Re-envisioning Entry-Level Mathematics Programs

THE
New Mathways
PROJECT

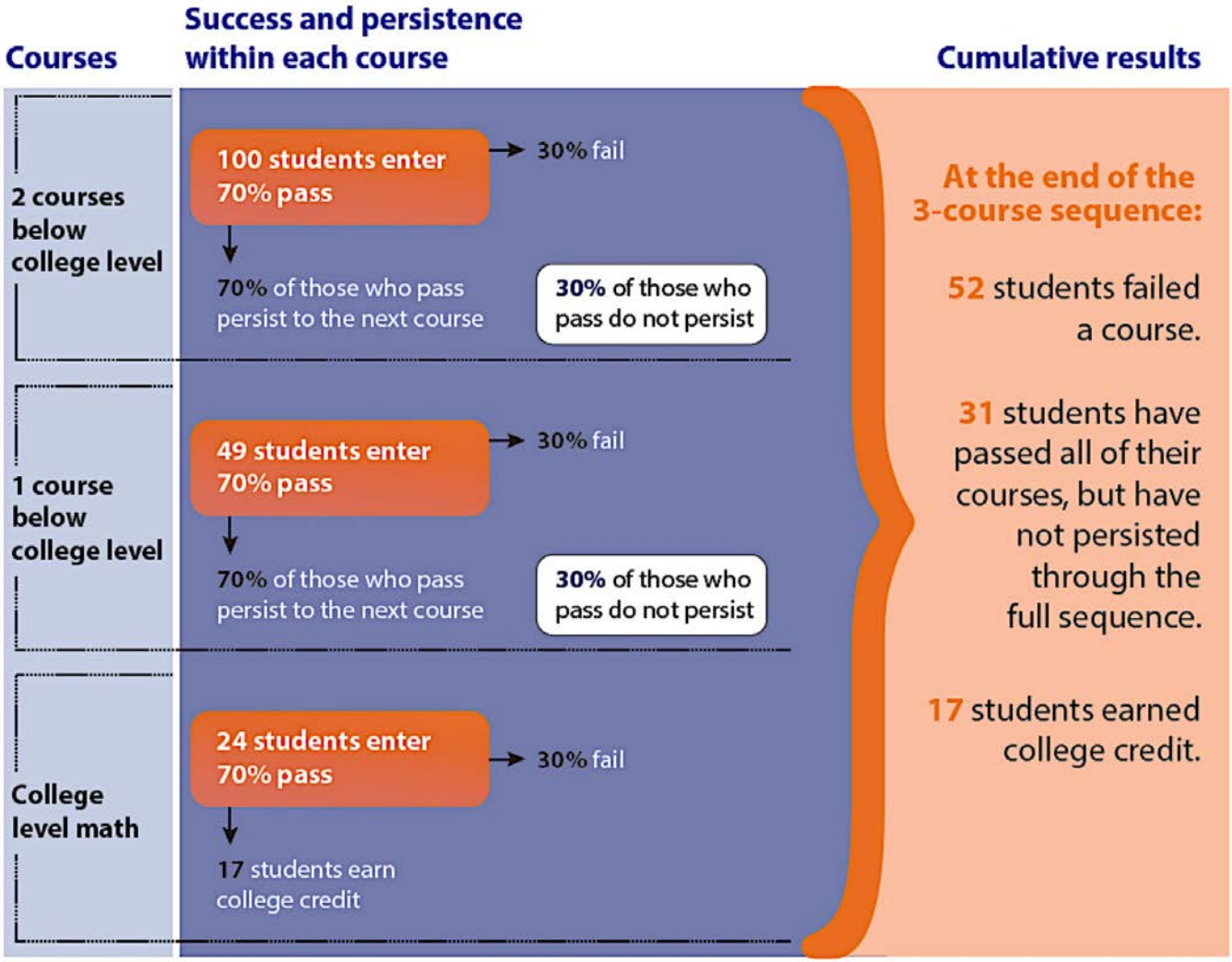
a Charles A. Dana Center higher education initiative

What is driving change?

