Presented by:
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Session description:
Participants will learn about implementation efforts underway in light of UC’s revised mathematics (area C) course policy for the 2021-22 school year and beyond. This session focuses on what the policy revisions mean for students’ college preparation and how the updated area C criteria encourage a broader range of advanced/honors math courses. Related updates, challenges, and partnership opportunities will also be presented to frame the role that UC can play in California’s attempts to make bold transformations in mathematics teaching and learning to support every student’s success.
The question posed here is both a challenge and an opportunity involving three distinct but related parts of a changemaking cycle:

- One has to do with expectations of college readiness as defined by K-12 curriculum standards and curriculum frameworks, academic preparation policy, institutional statements of mathematical competencies or essential quantitative reasoning, and so forth.

- Another part relates to actual curriculum and the high school math course options students decide to pursue – or are counseled to pursue – for college preparation. In this regard, we need to acknowledge that for some students, these options may be predetermined even before high school, based on how they were tracked during their middle school years.

- The third part reflects the mathematics subject requirement as outlined in undergraduate admissions policies and reinforced by admissions evaluation practices. The so-called “race to calculus” is very real indeed if the widely held assumption is that calculus is the ticket into college.

These distinct parts ultimately need to be pieced together to tackle the whole, and we need to be all in if we’re going to get things rolling.
Over the past decade, we have definitely gotten things rolling in California. The evolution we have seen touches on all three parts of the changemaking cycle.

Our state adopted the Common Core Standards for Mathematics for public K-12 schools, developed a Mathematics Curriculum Framework that served as a blueprint for designing college-prep math courses, which then prompted UC’s initial area C policy change to account for new integrated math sequences.

As California K-12 continues to explore and innovate in mathematics education, UC again adjusted our policy for math preparation to support the ongoing curricular changes, and the cycle of changemaking is moving forward with the proposed revisions to the K-12 Math Framework.
Keeping in mind the broader context for mathematics preparation, here are the main aims of UC’s revisions to area C course policy:

- Clarify UC’s expectations around college-prep mathematics learning
- Support high schools in their efforts to design and deliver multiple college-prep course options
- Encourage the submission of a wider range of both higher-level and honors math courses to empower students in their math achievements

In going over each of these policy aims, in turn, consider the guiding question: how can we change policies and practices to develop rigorous and relevant math course sequences that prepare all students for postsecondary success?
Since the state first implemented Common Core-aligned math courses, high schools are further expanding the math course options for students. The courses are still grounded in the standards of what students need to know and do with regard to this subject, but they are starting to look different based on the content and approach to skills development.

A prime example of this is an Introduction to Data Science course developed out of UCLA that was initially piloted throughout the greater Los Angeles Unified School District area. The growing popularity of this data science course and other “unfamiliar” math courses prompted questions, such as this one: can a student take Algebra 1, Geometry, and Data Science and fulfill the area C requirement?

Looking at the area C requirement, UC requires three foundational years of college-prep math that includes or integrates topics covered in algebra and geometry, including courses that draw from higher-level math, such as trigonometry, probability, and statistics. The UCLA data science course addressed the relevant math topics, but the question of whether the course would count to satisfy area C kept coming up.

There was a growing need to clarify UC’s expectations for college-prep math courses that will help students acquire specific skills to master the subject’s content and also gain proficiency in quantitative thinking and analysis, which is at the core of the area C requirement.
A workgroup of UC’s mathematics and statistics faculty was convened to review and revise the area C policy to provide the necessary clarifications. Nothing changed with regard to the foundational three courses that have defined area C since California’s Common Core implementation in 2014-15.

For higher-level math courses, they were defined as those that will:
- Deepen students’ understanding of mathematical concepts – meaning they will build upon prerequisite course content
- Align substantially with the Common Core (+) standards for higher mathematics
- Be developed for 11th and/or 12th grade levels
- Satisfy area C as a student’s required 3rd course (or recommended 4th course) in college-prep math

Examples of these kinds of higher-level math courses are what’s listed on the slide, although the list is not exhaustive.

