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December 5, 2018

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RE: California Mathematics Readiness Challenge Initiative (CMRCI) Report

The California Mathematics Readiness Challenge Initiative (CMRCI) was funded in 2017-2018 by the California Department of Education with the provision that the grantees each develop a 12th grade college readiness transition course (or curriculum). The grants required that each Institute of Higher Education (IHE) partner with K-12 districts to write, test, implement, and disseminate the curriculum. The funded partnerships included California State University (CSU) and K-12 district partnerships led by CSU Monterey Bay, CSU Sacramento, San Diego State, CSU San Bernardino, and the University of California Los Angeles. Each project was charged with developing a transitional mathematics course, defined as courses or curriculum needed to successfully transition to college level mathematics without needing remediation. The courses were to be specifically designed as a fourth-year requirement with Algebra 2 / Integrated Mathematics (IM) 3 as a pre-requisite, specifically for students who were not deemed college ready by the end of their senior year. This transitional course, or the one level

CSU Campuses
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
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San Luis Obispo
San Marcos
Sonoma
Stanislaus

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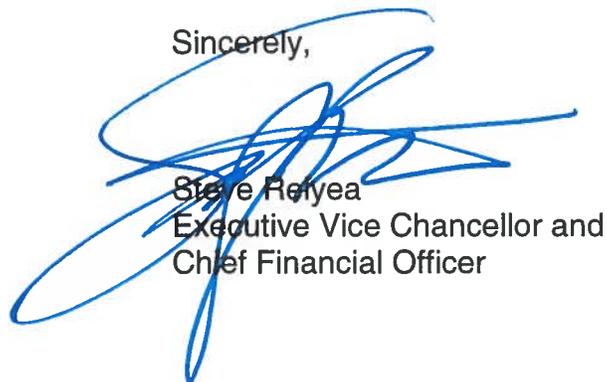
below transfer course, was to be developed with local stakeholders and implemented during the 2017-2018 school year.

The CMRCI sites have demonstrated that high school students can be successful at the transfer level course, especially if they have already completed Algebra 2 or IM 3. These new courses produced by faculty, in collaboration with their K-12 partners will help teachers implement courses that will be considered “transition” courses where no other remediation will be necessary for students to be successful at the university level. The tasks ahead now are deciding on how to scale up these models, making them available to K-12, and building the capacity necessary for teachers to successfully teach the courses given the amount of professional learning that was required in each model. The CSU Chancellor’s Office is examining different options that will commence with building an online presence for each curriculum offering and partnering with California County Superintendents Educational Services Association (CCSESA). Details of these options will be available at the Center for the Advancement of Instruction in Quantitative Reasoning (CAIQR) website in the future.

Senate Bill No. 828, Chapter 29, Section 21 identifies the Mathematics Readiness Challenge (Article 2). The Legislature intended that the program support the implementation and evaluation of grade 12 experiences that are designed to prepare pupils for placement into college-level courses in mathematics. The funding for Article 2 was appropriated in Item 6100-195-0890 of Section 2.00 of the Budget Act of 2016. By November 30, 2018 and in conformance with Section 9795 of the Government Code, the CSU is required to send to the Director of Finance and the Legislature the report of any policy changes made based on evidence collected through the program.

Should you have any questions about this report, please contact Zee Cline, Co-Director, CAIQR at (562) 951-4778 or Fred Uy, Co-Director, CAIQR at (562) 951-4713.

Sincerely,



Steve Relyea
Executive Vice Chancellor and
Chief Financial Officer

SR:dr

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Full report posted to www.calstate.edu/legislativereports

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California Mathematics Readiness Challenge Initiative

November 2018

1 Overview

The need for students to be “college ready” in mathematics is well documented. Remediation delays time to degree, costs students additional money and contributes to students dropping out of college. According to the 2016 report of *Education Reform Now*, the costs of remedial coursework throughout the U. S. reached nearly \$1.5 billion. Further, numerous studies demonstrate that more than half of those taking remedial classes actually do not complete their degrees (REMEDICATION Higher Education’s Bridge to Nowhere, 2012).