- Low student success in current math sequences
- Changing mathematics needs

Long sequences decrease student success

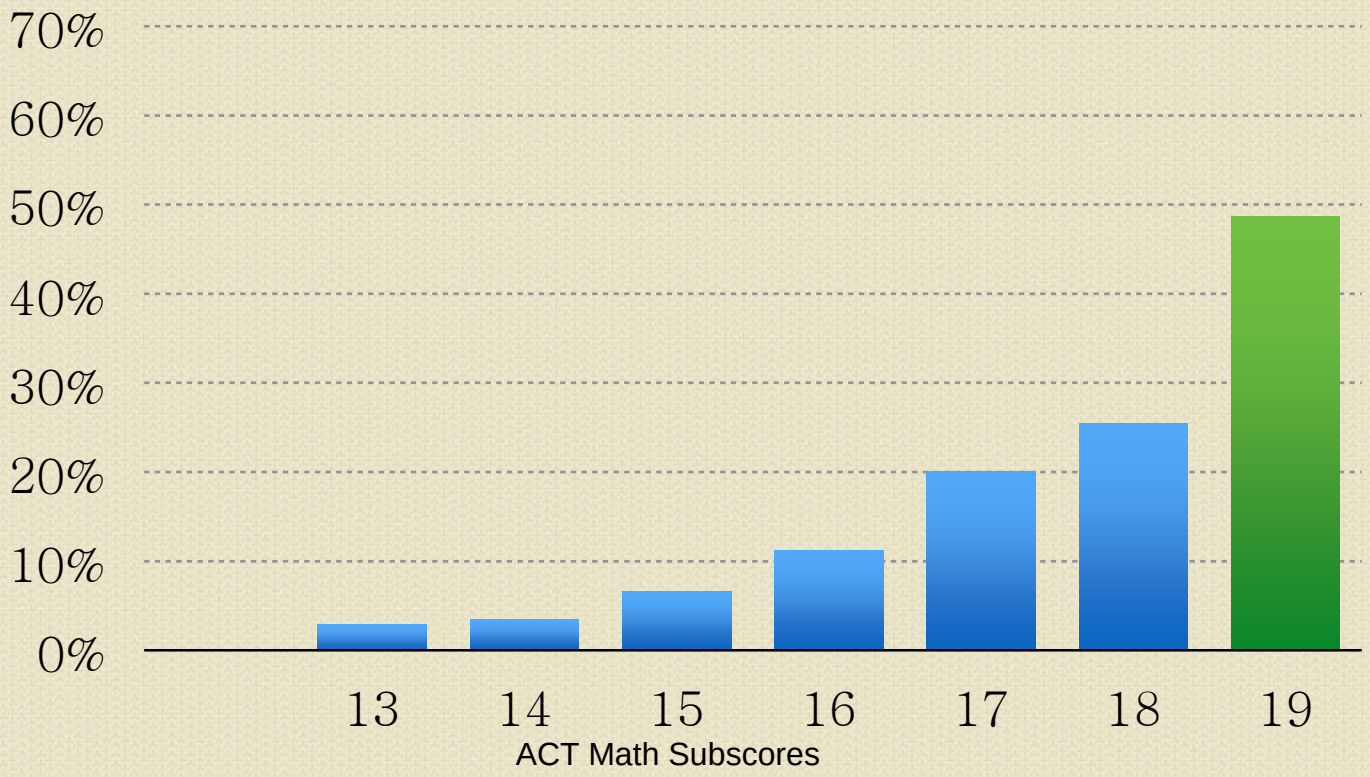
A thought experiment born out by data...



The impact of placement…

System-wide data for Tennessee: Students earning college level math credit in 1 year by ACT score

Students with ACT of 18 and below placed into developmental math; ACT of 19 placed into college level math



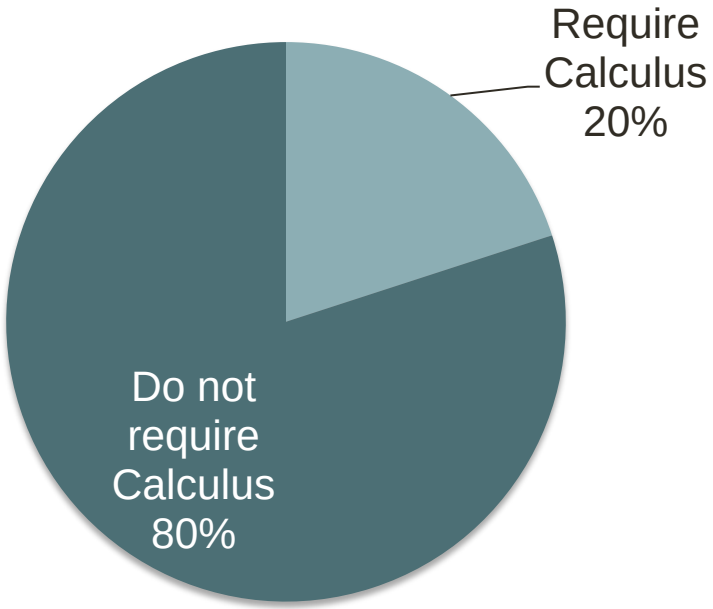
The purpose of college algebra

"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."

