

Dana Center  
**Mathematics**  
PATHWAYS

## Systems Approach to Scaling Mathematics Pathways

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NASH TS3, Denver, CO

April 13, 2017



# Vision

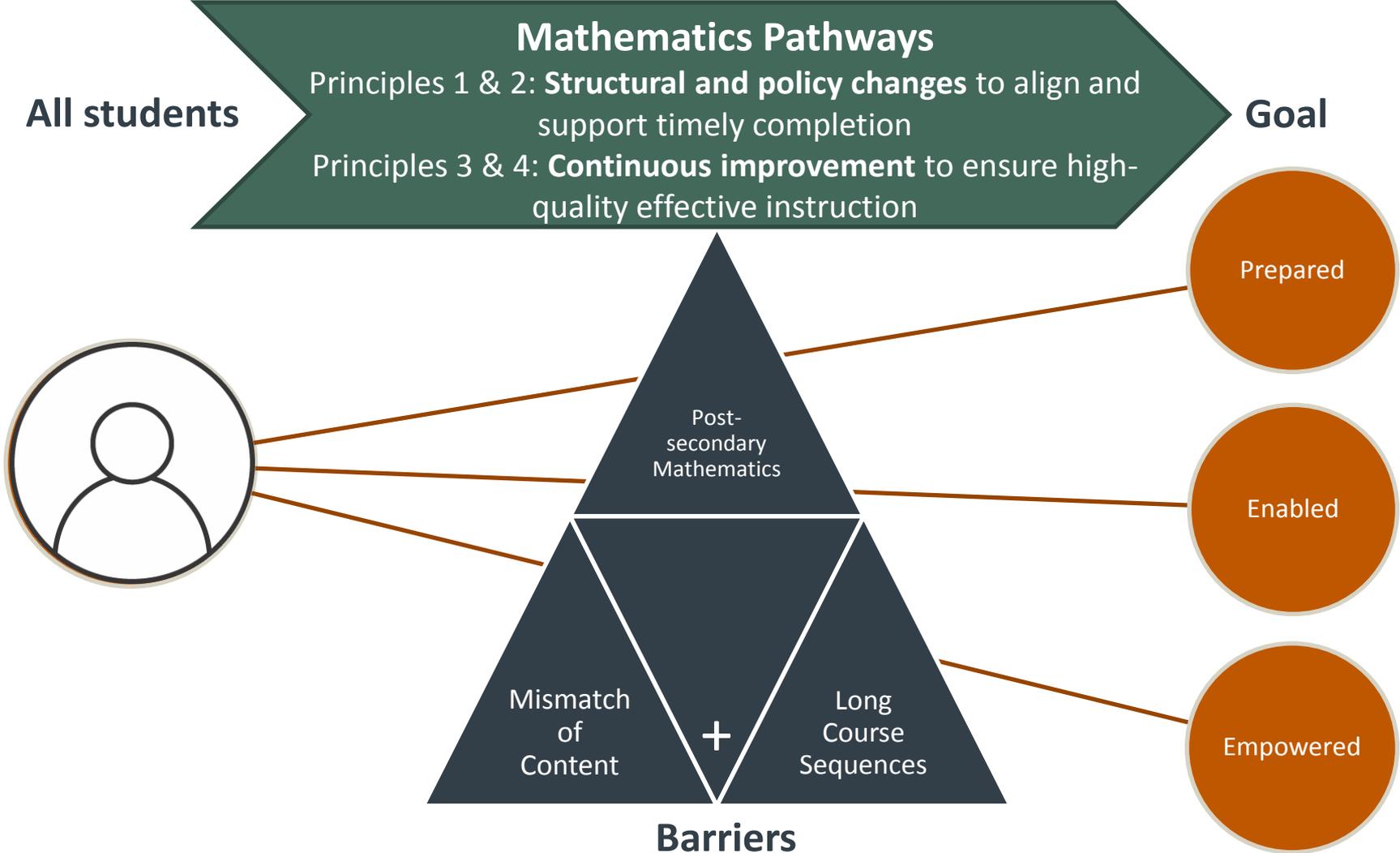
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All students have equitable access to and the opportunity for success in rigorous mathematics pathways that are aligned and relevant to their future aspirations, propelling them to upward economic and social mobility.