To ensure that all students have an opportunity to be successful, persist and earn a degree in a timely manner, it is important to examine the high school experience. As early as 2006, a study done by Plymouth State University recommended that every high school student take four years of rigorous mathematics. The study also recommended that high school graduation requirements should reflect the skills necessary to be accepted into college or the skilled workforce.

The California State University (CSU) has a long history of meeting students where they are and supporting them to degree completion. Over the past 20 years, the percentage of college-ready students entering the California State University (CSU) has nearly doubled, resulting in part from collaboration with K-12 partners to improve academic preparation and curricular alignment.

In 2017-18, the California Department of Education funded the *California Mathematics Readiness Challenge Initiative* (CMRCI) to better prepare high school students for mathematics courses at the post-secondary level. Grantees were required to develop a 12th grade college readiness transition course (or curriculum). Additionally, the grants required that each Institute of Higher Education (IHE) partner with K-12 districts to write, test, implement and distribute the curriculum.

Five IHE and K-12 district partnerships were funded, led by California State University (CSU), Monterey Bay, California State University, Sacramento, San Diego State University, California State University, San Bernardino and the University of California, Los Angeles. Each partnership was charged with developing a transitional mathematics course that enables students to successfully transition to college-level mathematics without needing remediation.

Today, each of the CMRCI projects have completed a year of writing curriculum, implemented the transitional mathematics course and started a process for evaluating the work completed and determining next steps. The California State University, Office of the Chancellor (CO), through the Center for the Advancement of Instruction in Quantitative Reasoning (CAIQR), is assisting the four CSU campuses in promoting and distributing their curricula and findings.

Improving college readiness is a central component of Graduation Initiative 2025, the CSU’s ambitious effort to ensure student success, increase graduation rates and eliminate achievement and equity gaps for all students. The CMRCI projects are increasing the number of students who are fully academically prepared to begin their CSU experience. Moving forward, the CSU will be identifying the best methods to scale these projects, making them available to students and teachers across the state.

2 Background

Similar studies have recommended that high school course content (not course titles) should be the focus of review, as course titles do not assure uniformity of content. Course content should reflect what is essential for each student to learn in order to succeed in college or in the skilled workforce. These studies also called for flexibility in instructional approaches, assuring that uniform delivery and presentation do not become the norm. Additionally, studies suggest schools encourage students to go beyond the minimum college preparatory requirements. Finally, it is suggested that educational agencies track student achievement from the beginning of kindergarten through their 12th year or – better yet – through their 16th year. Doing so will inform students, other stakeholders and policy makers if the results achieved are acceptable or need to be improved.

3 California Mathematics Readiness Challenge Initiative (CMRCI)

The CMRCI was specifically funded by the state legislature to develop fourth year transition courses for K-12 with the explicit purpose of better preparing high school students for mathematics courses at the post-secondary level. The initiative was developed to address two explicit concerns: ensuring STEM (science, technology, engineering and mathematics) majors are able to access the calculus sequence upon entering the university and ensuring non-STEM majors are able to complete a credit-bearing quantitative reasoning course upon entering the university.

Each of the CSU-led CMRCI projects developed a course that had Algebra 2 as a prerequisite and met the “c” (Math) part of the a-g requirements. Strategically, these courses were aligned with the CSU Early Assessment Program, which provides students with information regarding their preparation in mathematics and readiness to enter a credit-bearing course upon high school graduation. Any student who was deemed “Conditionally Ready” based on their Smarter Balanced Assessment (SBAC) scores, who successfully completed one of the CMRCI courses with a grade of C or better, was deemed “College Ready” and not in need of remediation.

In the case of two of the CMRCI projects, CSU San Bernardino and Sacramento State, a student who successfully completed the course with a grade of C or better and applied to one of the universities piloting the projects was considered “College Ready” at that particular site. This holds true even if the student was deemed Conditionally Ready. Hence, this provided an opportunity to admit a student, with a C or better and regardless of SBAC scores, into the course.