When higher-level math courses are submitted for area C consideration, the submitter selects the relevant math discipline, which currently includes a general Advanced Mathematics category, and three specific advanced math discipline categories of Calculus, Statistics, and Computer Science.
This chart shows in summary form what the revised criteria mean with respect to how students might fulfill area C starting in this 2021-22 school year and beyond.

They can follow the integrated sequence (Math I + Math II + Math III) or the traditional sequence (Algebra I + Geometry + Algebra II), as based in Common Core.

Or students can follow this newest option: the expanded math sequence, which is named as such to reflect the intent of broadening the options for students. In addition to a course in either the Math III or Algebra II discipline, students can take a course approved in the Advanced Mathematics, Calculus, or Statistics disciplines in area C to fulfill the subject requirement.

In the last column, students going above and beyond the minimum area C requirement are those who take a fourth year of math in high school, which UC strongly recommends.

For the students who follow the expanded sequence, UC currently considers them to be technically fulfilling the area C requirement by validation based on math discipline.
Validation of coursework/subject omission
- Students who successfully complete a higher-level math course (earn a C or better) without completing a lower-level course can validate the missing lower-level course (e.g., Statistics validates Algebra II; Math III validates Math II).
- There’s no change to UC policy on the geometry requirement; students cannot validate the omission of geometry.

Validation of deficient grades
- Students who successfully complete a higher-level math course (earn a C or better) can validate a deficient grade (D/F) in a lower-level course (e.g., Advanced Math validates Math III; Algebra II validates Algebra I).
- Students can validate a deficient grade (D/F) in a course from the Geometry or Math II discipline by completing at least the first semester of a higher-level math course (i.e., courses in the Advanced Mathematics, Calculus, or Statistics discipline categories, or other options as outlined in the figure).

Source: https://senate.universityofcalifornia.edu/bylaws-regulations/regulations/rpart2.html#r428
Showing support of California high schools’ efforts to design and deliver multiple college-prep course options is both a policy aim and an internal driver behind any further area C policy redefinitions, especially as the landscape of high school math courses keeps evolving.

Following UC faculty’s explicit approval of an expanded math sequence, the UC High School Articulation team analyzed the math course data from over 2,000 active A-G course lists on record to see what kinds of area C course options are currently available to students.

Among California public high schools, the largest percentage is offering courses in the traditional sequence only. But the next largest group (just over 24%) are those schools offering traditional + integrated + expanded math sequences, followed by those offering the integrated math sequence only (19%).

The potential shifts in the kinds of course offerings schools will choose to develop and implement is in part related to what UC and other higher education institutions are willing to count for admissions purposes, given that what counts for admissions is often what counts as a signal of college readiness.
UC High School Articulation also did analyses to take stock of the range of courses already approved in area C under the various advanced math discipline categories. Notably, over half of public high schools have quite a range of higher-level math course offerings currently available that cut across the general **Advanced Mathematics** discipline and the specific advanced disciplines of **Calculus** and **Statistics**.

The updates and policy guidance for advanced math will hopefully push the needle in support of those schools in the 8-10% range that now offer courses in the general **Advanced Mathematics** discipline only or have expanded their general **Advanced Math** offerings to either the **Calculus** discipline only or the **Statistics** discipline only.

In other words, these are schools that might offer some type of higher-level math, but they are not necessarily in the position of offering their students the opportunity to choose from among different advanced math disciplines, including Calculus and Statistics. It’s either one or the other, or neither.

For the 12% that don’t offer any advanced math courses, UC can further assess what their circumstances are to identify any partnership opportunities that could help them expand their math course offerings and close existing equity gaps.
UC High School Articulation issued a statewide call to district and school A-G list managers that UC is inviting an open review of higher-level mathematics courses currently approved in area C.

The point of requesting this school site-based analysis is so that any higher-level math courses that are eligible for UC honors based on the updated advanced math criteria can be flagged for resubmission.