The DCMP seeks to ensure that ALL students in higher education will be:

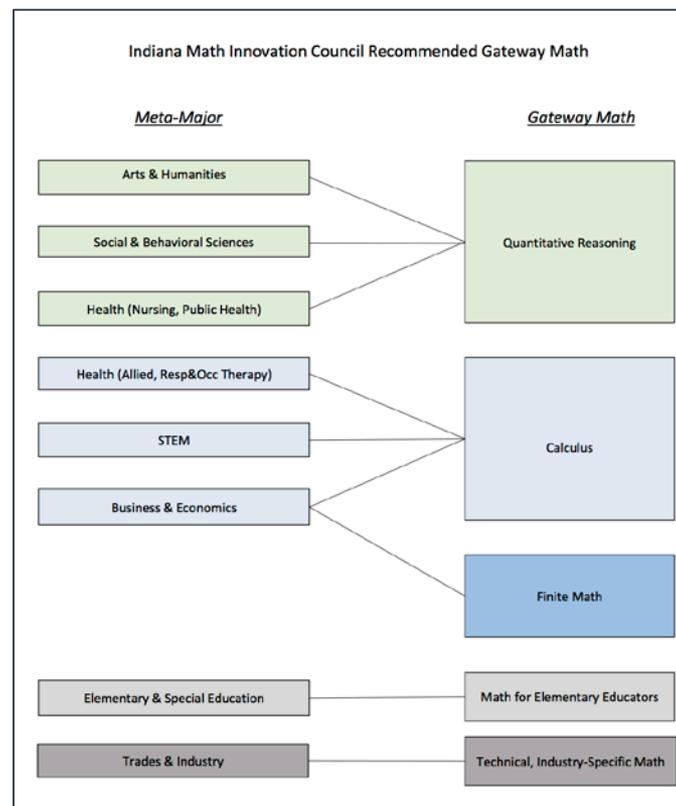
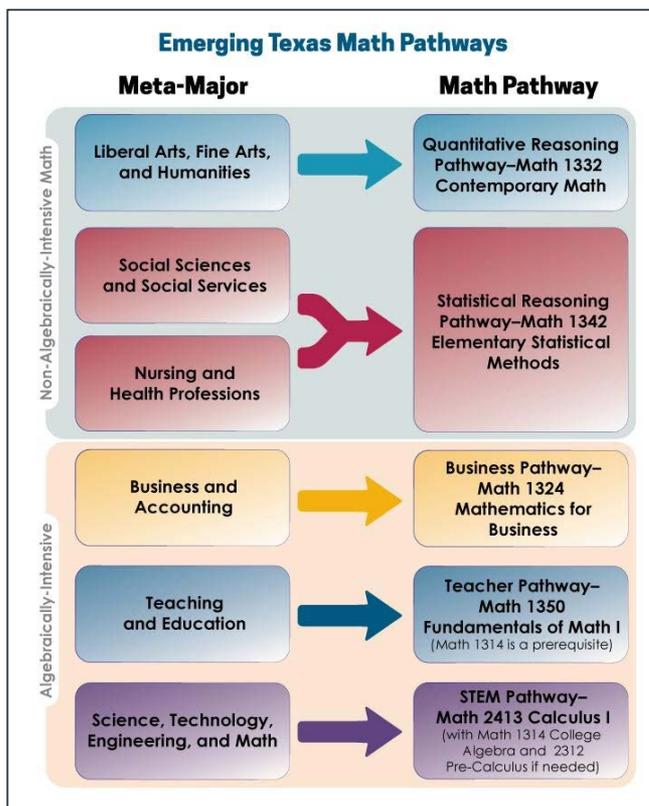
- **Prepared** to use mathematical and quantitative reasoning skills in their careers and personal lives,
- **Enabled** to make timely progress towards completion of a certificate or degree, and
- **Empowered** as mathematical learners.

# Dana Center Mathematics Pathways (DCMP)



# What is a mathematics pathway?

A mathematics pathway is a **mathematics course or sequence of courses** that students take to **meet the requirements of their program of study**. The concept of math pathways applies to pathways for **both college-ready and underprepared** students.



# DCMP Model

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## Institutions implement structural and policy changes quickly and at scale.