3.1 The Five California Mathematics Readiness Challenge Initiative Projects

The CMRCI project teams have developed effective professional learning curriculum and strategies for high school mathematics teachers, which will equip them for teaching a transitional mathematics course. The teams have established approaches for integrating transitional mathematics instruction within the policies and practices of partner school districts. They have also developed professional learning activities for high school principals, which enable them to support their transitional mathematics teachers and to establish a professional learning culture at their school site supportive of a transitional mathematics year. Each of the project teams have shared their professional learning strategies with their regional peers and identified approaches for project assessment. Together, they represent a varied set of exemplars for school districts to choose from and/or combine for a transitional curriculum.

San Diego State University

The San Diego State University (SDSU) and Sweetwater Union High School District (SUHSD) *Discrete Mathematics Partnership* has developed a curriculum targeting the advancement of students' deductive reasoning through consistent engagement in exploration, conjecturing, generalizing, justifying and repeated reasoning-using games, vertex-edge graphs, fractals, counting and cryptography as content. With an eye on sustainability, the program was designed to foster collaboration among teachers by developing and placing two mathematics teachers with common preparation periods in each classroom during the pilot year. The work is supporting the San Diego Compact for Success, a statewide model of success in secondary-higher education collaboration, by offering SUHSD students who could be college ready a transitional year mathematics course. The following have been the central goals of the project:

1. Refine and develop the existing discrete mathematics curriculum by leveraging expertise of partners.
2. Address professional-learning needs of SUHSD teachers through comprehensive professional development.
3. Train and support mathematics teachers on special assignment to serve as instructional coaches.
4. Develop the knowledge and capacity of SUHSD principals, counselors and paraprofessionals to support students in attaining college readiness.

California State University, Sacramento

Increasing Mathematics Readiness through Collaboration and Professional Learning is the CMRCI project led by Sacramento State. This project focuses on the implementation of an intersegmental approach to improving mathematics readiness in the greater Sacramento region. The project involves the design and implementation of the Early Assessment Program Senior Year Mathematics (ESM) course and the Early Assessment Program Quantitative Reasoning (EQR) course. Each course has its own week-long professional learning program that continues throughout the year in the form of four regional learning collaborations and classroom visitations. The project is an extension of the Placer County Partnership, a collaboration to address mathematics readiness that was created in 2009 and includes Sacramento State, Sierra College, Placer County Office of Education and several service area high schools.

Through an expanded partnership, the innovative course curriculum and professional learning components of the CMRCI project continue to be refined, updated and evaluated. The curriculum design team has expanded to include mathematics faculty from Sacramento State, regional community colleges, the California Mathematics Project, regional county offices of education and partnering high schools in order to fulfill the mathematic achievement needs of students primarily in Sacramento and Placer counties who have received scores of either "Standard Met" or "Standard Nearly Met" on the California Assessment of Student Performance and Progress (CAASPP). Sacramento State uses an intersegmental lens to support their collective impact model. This serves as the backbone of the partnership's infrastructure as well as the professional learning program for teachers and principals.

The ESM and EQR courses are designed to strengthen mathematical foundations and prepare students to be successful in college-level mathematics. They are designed to deepen students' conceptual

understanding of mathematical theory, skills and strategies, while aligning with National Common Core Standards for Mathematical Practice and with specific high school content standards listed in the California Common Core State Standards for Mathematics (CCSS-M).

Both the ESM and EQR courses fill a fundamental gap in the sequence of high school to postsecondary mathematics. The EQR course covers mathematical concepts between Algebra II and Integrated Math III as well as the application of mathematics to financial literacy. The ESM course covers mathematical concepts that are above the levels of Algebra II as well as the application of financial mathematics and introductory concepts in Calculus. Both courses provide students with an inventive approach to solving mathematics problems through teamwork and facilitative teaching, a student-centered approach that applies interactive and collaborative strategies in the classroom. Teachers also incorporate “Number Sense” activities into their daily lesson plans, strengthening students’ ability to interact with numbers flexibly and conceptually.

