NEW CHALLENGES AND OPPORTUNITIES:
TAKING STOCK OF NATIONAL PROGRESS IN
MODERNIZING MATHEMATICS PATHWAYS
OVERVIEW

- Highlights across the national landscape of math modernization
- Challenges on the horizon:
  - Beliefs and values
  - Messaging
  - Professional learning & teacher preparation
THE NATIONAL LANDSCAPE

MATHEMATICS MODERNIZATION
NOMENCLATURE

- Mathematics Pathways Project (CBMS/Dana Center original work)
  - Consideration of the 11-14 transition spaces
- Launch Years (Dana Center)
  - Focus on the K-12 aspects of the pathways work
- Leadership Network (AIMC, AMATYC, AMS, AMTE, ASSM, BBA, CBMS, MAA, NCTM, NCSM, TODOS)
- Catalyzing Change (NCTM)
- Mathematics Modernization
A NATIONAL MOVEMENT

CBMS/Dana Center Pathways Forum Participants

States currently working on a K-12 Pathways initiative
WASHINGTON (STATE)

Students who take MOWWM or CTE/Science as 3rd credit may take Modern Algebra II as 4th credit.
California

- California Mathematics Framework
  - Focus on equity and detracking
  - Builds from successful models like Escondido, SFUSD
- Higher education reform
  - Multiple placement measures for two-year colleges
  - CSU: repositioning quantitative reasoning courses, increasing access
Revised state mathematics standards to
- better incorporate statistical reasoning throughout grades
- reduce the number of topics covered each year
- reposition Algebra II (“Advanced Algebra”) to better prepare students for fourth-year course options relevant to their career pursuits

Reform of gateway courses in higher education
COMMON THEMES

- Focusing on a common middle school & grades 9-10 mathematical experience
  - Catalyzing Change in High School Mathematics (NCTM, 2018)
  - Invigorating High School Math (Leinwand & Milou, 2021)
- Re-envisioning the content and purpose of Algebra II
- Sensible and flexible options in grades 11-12
- Expanding first-year credit-bearing college options beyond College Algebra
CURRICULAR CHANGES ARE NOT ENOUGH.
SYSTEMIC CHANGE IN MATHEMATICS FRAMEWORK

Steele, 2021

Course structures and support
- job-embedded professional learning
- continuous improvement strategies
- adapting to changes and advances in research on learning

Mathematics curriculum
- NCTM effective mathematics teaching practices
- equitable mathematics teaching practices
- anti-racist pedagogies

Beliefs and values about students' mathematical learning
- leadership, visioning, and support for adults
- input and feedback from parents
- input and feedback from community
- to & from admin and other school staff
- articulation across grade bands
- rationale behind anticipated changes

Student-centered pedagogy
- rich tasks
- problem solving
- meaning-making
- mathematical modeling

Messaging and dialogue
- Intervention and support
- shared foundations
- meaningful pathways beyond ‘race to Calculus’
Beliefs and values about students' mathematical learning
BELIEFS AND VALUES

- Teachers’ beliefs influence the decisions that they make about the manner in which they teach mathematics.

- Students’ beliefs influence their perception of what it means to learn mathematics and their dispositions toward the subject.

- Without explicit and shared agreement about the beliefs and values of a school building:
  - Teachers will implement curricula in ways consistent with their beliefs.
  - Administrators will evaluate and fund math in ways consistent with their beliefs.
BELIEFS AND VALUES

- Initiate critical conversations about the productive and unproductive beliefs that mathematics teachers hold in a building
- Create a shared statement of beliefs and values for the district and the building
- Use regular staff development time to explicitly discuss beliefs:
  - Discussing and analyzing teaching practice
  - Evaluating student work
  - Co-designing and co-scoring assessments
WHAT WE OFFER THAT IS DIFFERENT FROM OTHER TEXTS THAT DISCUSS COLLABORATION, PROFESSIONAL GROWTH, AND SYSTEMIC SUPPORTS IS A SET OF HONEST, ACCESSIBLE STARTING PLACES FOR YOU TO INSTIGATE YOUR OWN QUIET REVOLUTION USING THE LESSONS WE HAVE LEARNED IN HOLT.
MESSAGING

CHALLENGES

Messaging and dialogue
The message of ‘mathematics modernization’ is one of the strongest approaches across the ideological spectrum.

Community members must not see modernization efforts as taking away opportunities for students with high achievement profiles.

Focus on data-based arguments about mathematics teaching and learning.

- Over-acceleration limits opportunities for deep understanding.
- Taking calculus or better in high school is not required for STEM careers.
- Mathematics modernization is a workforce and global competitiveness issue.
First mathematics course in college and graduating in engineering: Dispelling the myth that beginning in higher-level mathematics courses is always a good thing

- Students taking Calculus I or higher as their first college math course are more likely to graduate with an engineering degree
- Starting past Calculus I (taking high school calculus and getting credit) gave no discernible advantage to students over starting at Calculus I
- When considering grade and course together, some groups of students who were more successful at courses before Calculus I were as likely to graduate as students who were less successful starting further on in the sequence
Leadership, visioning, and support for adults
PROFESSIONAL LEARNING

- Implementation of the curriculum is important
- Districts, states, and universities must collaborate on professional development focused on research-based instructional practices
TEACHER PREPARATION

- New teachers must exit a preparation program with strong fluency in research-based effective practice

- The mathematics content for preservice teachers must evolve:
  - Statistics
  - Data science
  - Integrated secondary content
STEELE • NEW CHALLENGES AND OPPORTUNITIES

SYSTEMIC CHANGE: A TYPICAL MODEL

Agree on what mathematics to teach and when
- Courses
- Standards
- Curriculum

Create structures that ensure homogeneity
- Pacing Guides
- Assessments
- Syllabi

Attend to form-focused aspects of pedagogy
- Manipulatives
- Student Grouping

Attend to function-focused aspects of pedagogy
- Problem solving
- Communication

Demotivation and teacher burnout risks
- loss of freedom
- curricular gaps
- “kids can’t do”
- divergence in pedagogy

Superficial implementation
- focus remains on procedural mathematics
- rote manipulative use
- tasks not group-worthy; group work is devalued
SYSTEMIC CHANGE BASED ON SHARED VALUES ABOUT TEACHING AND LEARNING
WHAT ARE YOU WONDERING ABOUT?