Mathematics pathways are structured so that:

- Principle 1: All students, regardless of college readiness, enter directly into mathematics pathways **aligned to their programs of study**.
- Principle 2: Students **complete** their first college-level mathematics requirement in their **first year of college**.

## Institutions and departments engage in a deliberate and thoughtful process of continuous improvement to ensure high-quality, effective instruction.

Students engage in a high-quality learning experience in mathematics pathways that are designed so that:

- Principle 3: **Strategies to support students as learners** are integrated into courses and are aligned across the institution.
- Principle 4: **Instruction** incorporates evidence-based curriculum and pedagogy.

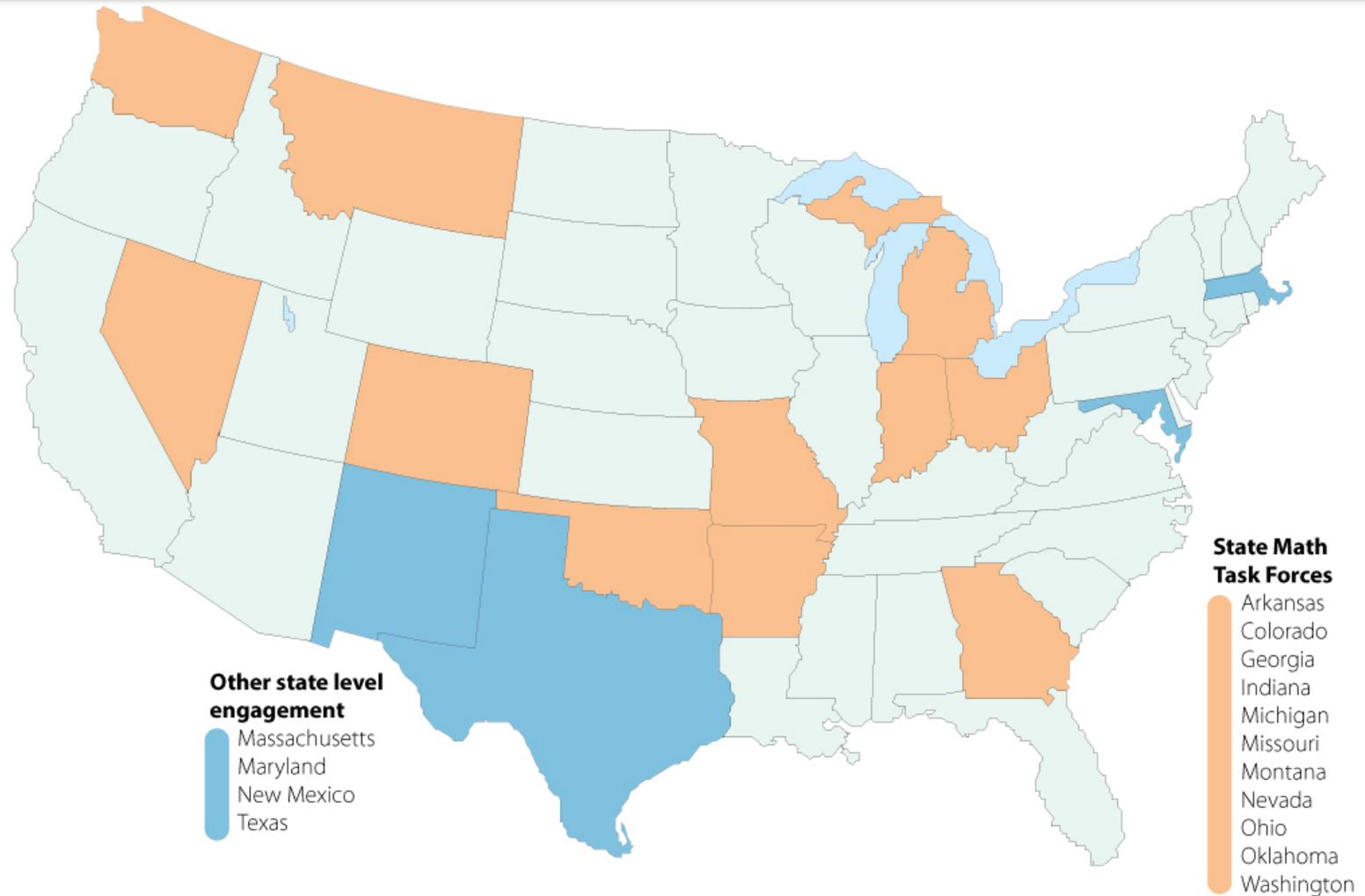
# Systems approach to the DCMP model

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All students are prepared, enabled, and empowered.

