive public universities in Florida, including Florida Atlantic University and Florida International University.

Students seeking admission to the Twin Cities, Duluth, Morris and Rochester campuses of the University of Minnesota, for example, are required to have taken four years of mathematics. The university system enacted this admission change in 2015 as a result of "university research [that]

has shown that completing four years of math enhances student success in college. Grade point averages and retention and graduation rates at the University of Minnesota are higher for students who have taken four years of math."

Long Beach Unified School District

The Long Beach Unified School District (LBUSD) – where 70 percent of students are from households below the federal poverty level and 86 percent are non-white – increased the quantitative reasoning requirement six years ago to improve college readiness. Prior to changing the requirement, just 39 percent of students met the "a-g" requirements for admission to the CSU. Today, 56 percent of students meet the "a-g" requirements, and the district's African American and Latino students graduate at higher percentages compared to their peers in the county and across the state. Despite early opposition to the change and concern that underserved students would be disadvantaged, the outcomes have demonstrated the opposite. Students of color in LBUSD are graduating and attending college at higher rates due to better quantitative reasoning preparation.

Conclusion

For decades, the CSU has been at the forefront of addressing the academic preparation of prospective and current students while maintaining a commitment to authentic access to a high-quality degree. To this end, groundbreaking programs like the CSU's Early Assessment Program, established in 2003, provide prospective students, families and schools with early guidance on preparation for collegiate study and opportunities to enhance preparation in the senior year of high school. Similarly, the Expository Reading and Writing Course, now offered in more than 1,000 California high schools, provides seniors the opportunity to complete a fourth-year course in English language arts that was co-developed by CSU and high school faculty to more closely align with college-level writing expectations. Most recently, the CSU implemented new academic preparation policies and practices, expanding the use of multiple measures for assessment and placement in English and mathematics/quantitative reasoning, replaced stand-alone developmental education courses with supported, credit-bearing baccalaureate courses and expanded the range of subjects that satisfy the general education quantitative reasoning requirement for graduation.

A quantitative reasoning admission requirement is being considered as the next step in ensuring equity and authentic access for all CSU students. The proposal would not be intended to curtail access or change the composition of the CSU student population. Instead, it is intended to ensure that all students who enter the CSU are prepared to be successful in their coursework and participate in a range of majors and career fields.

Quantitative Reasoning Research Summary

Adelman, C. (2005). Executive Summary: The Toolbox Revisited: Paths to Degree Completion from High School Through College. *The Journal for Vocational Special Needs Education,28* (1), 23-30.

URL: The Toolbox Revisited: Paths to Degree Completion From High School Through College

"The academic intensity of the student's high school curriculum still counts more than anything else in precollegiate history in providing momentum toward completing a bachelor's degree. There is a quantitative theme to the curriculum story that illustrates how students cross the bridge onto and through the postsecondary landscape successfully. The highest level of mathematics reached in high school continues to be a key marker in precollegiate momentum, with the tipping point of momentum toward a bachelor's degree now firmly above Algebra 2."

Long, M. C., Iatarola, P., & Conger, D. (2009). Explaining gaps in readiness for college level math: The role of high school courses. *Education Finance and Policy, 4*(1), 1-33.

URL: Explaining Gaps in Readiness for College-Level Math: The Role of High School Courses

"Despite increased requirements for high school graduation, almost one-third of the nation's college freshmen are unprepared for college-level math. The need for remediation is particularly high among students who are low income, Hispanic, and black. Female students are also less likely than males to be ready for college-level math. This article estimates how much of these gaps are determined by the courses that students take while in high school. Using data on students in Florida public postsecondary institutions, we find that differences among college-going students in the highest math course taken explain 28–35 percent of black, Hispanic, and poverty gaps in readiness and over three-quarters of the Asian advantage. Courses fail to explain gender gaps in readiness. Low-income, black, and Asian students also receive lower returns to math courses, suggesting differential educational quality. This analysis is valuable to policy makers and educators seeking to reduce disparities in college readiness."