California State University, Monterey Bay

The Monterey County Consortium for Mathematics Readiness (MCCMR) project developed a new transitional mathematics readiness course with a focus on mathematical modeling called *Transition to College Mathematics: A Mathematical Modeling Approach*. The project, led by California State University, Monterey Bay (CSUMB) also aligned professional development for teachers who will teach the course, as well as for other mathematics teachers in those schools. As a partnership among a four-year university (CSUMB), a community college (Hartnell College), the Monterey County Office of Education, the Monterey Bay Area Mathematics Project and six school districts across Monterey County, MCCMR is a comprehensive project that addresses the severe under-preparation of students for college mathematics that has been pervasive in the county. The project has included the following major components:

1. The development and piloting of a new transitional course that engages and motivates students, demonstrates the usefulness of mathematics across the strands, deepens students’ understanding and reinforces their skills.
2. Professional development for school teams, including teachers who are teaching the new course, other mathematics teachers at the site and the site’s principal (or designee). The professional development component includes a summer institute and monthly after-school site-based follow-up meetings.
3. A countywide professional community to provide in-service teachers and future mathematics teachers with ongoing professional growth opportunities such as mathematics circles, teaching video clubs and peer support.
4. A countywide mathematics advisory group that analyzes data and discusses strategies and policies to address college mathematics readiness. This group also improves articulation between the high schools and higher education.

California State University, San Bernardino

Mathematical Reasoning With Connections (MRWC) is the development of a cross-sectoral, bi-county collaboration to address the need for a fourth year high school mathematics course that aligns with

California Content State Standards. The team includes key members representing both Riverside and San Bernardino County Offices of Education, numerous school districts, regional community colleges, three California State University campuses: San Bernardino, Long Beach and Pomona, and one University of California; all members have been working together in a focused manner on this project since October 2015. The lead curriculum development expert on the team was the primary author of the CSU's Strengthening Mathematics Instruction (SMI) curriculum. SMI was a professional development program for HS teachers of mathematics throughout California with the intent to increase performance of high school students in mathematics and to strengthen their readiness for college level mathematics.

This project builds upon work to transform mathematics curriculum across California that aligns MRWC 2 with the standards. The mathematics standards are built upon the international models for mathematical practice; they provide clarity and specificity and stress conceptual understanding of key ideas by continually returning to organizing principles. The new curriculum will meet both the standards for Mathematics Content, and the standards for Literacy in the Sciences and Technical Subjects. It will follow the Intersegmental Committee of the Academic Senates of the University of California (UC), CSU, and California Community College (CCC) model for expectations of entering first-year students for in-depth factual knowledge embedded within a conceptual framework, and for the ability to organize knowledge to ensure the retrieval and application of that knowledge.

The new curriculum for this mathematics course provides students with a bridge into multiple college and career options, including science, technology, engineering, arts, mathematics (STEAM), career technical education (CTE) and non-technical pathways. It will satisfy a-g requirements and will require prerequisites of Algebra 2 or Integrated Mathematics (IM) 3. The course is designed to help students gain the necessary numerical fluency and mathematical proficiency to be successful in college mathematics and related subjects that require mathematical understanding. It will address the greatest deficits seen among students enrolled in postsecondary developmental mathematics in the region, and will have the necessary procedural rigor and conceptual depth to ensure that students meet the conditions for college-level mathematics.

University of California, Los Angeles

College Access through Data Science is a partnership among the University of California, Los Angeles (UCLA) Graduate School of Education & Information Studies (GSEIS) Center X, the UCLA Department of Statistics and the Centinela Valley Union High School District to strengthen teaching and learning in mathematics. This project developed a Data Science Pathway, which culminates in a fourth-year *Introduction to Data Science* course that uses both statistical reasoning, data analysis and technology to engage students in strengthening their mathematical content knowledge.

This work builds upon *Mobilize*, a 2010 grant funded by the National Science Foundation (NSF) in partnership between UCLA and Los Angeles Unified School District (LAUSD). *Introduction to Data Science*© (IDS) curriculum teaches students to reason with, and think critically about, data in all forms. IDS is a rigorous course for students who wish to: develop their quantitative skills; take a course that will prepare them for Advanced Placement (AP) Statistics; take an alternative high school mathematics pathway; gain access to emerging fields that include Computational Data Analysis and be engaged with mathematics, statistics and computational thinking when the instruction is inquiry-based in real world issues.