# State-level mobilization



# From scaling up to working at scale

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Faculty-driven

Administrator-  
supported

Policy-enabled

Culturally-reinforced

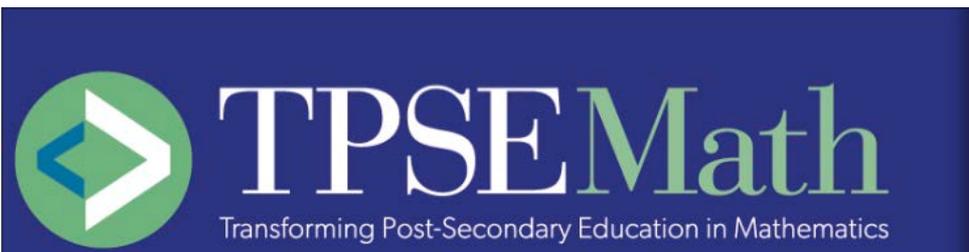
# What do leaders in mathematics say?

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“Unfortunately, there is often a **serious mismatch between the original rationale for a college algebra requirement and the actual needs of students who take the course**. A critically important task for mathematics sciences departments at institutions with college algebra requirements is to clarify the rationale for requirements, determine the needs of students, and **ensure that department’s courses are aligned** with these findings.”

—Mathematics Association of America,  
Committee on the Undergraduate Program in Mathematics

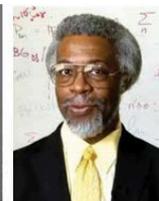
# Transforming Post-Secondary Education in Mathematics



Phillip  
Griffiths,  
IAS



Eric  
Friedlander,  
USC



Jim Gates,  
U. Maryland



Mark Green,  
UCLA



Tara Holm,  
Cornell



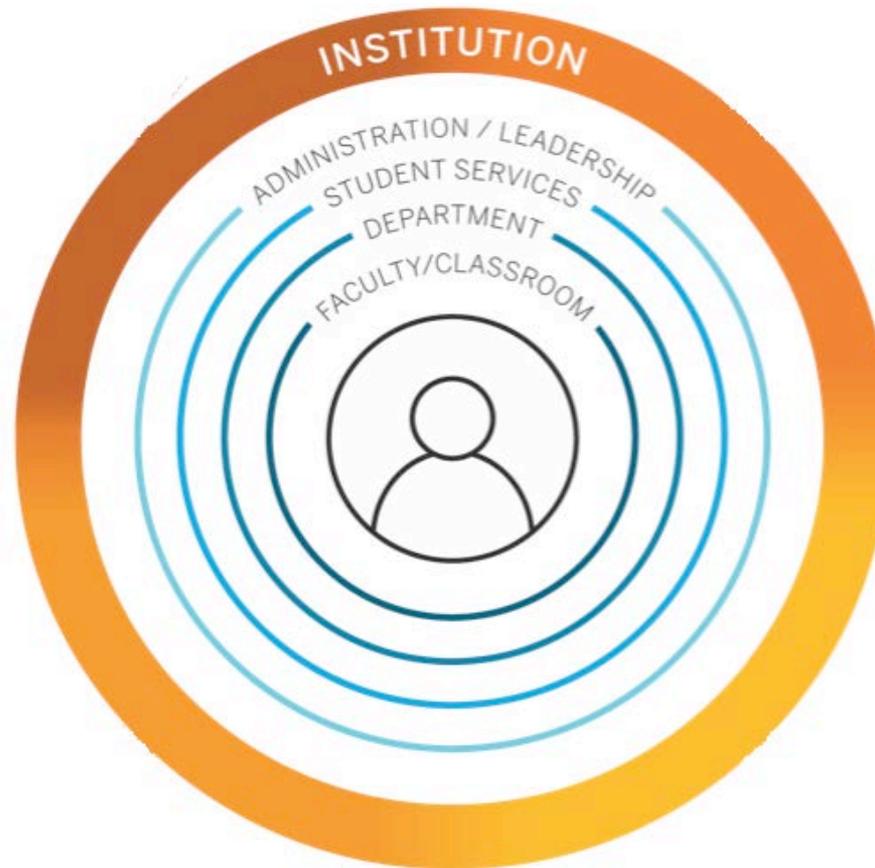
Uri  
Treisman,  
UT Austin

A **vision** for tomorrow's mathematical sciences departments:

- To *narrow the gap* between mathematics as used in the workplace and mathematics as experienced in our classrooms.
- To make *mathematics an essential partner to other disciplines* with broader responsibility for quantitative education across the institution.
- To ensure that postsecondary mathematics is a potent resource for students' *upward social and economic mobility*.

# Intra-institutional Implementation: Math Pathways Within An Institution

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# Inter-institutional Implementation: Math Pathways Across Systems

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# Systems Approach to Math Pathways

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**Change at scale requires work at multiple levels of the system.**

# DCMP Resource Site

[www.dcmathpathways.org](http://www.dcmathpathways.org)

The University of Texas at Austin  
Charles A. Dana Center  
College of Natural Sciences

NEWS CONTACT

Dana Center  
**Mathematics**  
PATHWAYS

The DCMP Learn About Take Action Where We Work Resources

The Right Math for the Right Student at the Right Time

The Dana Center Mathematics Pathways seeks to ensure that ALL students in higher education will be:

- **Prepared** to use mathematical and quantitative

It takes coordinated action across all...

In order to...

- Levels of the system (national, state, institution, classroom)
- Redesign course and institutional structures that deter success;

# About the Dana Center

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The **Charles A. Dana Center** at The University of Texas at Austin works with our nation's education systems to ensure that every student leaves school prepared for success in postsecondary education and the contemporary workplace.

Our work, based on research and two decades of experience, focuses on K–16 mathematics and science education with an emphasis on strategies for improving student engagement, motivation, persistence, and achievement.

We develop innovative curricula, tools, protocols, and instructional supports and deliver powerful instructional and leadership development.

2016



The University of Texas at Austin  
**Charles A. Dana Center**

# ***Finding a Balance: Purposeful Mathematics Pathways***

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NASH TS3 Convening

April 13-14, 2017

Denver, Colorado

Nancy S. Shapiro  
Associate Vice Chancellor



# What problem are we trying to solve in Maryland?

- Intermediate Algebra is the “graveyard” for non-STEM majors
- Approximately 71% of Maryland’s community college students test into developmental math courses
- Existing regulations drove community college students toward math courses that did not align with the requirements of their majors and resulted in high failure and drop-out rates
- USM institutions had multiple mathematics pathways, but community colleges did not
- Inefficient Transfer from community college to 4-year institutions

# Can you relate?

## Think. Pair. Share.

- Do any of these issues resonate with you on your campus or in your state? If so, which ones?
- Are there other issues challenging your systems?

# Maryland's Goals for Undergraduate Mathematics

- Reduce the number of students taking remedial math
- Increase the percentage of students who successfully complete remedial math within their first year of college
- Increase the percentage of first year freshmen who successfully complete a math course that fulfills a general education requirement in their first year
- Develop math pathways to place students in more appropriate courses for their educational goals and for success in their degree program area
- Provide better advising for incoming freshmen and returning non-traditional students

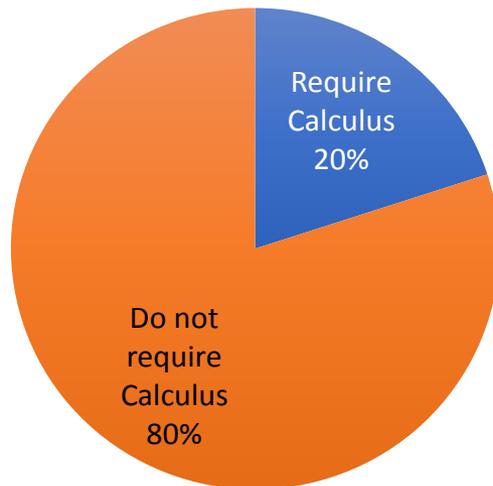
# Cost of Remedial Education

*College and Career—Are Maryland Students Ready* (Maryland Department of Legislative Services February 2015)