Long, M. C., Conger, D., & Iatarola, P. (2012). Effects of high school course-taking on secondary and postsecondary success. ***American Educational Research Journal*****, 49(2), 285–322.**

URL: https://doi.org/10.3102/0002831211431952

"Using panel data from a census of public school students in the state of Florida, the authors examine the associations between students' high school course-taking in various subjects and their 10th-grade test scores, high school graduation, entry into postsecondary institutions, and postsecondary performance. The authors use propensity score matching (based on 8th-grade test scores, other student characteristics, and school effects) within groups of students matched on the composition of the students' course-taking in other subjects to estimate the differences in outcomes for students who take rigorous courses in a variety of subjects. The authors find substantial significant differences in outcomes for those who take rigorous courses, and these estimated effects are often larger for disadvantaged youth and students attending disadvantaged schools."

Blair, R., & Getz, A. (2011). A Brief History of the Quantitative Literacy Movement.

URL: A Brief History of the Quantitative Literacy Movement

"It has always been important for individuals to have the capacity to *do* arithmetic and algebra, however, in today's global and technological society, doing calculations is not enough. An individual's capacity to identify and understand quantitative situations, reason quantitatively, and communicate about the role mathematics plays in the world is essential. This quantitative literacy goes beyond basic computational skills. The quantitatively literate individual should be able engage in mathematics and solve quantitative problems from a wide array of authentic contexts and everyday life situations. These "habits of the mind" lead to making well-founded mathematical judgments that are useful in an individual's current and future life as a constructive, concerned, and reflective citizen. Quantitative Literacy (QL) is more than just arithmetic skills and as fundamental as language literacy."

Bozick, R., Ingels, S., & Owings, J. (2008). Mathematics Coursetaking and Achievement at the End of High School: Evidence from the Education Longitudinal Study of 2002 (ELS:2002).

URL: Mathematics Coursetaking and Achievement at the End of High School: Evidence from the Education Longitudinal Study of 2002.

"The findings show that the largest overall gains are made by students who take precalculus paired with another course during the last 2 years of high school. In terms of learning in specific content areas, the largest gains in intermediate skills such as simple operations and problem solving were made by those who followed the geometry–algebra II sequence. The largest gains in advanced skills such as derivations and making inferences from algebraic expressions were made by students who took precalculus paired with another course. The smallest gains were made by students who took one mathematics course or no mathematics courses during their last 2 years."

Elrod, S. (2014, December 19). Quantitative Reasoning: The Next "Across the Curriculum" Movement.

URL: Quantitative Reasoning: The Next "Across the Curriculum" Movement

"By one definition, quantitative reasoning (QR) is the application of basic mathematics skills, such as algebra, to the analysis and interpretation of real-world quantitative information in the context of a discipline or an interdisciplinary problem to draw conclusions that are relevant to students in their daily lives. It is not just mathematics. Carleton College, for example, views QR as "the habit of mind to consider the power and limitations of quantitative evidence in the evaluation, construction, and communication of arguments in public, professional, and personal life." The term numeracy is also used in conjunction with these skills."

Finkelstein, N., Fong, A., Tiffany-Morales, J., Shields, P., & Huang, M. (2012). College Bound in Middle School & High School? How Math Course Sequences Matter.

URL: College Bound in Middle School & High School? How Math Course Sequences Matter

"Irrespective of students' math performance, taking four years of high-school math strengthens their postsecondary opportunities. For students seeking entrance to one of California's public university systems, a fourth year of math is strongly recommended. Yet our analysis shows that slightly more than 30 percent of students in the study sample did not take math during their senior year. For those who don't study math their senior year (as well as for others who may not move directly from high school to college), having to take a college placement test after at least a year away from math can be a major deterrent to placing into a college-level math course; and students who do not do well on their placement test are likely to end up in a developmental, or remediation, math course, which yields no college credit."

Gao, N. (2016, July). College Readiness in California: A Look at Rigorous High School Course-Taking. Public Policy Institute of California.

URL: College Readiness in California: A Look at Rigorous High School Course-Taking

"In this report we look at participation and performance in rigorous high school courses among California high school students, both overall and across demographic and racial/ethnic groups. While enrollment in rigorous courses has been increasing, particularly among students who are traditionally underrepresented in higher education, a large majority of California high school students are not taking the courses that can prepare them for college. Forty-three percent of high school graduates in 2015 completed the a–g requirement, and 27 percent of high school graduates in 2013 passed an advanced placement (AP) exam. Participation in advanced math, biology, chemistry, and physics courses is also low. In particular, only 30 percent of high school juniors and seniors enrolled in Algebra II and smaller shares enrolled in chemistry (28%) and physics (10%)."