The IDS curriculum consists of daily classroom activities, computer labs, and participatory sensing--a data collection method using smartphones and tablet devices. The California Content State Standards for High School Statistics and Probability relevant to data science are taught along with the data demands of good citizenship in the 21st century. IDS provides access to rigorous learning that fuses mathematics with computer science through the use of “R” using the *RStudio* interface, an open-source programming language that has long been the standard for academic statisticians and analysts in industry. The computer lab activities develop fundamental R programming and analysis skills.

The application of statistics combined with the use of technology in IDS uniquely addresses modeling, which is one of the standards for mathematical practice. IDS is an approved “c” mathematics course with a statistics designation in the University of California a-g requirements. Statistics courses in California validate Algebra 2.

3.2 Results from the Five CMRCI Projects

Overall, each of the five projects reported a successful year. More than 47 school districts participated, with 123 schools that affected 250 teachers and approximately 8,871 students.

CMRCI Site	Districts	Schools	Teachers	Students
San Diego State	1	12	22	1,204
CSU Monterey Bay	5	8	8	197
Sacramento State	20	52	139	4,293
CSU San Bernardino	20	48	74	2,963
UCLA	1	3	7	214
Totals	47	123	250	8,871

The amount of professional learning varied in each project from 10 days to 21 days, with each program reporting the importance of the professional learning to ensure the effectiveness of the curriculum. At some sites, teachers reported needing more time to fully understand and implement the desired curriculum to get improved outcomes. Many of the teachers were appreciative of the coaching support and realized just how challenging it is to change practice.

However, teachers also indicated that the activities, strategies and instructional practices they were learning in the new program had an impact on the other classes they were teaching, how they approached mathematics instruction and the expectations they had for their students, as they gained a deeper understanding of what was expected for a credit-bearing course at the university.

4 CMRCI and Academic Preparation in the CSU

The CSU-led CMRCI projects is simply one facet of the university's commitment to improving the academic preparation of incoming students. Academic preparation is one of the six operational priorities of the CSU's Graduation Initiative 2025, the university's ambitious effort to ensure student success, increase graduation rates and eliminate achievement and equity gaps for all students. It has also been a focus of the Academic Senate of the CSU and of recent systemwide policy changes. These collective efforts – in addition to the campus-led CMRCI projects – will have a tangible impact on the academic preparation of future students, as well as the educators who are preparing them for college.

4.1 Graduation Initiative 2025

The aspirational goal for the academic preparation pillar of the CSU's Graduation Initiative 2025 is to “provide CSU students, including those who arrive academically underprepared, the opportunity and support needed to complete 30 college-level semester units – 45 quarter units – before beginning their second academic year.” The four CSU-led CMRCI projects are advancing this goal in a number of ways. First, these projects are enhancing the content and pedagogical preparation of mathematics and science teachers. Each of the CMRCI sites developed an extensive model for professional learning that includes content understanding for teachers to help them to address their own gaps in content knowledge and pedagogy, thus helping them to be stronger transition instructors.

Second, the CMRCI projects are increasing the number of students who are fully academically prepared to enter the CSU and complete a transfer-level course in mathematics within their first year at the university. This reduces students' time to completion and improves persistence and graduation rates. Studies have shown that students who are welcomed with no conditions tend to be more successful and feel a stronger sense of belonging at the university (PPIC 2018).

Third, the projects potentially will close the equity gaps. We know the need for mathematics remediation disproportionately impacts students from historically underserved communities. By developing transitional courses that support mathematics readiness in college, the CMRCI projects are advancing the CSU's goal of closing all equity gaps by 2025.

4.2 Academic Senate of the CSU Task Force

In 2016-17, the Academic Senate of the CSU undertook the task of looking at mathematics preparation statewide and convened a task force. This task force, which consisted of CSU faculty and other statewide stakeholders, reviewed mathematics preparation across the state and made recommendations to the CSU Chancellor's Office:

Recommendation 1: Formulate an updated quantitative reasoning definition based on CSU best practices and reflecting national standards

Current policy relies on the phrase “intermediate algebra” as shorthand for full college preparation through high school and defines baccalaureate-level quantitative reasoning as the mathematics that builds on this level. The Task Force recommended updating this definition to include other kinds of quantitative reasoning.