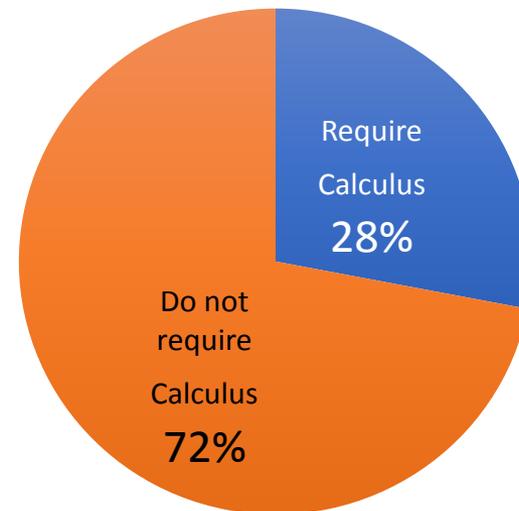
- Community Colleges: \$7000/student (for a total of \$75.3 Million)
- USM: \$9000/student (for a total of \$14.0 Million)

# What is the “right math”?

## Community College Student Enrollment into Programs of Study



## Four-Year Student Enrollment into Programs of Study



Burdman, P. (2015). *Degrees of freedom: Diversifying math requirements for college readiness and graduation*. Oakland CA: Learning Works and Policy Analysis for California Education.

# Think. Pair. Share.

Consider the last two slides: cost of remediation and enrollments.

- How would you go about getting buy-in to change a dysfunctional system?
- What types of evidence needs to be collected to influence policy changes?
- Who is responsible for collecting the data? From whom?

# Achieving Buy-In For Policy Changes

## Leadership from the Top

- Intersegmental Chief Academic Officers
- MMRI Steering Committee

## Engaging Faculty

- Statewide Mathematics Group
- MMRI Workgroup
- Campus-level committees and task forces

# Engaging Faculty: Statewide Mathematics Group

- Mathematics faculty representatives from all higher education institutions are invited (Public, Private, Community College, 4-year)
- Sample Types of Work:
  - Established a core definition for the mathematic general education and recommended core course components for the mathematic general education courses
  - Identified the expected student outcomes for the general education mathematics courses and developed potential methods of measuring student general education competencies or outcomes
  - Shared individual institutions' mathematics general education courses and discussed how these traditional general education courses meet the competencies

# Policy Change: New General Education Language

## Old Language

*One course in mathematics at or above the level of college algebra*

## New Language

*One course in mathematics, having performance expectations demonstrating a level of mathematical maturity beyond the Maryland College and Career Ready Standards in Mathematics (including problem-solving skills, and mathematical concepts and techniques that can be applied in the student's program of study).*

# Policy Takeaways

- Take advantage of existing structures and relationships
- Space or forum for open and frank dialogue is key
- Essential Conditions
  - Common understanding of the problem
  - Shared belief that the problem is important and needs to be addressed



THE COLLEGE SYSTEM  
*of* TENNESSEE

# Mathematics Pathways: A Planning & Implementation Template for Success

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NASH TS3

April 13-14, 2017

Randy Schulte

Associate Vice Chancellor

# *The Tennessee Two-Step*

1. Realignment of Math Pathways
2. Implementation of Corequisite Remediation



# TS3 System-wide Goals for Student Success in Mathematics

- Reduce the number of students taking remedial math
- Increase the percentage of students who successfully complete remedial math within the first year of college
- Increase the percentage of first year freshmen who successfully complete a credit-bearing math course in the first year
- Develop math pathways to place students in appropriate courses for their degree programs
- Provide better advising for incoming freshmen to support these goals