Lee, J. (2012). College for all: Gaps between desirable and actual P–12 math achievement trajectories for college readiness. *Educational Researcher*, 41(2), 43–55.

URL: https://doi.org/10.3102/0013189X11432746

"This study addresses missing links in "college for all" debates by investigating gaps between actual and desirable math achievement trajectories for students' college readiness. Linking multiple national data sets across P–16 education levels, the study estimates college readiness benchmarks separately for two-year and four-year college entrance and completion. The goals of the study are to compare performance standards, benchmarks, and norms for college readiness and to assess college readiness gaps among all students as well as gaps among racial and social subgroups. The results suggest that entrance into and completion of two-year versus four-year colleges require substantially different levels of math achievement in earlier education periods and that meeting national versus state proficiency standards leads to differences in postsecondary education outcomes and can mean the difference between bachelor's and associate's degree attainment. Persistent racial and social gaps in college readiness threaten the goal of getting all students academically ready for at least two-year college completion."

Daun-Barnett, N., & St. John, E. (2012). Constrained curriculum in high schools: The changing math standards and student achievement, high school graduation and college continuation. *Education Policy Analysis Archives, 20*, 5.

URL: http://dx.doi.org/10.14507/epaa.v20n5.2012

"Mathematics education is a critical public policy issue in the U.S. and the pressures facing students and schools are compounded by increasing expectations for college attendance after high school. In this study, we examine whether policy efforts to constrain the high school curriculum in terms of course requirements and mandatory exit exams affects three educational outcomes – test scores on SAT math, high school completion, and college continuation rates. We employ two complementary analytic methods – fixed effects and difference in differences (DID) – on panel data for all 50 states from 1990 to 2008. Our findings suggest that within states both policies may prevent some students from completing high school, particularly in the near term, but both policies appear to increase the proportion of students who continue on to college if they do graduate from high school. The DID analyses provide more support for math course requirement policies than mandatory exit exams, but the effects are modest. Both the DID and fixed effects analyses confirm the importance of school funding in the improvement of high school graduation rates and test scores."

Trusty, J., & Niles, S. (2003). High-school math courses and completion of the bachelor's degree. *Professional School Counseling, 7*(2), 99-107.

URL: http://www.jstor.org/stable/42732549

"Using a national longitudinal sample of 5,257 young people who were pursuing the bachelor's degree, we studied how credits in intensive high school mathematics courses affected their completion versus noncompletion of the degree. Finishing one unit in any of four intensive math courses more than doubled the likelihood that participants would later complete the bachelor's degree. Effects were present above and beyond the effects of background variables, including early math ability. Implications of findings are presented."

One Year Out: Findings From A National Survey Among Members Of The High School Graduating Class Of 2010 (Rep.). (2011). Washington, DC: Hart Research Associates.

URL: One Year Out: Findings From A National Survey Among Members Of The High School Graduating Class Of 2010

"Four in nine members of the class of 2010 say that based on what they know now they wish they had taken different courses in high school, with the largest proportion of these graduates saying they wish they had taken more math courses or more difficult math courses. 44% say that they wish they had taken different courses in high school. Among this group, 40% would have taken more or higher-level math courses, 37% would have taken courses that would have trained them for a specific job, and 33% would have taken more or higher-level science courses. Regrets about course selection are higher than average among students who went on to college but felt less well prepared than others at their college, students who considered dropping out or did drop out of college, and students who were required to take non-credit remedial courses once they got to college."

Rigor at Risk: Reaffirming Quality in the High School Core Curriculum (Rep.). (2007). Iowa City, IA: ACT.

URL: Rigor At Risk: Reaffirming Quality in the High School Core Curriculum

"Of those students who take a core mathematics curriculum, only 16 percent are ready for a credit bearing first-year College Algebra course (see Figure 4). It is not until students take one full year of additional mathematics courses beyond the core that we see more than half (62 percent) of ACT-tested students ready for college-level work in mathematics."

The Value of the Fourth Year of Mathematics (Rep.). (2013). Washington, DC: Achieve, Inc.