Recommendation II: Revise CSU quantitative reasoning requirements and adopt equitable, feasible requirements that articulate with the other segments

The Task Force found that CSU policies with respect to admission, transfer and graduation are unduly constrained by treating foundational quantitative reasoning as necessary for success in all kinds of baccalaureate-level quantitative reasoning. Better policies would recognize that quantitative reasoning is valuable at both levels in ways that are not always sequential. The Task Force proposed flexible and appropriately rigorous definitions of quantitative reasoning at the foundational and baccalaureate levels to inform separate requirements at entry and at graduation.

The general expectation is that California's current State Standards in Mathematics, which follow closely the national Common Core Standards, will improve quantitative reasoning proficiency in students entering the CSU, the UC and the CCC. It is the hope of the Task Force that in the future most students will easily surpass the Foundational Quantitative Reasoning threshold.

Recommendation III: Ensure equitable access and opportunity to all CSU students

The Task Force recommended policy revisions to provide equitable treatment of community college transfer and first-year CSU students; improve access to quantitative reasoning classes relevant to a student's major, interests and career; and raise the CSU systemwide expectation for quantitative reasoning in high school from three to four years of coursework.

In each of its recommendations, the Task Force sought equity through a balance of access and opportunity. For example, the recommendation to raise the CSU's systemwide expectation of quantitative reasoning in high school to four years of coursework stipulated that the fourth year of instruction could reinforce practice and application of prior learning in quantitative reasoning rather than broach new topics in math. (In operational terms this means the fourth year of high school quantitative reasoning might not be in Area c of the UC a–g curriculum of college preparatory courses.)

Recommendation IV: Create a CSU "Center for Advancement of Instruction in Quantitative Reasoning"

The Task Force appreciates the rapidly changing contexts of high school instruction, best practices in postsecondary education, and the skills in quantitative reasoning that CSU students will rely on after graduation. The report supported a recent resolution of the Academic Senate of the CSU calling for creation of a dedicated Center, whose task it would be to implement these and subsequent findings and to support much-needed development of high-quality instruction and curricula in quantitative reasoning throughout the state's high school, community college and public university systems.

Although presented separately here, the four recommendations are interdependent. The policy proposals in Recommendation III depend on the definitions and distinctions of Recommendations I and II. The Center for Advancement of Instruction in Quantitative Reasoning (Recommendation IV) would provide a venue for the consultation and collaboration necessary for success in Recommendations I–III. Members of the task force expressed reservations about reducing the emphasis on algebra unless rigor could be assured in other ways. The Center, to be modeled on the CSU's successful Center for the Advancement of Reading, would provide the sustained system-level attention to pedagogy, evidence of learning at entry for both freshmen and transfer students and support for high schools offering 12th grade courses in quantitative reasoning.

4.3 The Center for Advancement of Instruction in Quantitative Reasoning

As indicated above, one of the recommendations from the Academic Senate Task Force was to create a Center for the Advancement of Instruction in Quantitative Reasoning (CAIQR), similar to the successful Center for the Advancement of Reading and Writing, where issues concerning mathematics education could be addressed on a regular basis.

In September 2017, the CSU launched the CAIQR. Staff was responsible for reviewing the work of the CMRCI projects and mathematics education within the CSU as a whole. CAIQR began working with the Institute for Teaching and Learning (ITL) to develop and provide professional development for CSU faculty. In addition, CAIQR staff consulted with stakeholders on next steps, suggestions for addressing critical issues in K-12 mathematics education (as evidenced by the Smarter Balanced Assessment scores), steps for addressing the teacher shortage in both secondary mathematics and science, and to begin consideration of a fourth year quantitative reasoning requirement.

Engagement with CMRCI Projects

CAIQR is directly engaged with the CMRCI sites. Staff have visited each site, convening the site coordinators and directors and monitoring progress. Through these visits, CAIQR staff has gained a better understanding of the CMRCI projects and can support these campuses in developing a structure to continue the work and distribute the curriculum.

As part of the work of CAIQR, the CSU Office of the Chancellor has committed to helping each of the CSU CMRCI sites distribute their work to high schools by putting the curriculum online and sharing with schools across the state. Although, there are currently no CSU funds assigned to ensure that there will be professional development for these curricula, the Chancellor's Office is committed working with the CMRCI sites to build the capacity necessary to do a cost recovery model for K-12 schools.