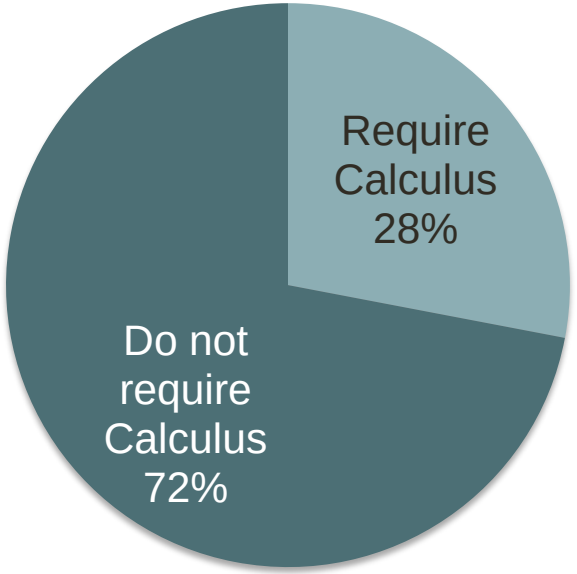
Source: Mathematical Association of America, 2004

What math is needed?

Community College Student Enrollment into Programs of Study



Four-Year Student Enrollment into Programs of Study



Source: Burdman, 2015; Chen & Soldner, 2013

Common Vision 2025

The primary goal of this initiative is to **develop a shared vision in the mathematical sciences community of the need to modernize the undergraduate mathematics program, especially the first two years.**

"The mathematical sciences community must begin to think in terms of a broader range of entry-level courses and pathways into and through curricula for all students, including mathematics and other STEM majors as well as non-STEM majors."

Common Vision report, p. 13

Two goals:

Increase and accelerate student success in mathematics

AND

Teach mathematics content and skills that will be of value to students in their lives and careers

Definition of math pathway

...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 college-ready and underprepared students.

A new vision for the student experience in math...

THE
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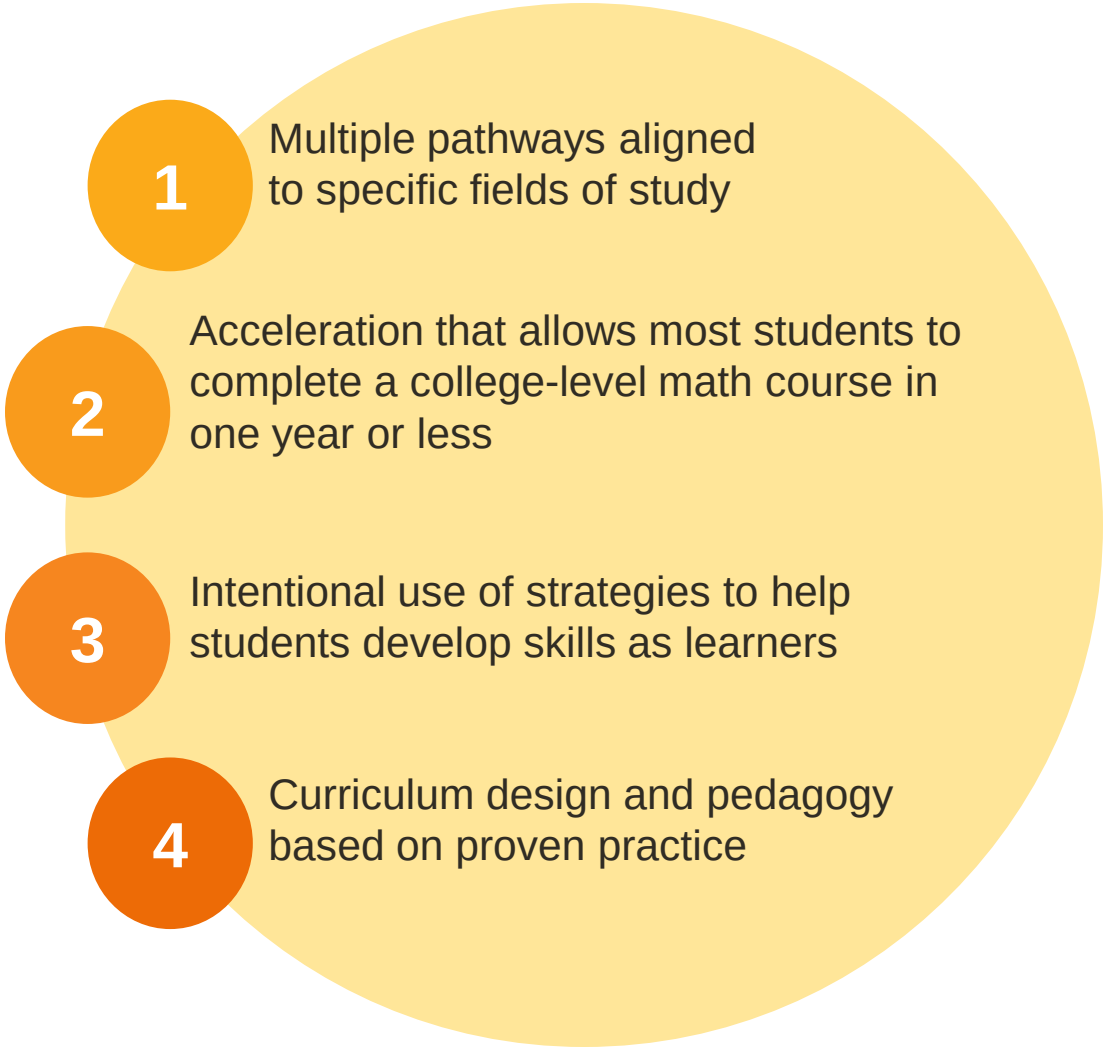