URL: The Value of the Fourth Year of Mathematics

"Too many students and educators view the senior year and graduation from high school as an end point, rather than one vital step along the education pipeline. Students who engage in a fourth year of math tap into and build upon their advanced analytic skills and are more likely to have better success in postsecondary course work, as they have maintained their momentum and continued to practice mathematics throughout their high school experience."

Excerpt from the Academic Senate CSU Quantitative Reasoning Task Force

ASCSU Recommendation IIIB: Require four years of high school quantitative reasoning. The Quantitative Reasoning Task Force recommends that four years of high school quantitative reasoning coursework be required as part of the CSU admissions criteria (per ASCSU Resolution AS-3244-16/APEP).

Rationale for Recommendation IIIB. As the ASCSU noted in the rationale for Resolution AS-3244-16/APEP, the success of incoming students is maximized when students maintain their exposure to mathematics/quantitative reasoning. As is the case with a second language, mathematical skills decline from lack of use, and it is important that students continue practicing and developing quantitative abilities throughout their academic careers. In a number of settings, including the CSU Admission Handbook and through CSU Mentor, the CSU already recommends four years of mathematics, even though only three years are required. The standing ICAS recommendation in the "Statement on competencies in mathematics expected of entering college students" similarly states [ICAS 2013]:

For proper preparation for baccalaureate level coursework, all students should be enrolled in a mathematics course in every semester of high school. It is particularly important that students take mathematics courses in their senior year of high school, even if they have completed three years of college preparatory mathematics by the end of their junior year. Experience has shown that students who take a hiatus from the study of mathematics in high school are very often unprepared for courses of a quantitative nature in college and are unable to continue in these courses without remediation in mathematics.

It is important to note that the fourth-year mathematics course called for by the CSU resolution would not necessarily be a fourth course in Area c; it must be a–g compliant, but it could be a course approved in Area g.

Other states in the U.S. already require a fourth year of mathematics for admission to their state university systems. For example, effective with the class entering in the fall of 2015, students in Maryland are required not only to complete four years of mathematics for entry to any of the state's public universities, but those who complete Algebra II prior to their final year must complete the four-year mathematics requirement by taking a course or courses that utilize non-trivial algebra [St. George 2014]. The Maryland policy was based in part on the report "Coming to our senses: Education and the American future" [Kirwan et al. 2008], which found that the academic intensity of the high school curriculum was the most important predictor of college success, and so recommended four years of college preparatory mathematics.

These findings and prescriptions are not new. Kirst argued in "Overcoming the high school senior slump: New education policies" that high schools should redesign their senior year courses to serve as gateways to general education requirements students would likely encounter in their first year of college and emphasize the importance of taking senior-year math courses [Kirst 2001]. He also recommended that colleges should include a senior-year math course in their admissions requirements.

There is a strong correlation between taking more mathematics in high school and being college-ready upon arrival at the university. Studies have documented that

1. SAT-Math and ACT-Math scores improve as the number of years of high school mathematics increases (see [SAT 2013]–[SAT 2015]);
2. the likelihood of needing remediation decreases and the likelihood of completing general education quantitative reasoning requirements increases as students take more high school mathematics (see, e.g., [USHE 2015]).

Finally, many former high school students, with the clarity of 20/20 hindsight, recognize that they should have taken more (or more difficult) mathematics courses in high school. A "one year later" survey of 1,507 high school graduates found that 44% of those students wish they had taken different courses in high school. The most frequently expressed regret (40% of this group, or more than one in every six students surveyed) was that they hadn't taken more or higher-level mathematics courses [Hart 2011]. (For further background on the subject of mathematics courses in the senior year of high school, see Appendix E.)

Implementation notes for Recommendation IIIB. If the CSU adopts this admission requirement, there will be a natural implementation phase of at least three to four years. The CSU cannot impose this requirement on students already enrolled in high school; it will be operational only as the next 8th grade class enters the 9th grade. With this in mind, the CSU needs to move forward by communicating its intention to all stakeholders and interested parties as soon as possible.

The CSU will be in a better position to assist high schools in meeting the new requirement with existing Area c and other appropriate courses as well opportunities for professional development if the system supports the creation of a Center for the Advancement of Instruction in Quantitative Reasoning. The Center would be charged with developing a modular course patterned after the Expository Reading and Writing Course, which was designed to reduce remediation needs in English.