A GOAL WITHOUT A PLAN

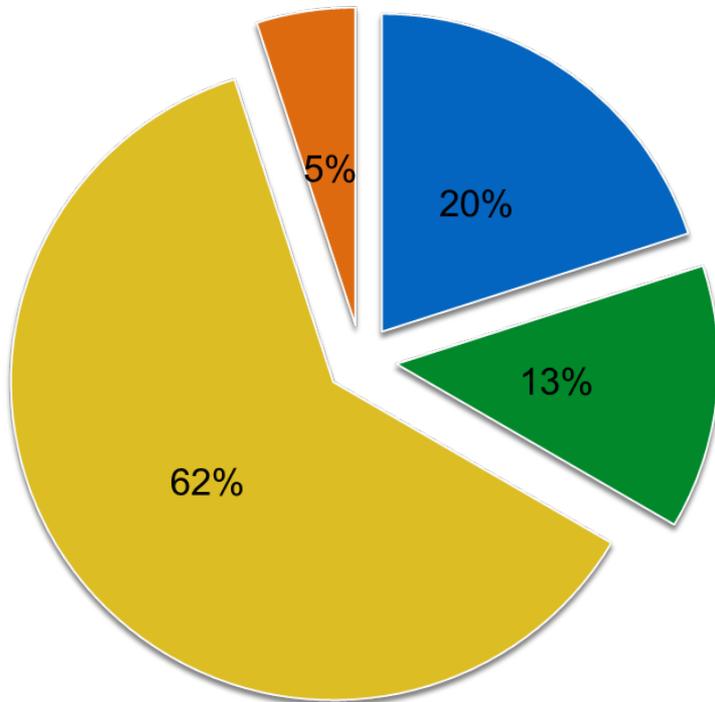


IS JUST A WISH

**Antoine de Saint-Exupery**

# STEP ONE: REALIGNMENT OF MATHEMATICS PATHWAYS

- System-wide meetings with
  - Mathematics Academic Leaders
  - Mathematics Faculty
- Tennessee Transfer Pathways curricula development and revision
  - Discipline-specific Academic Leaders
  - Discipline-specific Faculty



- MATH 1000 - Bridge to Algebra
- MATH 1010 - Quantitative Reasoning
- MATH 1530 - Statistics
- MATH 1630 - Discreet Math

# STEP TWO: Implementation of Mathematics Corequisite Remediation

- Data Analytics
- Collaboration
- **Planning & Implementation**

# Planning & Implementation Template

1. KEY ACCOMPLISHMENTS
2. CHALLENGES
3. STEPS FORWARD
4. WHO AND WHEN?
5. METRICS
6. NEEDS ASSESSMENT

# Planning & Implementation Template

## 1. KEY ACCOMPLISHMENTS

- Describe major steps enacted so far to realize this initiative.
  - Successes
  - Effective Practices
  - Models



# Planning & Implementation Template

## 2. CHALLENGES

- *Pedagogy*
- *Scheduling*
- *Staffing*
- *Technology*
- *Outreach*
- *Support*



# Planning & Implementation Template

## 3. STEPS FORWARD

- What additional steps need to be taken to fully implement the practice?
  - Policy
  - Process
  - Goals
  - Strategies



# Planning & Implementation Template

## 4. WHO AND WHEN?

INITIATIVE CATEGORY	DESCRIPTION OF TASK	PRIMARY RESPONSIBILITY	TIMEFRAME to IMPLEMENTATION
<i>Technology</i>	<i>Identify online supplemental instructional software</i>	<i>Coordinator of Mathematics Learning Support</i>	<i>Spring 2017 – research Fall 2017 – pilot Spring 2018 – go to scale</i>

Many great things can be done in a day if you don't always make that day  
**TOMORROW.**

[WWW.LIVELIFEHAPPY.COM](http://WWW.LIVELIFEHAPPY.COM)

# Planning & Implementation Template

## 5. METRICS

- How will we know that this practice is making progress?
  - Measurable targets
  - Trajectories on timeline
  - Accountability



# Planning & Implementation Template

## 6. NEEDS ASSESSMENT

- Identify and list what you need to fully actualize the initiative.
  - Physical resources
  - Human capital
  - Data
  - External assistance



## RESULTS:

*In 2015, Tennessee abolished prerequisite remediation. Now remedial students take the normal college math or writing course, but alongside it, get extra workshops and tutoring.*

*Co-requisite remediation makes a huge difference. In the old system, only 12 percent of students who began in remedial math completed a college-level math class in their first year. Now 55 percent do.*



THE COLLEGE SYSTEM  
*of* TENNESSEE

# For More Information

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