In doing so, high schools can potentially increase their UC honors math course offerings, which only gives students greater opportunities to be recognized for pursuing the most challenging levels of mathematics available at their school, and for strengthening their math education with four years of college-prep math coursework in high school.
What is in progress now through spring 2022 in our state is a review process to revise California’s K-12 Mathematics Curriculum Framework for all public schools.

To clarify, curriculum frameworks provide guidance to educators, parents, and textbook publishers, to support implementing California content standards. That means the next version of the Math Curriculum Framework will be the blueprint for the design of future math courses that align to California’s college readiness standards.

The Framework authors acknowledge several key reasons for change as presented on the slide.

Some of the highlights of what the Framework authors are attempting to do in response to this need for change include:

- Placing greater emphasis throughout the Framework document on access and depth, over remediation or acceleration
- Introducing a data-focused pathway at every grade level, kindergarten through grade 12
- Proposing a new high school math course sequence called Mathematics: Investigating & Connecting (MIC), that will stand alongside the integrated and traditional math course sequences
  - There will be two lower-level courses, MIC 1 & 2
  - Followed by two higher-level courses, Mathematics: Investigating & Connecting with a data science focus, and one with a focus on modeling with functions

See California Department of Education website for more information: [https://www.cde.ca.gov(ci/ma/cf)]
The potential introduction and integration of data science into K-12 mathematics education is an exciting prospect for UC, especially given the expansion of undergraduate data science majors at 5 of the UC campuses and other data science education initiatives, such as the Introduction to Data Science Project homebased at UCLA. The IDS Project is the leading provider nationwide of high school data science instructional materials, professional learning, and technological resources.

As a high school course approved in the Statistics discipline of area C, Introduction to Data Science teaches students quantitative reasoning, critical analysis, and computational thinking in relation to data in all forms. The course is grounded in Common Core math standards and blends mathematics with computer science.

Since its introduction in 2015, IDS has been offered in 45 high schools across 15 districts to 9,500 students and counting.

Visit the IDS Project website for more information: https://centerx.gseis.ucla.edu/idsucla/
UC is also working in partnership with the other education segments to enhance mathematics education in California. CMEC is an intersegmental group of professionals and educators committed to improving mathematics education from the pre-kindergarten through postsecondary (PK-16) levels, especially to bridge gaps at key points of transition in PK-12 through college mathematics.

CMEC was awarded a one-year planning grant funded by the College Futures Foundation to convene a CMEC Think Tank with intersegmental workgroups. Our short-term goal is to create a plan for change implementation across PK-16 with the longer-term goals of building capacity within California schools, colleges, and universities to better support the math readiness and achievement of all students.

The overarching outcome for the think tank effort is a deep understanding (with a keen focus on equity) of the California PK-16 structures that empower students in mathematics learning. This will involve assessing course options, content, design, pedagogy, and learning progressions, as supported by policy alignment and educator professional learning.

The CMEC Think Tank involves leaders and providers of professional training in PK-16 mathematics and PK-12 schools & districts; faculty and administrators from the California Community Colleges/CSU/UC systems as well as private postsecondary institutions; representatives from state and regional education agencies; and leaders from professional organizations such as the California Mathematics Council. The think tank’s formation is an indicator that California is indeed going all in on transforming math education, and we’re ready to serve as a model for other states around the country who are wanting to do the same.
As we look to the future and plan for what’s next for the sake of our students, we ought to capitalize on the synergy we have in place in California, which is captured in this excerpt from a statement recently issued by UC’s Board of Admissions and Relations with Schools, also known as BOARS – the faculty body that voted unanimously to approve the area C policy changes in October 2020.

The end goal is to move beyond a straight and narrow math pathway and limited options so that students can have greater choice to determine the most relevant mathematics learning for their educational and career aspirations.

We – you – can start by encouraging students, families, fellow counselors, and other colleagues to explore and pursue different area C math courses, all the while, keeping our college-prep expectations high for all students in support of their success.