More than 60 percent of students advancing to the CSU from high school already complete four years of math. Moreover, many California high schools already offer such a 12th grade course in quantitative reasoning. The goal is to fill in the gap and overcome what might otherwise be a one- or two-year hiatus in students' use of acquired quantitative skills.

California State University Bridge Courses in Mathematics

The California State University (CSU) Bridge Courses were developed with grants from the California Department of Education and a federal Investing in Innovation (i3) grant. Bridge Courses were co-developed by high school mathematics teachers and CSU faculty to create a senior year course that fulfills an area 'c' admission requirement and serves as a transition to college-level mathematics and quantitative reasoning courses.

Five CSU campuses are leading the development and implementation of these courses in collaboration with their K-12 partners. The projects focus on: a) preparing teachers for rigorous mathematics instruction; b) developing innovative pedagogical practices; and c) exploring the range of quantitative reasoning content that effectively bridges K-12, community college and CSU competency expectations.

The projects help schools build capacity to increase college readiness, especially in STEM-related fields. These courses are effectively filling resource gaps and addressing course availability needs in poor districts while expanding pathways for mathematics success.

All five projects fundamentally shift the way mathematics is taught in high school, opening doors for more students to realize academic success. For example, in the Mathematics Reasoning with Connections course led by CSU San Bernardino, the curriculum emphasizes the connections between algebra, geometry, trigonometry and statistics, with a focus on deep contextual understanding. These Bridge Courses offer an opportunity for high schools to offer multiple quantitative reasoning pathways for students while responding to their diverse career interests.

The CSU is working with local school districts to build awareness about the promise of Bridge Courses throughout the state. These courses hold the potential to be developed, scaled and targeted at school districts with limited resources.

Table 1: The number of districts, schools, teachers, and students participating in C

CSU Lead: **Course Title**	**Districts**	**Schools**	**Teachers**	**Students** (approximate)
CSU Monterey Bay: Transition to College Level Mathematics	5	8	8	197
CSU Northridge: Transition to College Mathematics and Statistics Project	1	48	40	2,131
Sacramento State: Excellence in Academic Preparation	20	52	139	4,293
CSU San Bernardino: Mathematical Reasoning with Connections	20	48	74	2,963
San Diego State: Discrete Mathematics	1	12	22	1,204
Totals	**47**	**168**	**283**	**10,788**

Table 1: States that Require a Minimum of Four Years of High School Mathematics/Quantitative Reasoning for a General Diploma