CAIQR plans on aligning with county offices of education (COE) and building on the partnerships that have already been established in English Language Arts to offer a cost-recovery model for K-12 schools interested in implementing the curricula.

Identification of Shared Best Practices

One of the areas CAIQR will be working on moving forward is identifying shared best practices among the four CSU-led CMRCI sites, the California Elementary Mathematics and Science Professional Learning Initiative sites, and several Investing in Innovation Fund sites that have been working on mathematics, science or quantitative reasoning. It is the intent of CAIQR to create an opportunity for the writers of each curriculum to come together and share their learnings of what constitutes a strong solid 4th year transition course in mathematics and how best to implement these strategies to help teachers and faculty implement an effective course.

Additionally, the CAIQR plans to have a series of professional learning activities where K-12 schools can learn about the various CMRCI projects. K-12 schools are then better prepared to make an informed choice on which curriculum best fits their needs and helps them to reach the college and career readiness standards.

Collaboration with Community Colleges

CAIQR will also be monitoring the work underway at the CCC in response to AB 705, a bill requiring a community college district or college to maximize a student's completion of transfer-level coursework in English and mathematics within a year, to see if there is a way to leverage the work of both the CCC and K-12 to reduce the need for remediation once students have arrived at the CSU. It is particularly important for the CSU effort in reforming mathematics education that there is not a differential impact on students from historically underserved communities.

4.4 Systemwide Policy Changes

During the 2017-18 academic year, the CSU Office of the Chancellor passed Executive Order 1100-Revised and Executive Order 1110, systemwide policy changes to improve outcomes for students who arrive in need of additional academic support. These changes included improving assessment of college readiness, strengthening the Early Start Program, restructuring developmental education and clarifying and updating General Education requirements. These policy changes, combined with the efforts of the CMRCI grants, are greatly impacting the way the CSU addresses academic preparation for incoming freshman and transfer students.

Additionally, the CSU is proposing a fourth year mathematics/quantitative reasoning course be added to the a-g requirements as part of the eligibility requirements for first-time students applying to the CSU. CAIQR is supporting this effort by helping to build capacity among K-12 partners to offer the quantitative reasoning courses. These courses will include courses with Algebra 2 as a pre-requisite, CTE courses that have a "g" designation (i.e. computer science or engineering) and advanced science courses.

Understanding that some of California's most under-resourced school districts may need more time to prepare, the preliminary plan is to phase in the four years of mathematics requirement gradually to ensure that it does not have a negative impact on any students or K-12 schools.

This fourth year of mathematics/quantitative reasoning requirement will provide students an opportunity to engage in applied mathematics or continue their mathematics studies and not lose a year of high school quantitative reasoning. Clearly, expanding the use of the transition courses developed under the CMRCI grant will help in laying the foundation to support this proposal. The courses developed were rooted in deep learning, effective pedagogy and relevant appropriate content for the needs of the students.

5 Conclusion

The CMRCI sites have demonstrated that high school students can be successful at the transfer level course, especially if they have already completed Algebra 2 or IM 3. These new courses, produced by faculty in collaboration with their K-12 partners, are helping teachers implement courses that will be considered “transition” courses. By successfully completing these courses, participating students will be ready for college-level coursework and success, without needing additional remediation.

Given the success of the CMRCI projects for both students and teachers, the CSU is now focused on developing the framework to scale these models, making them available to K-12 schools across the state. Also, the university is committed to building the capacity necessary for teachers to successfully teach the courses, given the amount of professional learning that was required in each model. Led by the CAIQR, the CSU is examining different avenues for building an online presence for each CMRCI curriculum offering and is partnering with the California County Superintendents Educational Services Association in support of these efforts.

Improving the mathematics academic preparation of incoming students will help ensure that all CSU students enter their second academic year with sufficient units to be on track to earn a degree. It also addresses the inequities in academic readiness head-on, helping the CSU close persistent achievement gaps and ensure that all students – regardless of their background – have the same opportunity for success. The CMRCI projects build on the momentum underway at the CSU, advancing best practices for teaching and learning to better serve all California students.

6 Citations

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