State	Requirement
1. Alabama	3 credits to include: Algebra I, or its equivalent; Geometry, or its equivalent; Algebra II w/Trig or Algebra II, or its equivalent. One credit from Alabama Course of Study: Mathematics or CTE/AP/IB/postsecondary equivalent courses
2. Arkansas	(1) Algebra I or First Part and Second Part Algebra I (Grades 7-8 or 8-9); (1) Geometry or First Part and Second Part Geometry (Grades 8-9 or 9-10); (1) Algebra II; (1) Fourth Math - Choice of: Advanced Topics and Modeling in Mathematics, Algebra II, Calculus, Linear Systems and Statistics, Mathematics Applications and Algorithms, Pre-Calculus, or an AP mathematics
3. Connecticut	Four credits in mathematics, including algebra I, geometry and algebra II or probability and statistics
4. Delaware	The student shall complete mathematics course work that includes no less than the equivalent of the traditional requirements of Geometry, Algebra I and Algebra II courses. The student shall complete an Algebra II or Integrated Mathematics III course as one of the Mathematics credits. During the senior year the student shall maintain a credit load each semester that earns the student at least a majority of credits that could be taken that semester. A credit in Mathematics shall be earned during the senior year.
5. District of Columbia	Must include Algebra I, Geometry and Algebra II at a minimum
6. Florida	A student must earn one credit in Algebra I and one credit in geometry. Earn one credit in Algebra II and one credit in statistics or an equally rigorous course.
7. Georgia	Four units of core credit in mathematics shall be required of all students, including Mathematics I or GPS Algebra, or its equivalent and Mathematics II or GPS Geometry, or its equivalent and Mathematics III or GPS Advanced Algebra or its equivalent. Additional core courses needed to complete four credits in mathematics must be chosen from the list of GPS/ CCGPS /AP/IB/dual enrollment designated courses.
8. Louisiana	Algebra I (1 unit); Applied Algebra I (1 unit), or Algebra I-Pt. 1 and Algebra I-Pt. 2 (2 units); The remaining units shall come from the following: Geometry or Applied Geometry; Technical Math; Medical Math; Applications in Statistics and Probability; Financial Math; Math Essentials; Algebra II; Advanced Math - Pre-Calculus; Discrete Mathematics; or course(s) developed by the LEA and approved by BESE.
9. Maryland	3 credits - 1 in Algebra/Data Analysis; 1 in Geometry; and 1 additional mathematics credit 4 credits beginning with the class of 2018
10. Michigan	Algebra I, Geometry, Algebra II, one math course in final year of high school. Under HB 4465, a student may complete Algebra II over 2 years with 2 credits awarded or over 1.5 years with 1.5 credits awarded. A pupil also may partially or fully fulfill the Algebra II requirement by completing a department-approved formal career and technical education program or curriculum, such as a program or curriculum in electronics, machining, construction, welding, engineering, computer science, or renewable energy, and in that program or curriculum successfully completing the same content as the Algebra II benchmarks assessed on the department prescribed state high school assessment, as determined by the department.
11. New Mexico	4 units of math with one unit equal to or greater than Algebra 2. 2013 and after: Four units in mathematics, of which one shall be the equivalent to or higher than the level of algebra 2, unless the parent submitted written, signed permission for the student to complete a lesser mathematics unit.
12. Ohio	Four units, which shall include one unit of algebra II or the equivalent of algebra II
13. Tennessee	4 credits, including Algebra I, II, Geometry and a fourth higher level math course. (Students must be enrolled in a mathematics course each school year.)

14. Virginia	Courses completed to satisfy this requirement shall include at least two different course selections from among: Algebra I; Geometry; Algebra, Functions and Data Analysis; Algebra II, or other mathematics courses above the level of Algebra II. The Board shall approve courses to satisfy this requirement.
15. West Virginia	Math I; Math II; Math III STEM, or Math III LA or Math III TR; Math IV or Math IV TR or Transition Mathematics for Seniors or any other fourth course option (Chart V). An AP mathematics course may be substituted for an equivalent course or any fourth course option.

Table 2: States that Require Four Years of High School Mathematics

AND a Senior Year Course

State	Mathematics requirement
Delaware	The student shall complete mathematics course work that includes no less than the equivalent of the traditional requirements of Geometry, Algebra I and Algebra II courses. The student shall complete an Algebra II or Integrated Mathematics III course as one of the Mathematics credits. During the senior year the student shall maintain a credit load each semester that earns the student at least a majority of credits that could be taken that semester. A credit in Mathematics **shall be earned during the senior year**.
Michigan	Algebra I, Geometry, Algebra II, one math course in final year of high school. Under HB 4465, a student may complete Algebra II over 2 years with 2 credits awarded or over 1.5 years with 1.5 credits awarded. A pupil also may partially or fully fulfill the Algebra II requirement by completing a department-approved formal career and technical education program or curriculum, such as a program or curriculum in electronics, machining, construction, welding, engineering, computer science, or renewable energy, and in that program or curriculum successfully completing the same content as the Algebra II benchmarks assessed on the department prescribed state high school assessment, as determined by the department. The DOE shall post on its website and submit to the senate and house standing committees on education guidelines for implementation. Each **pupil must successfully complete at least 1 mathematics course during his or her final year of high school enrollment**. The bill is now Public Act 208 of 2014.
Ohio	Earn at least four units of mathematics which shall include algebra I, algebra II, geometry, and another higher-level course or **a four-year sequence of courses** which contains equivalent content.
Tennessee	4 credits, including Algebra I, II, Geometry and a fourth higher level math course. (**Students must be enrolled in a mathematics course each school year**.)
West Virginia	Math I; Math II; Math III STEM, or Math III LA or Math III TR; Math IV or Math IV TR or Transition Mathematics **for Seniors or any other fourth course option** (Chart V). An AP mathematics course may be substituted for an equivalent course or any fourth course option.