Process for state level work

Each state has a customized plan and timeline.

Phase 1: Build urgency and intrinsic motivation for change

Phase 2: Enable scale by creating the policy and practice conditions for statewide implementation

Phase 3: Enact the NMP at institutions by building faculty and institutional

Consulting, tools, and services support each phase.

State-level work under the New Mathways Project

THE
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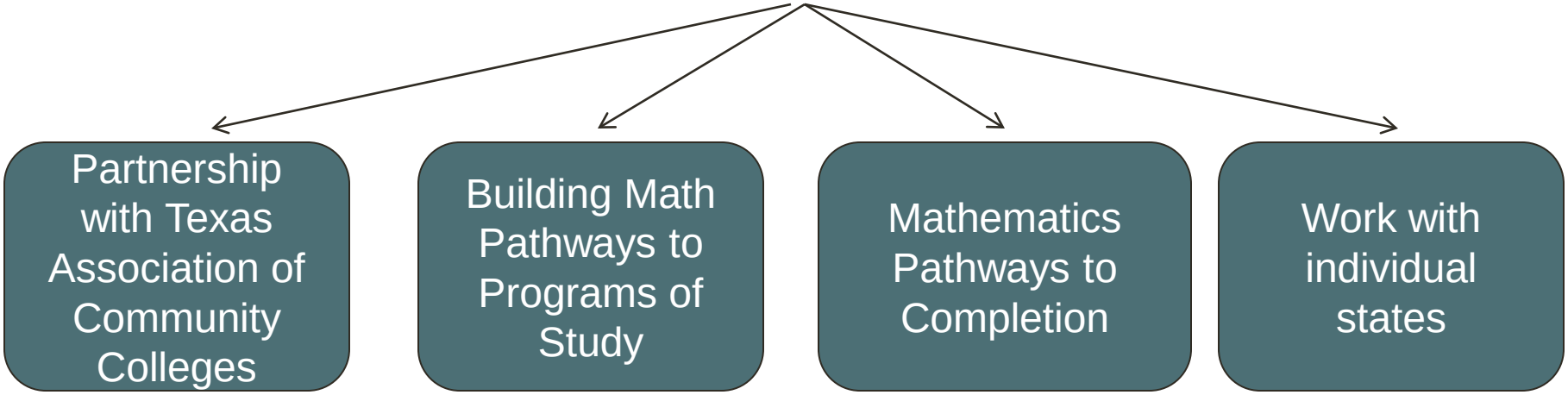


States in which we work

Building Math Pathways to Programs of Study: Colorado, Indiana, Missouri, Montana, Nevada, Ohio

- 2-year project started in 2014, ends 2016

Mathematics Pathways to Completion: Arkansas, Michigan, Missouri, Oklahoma, Washington

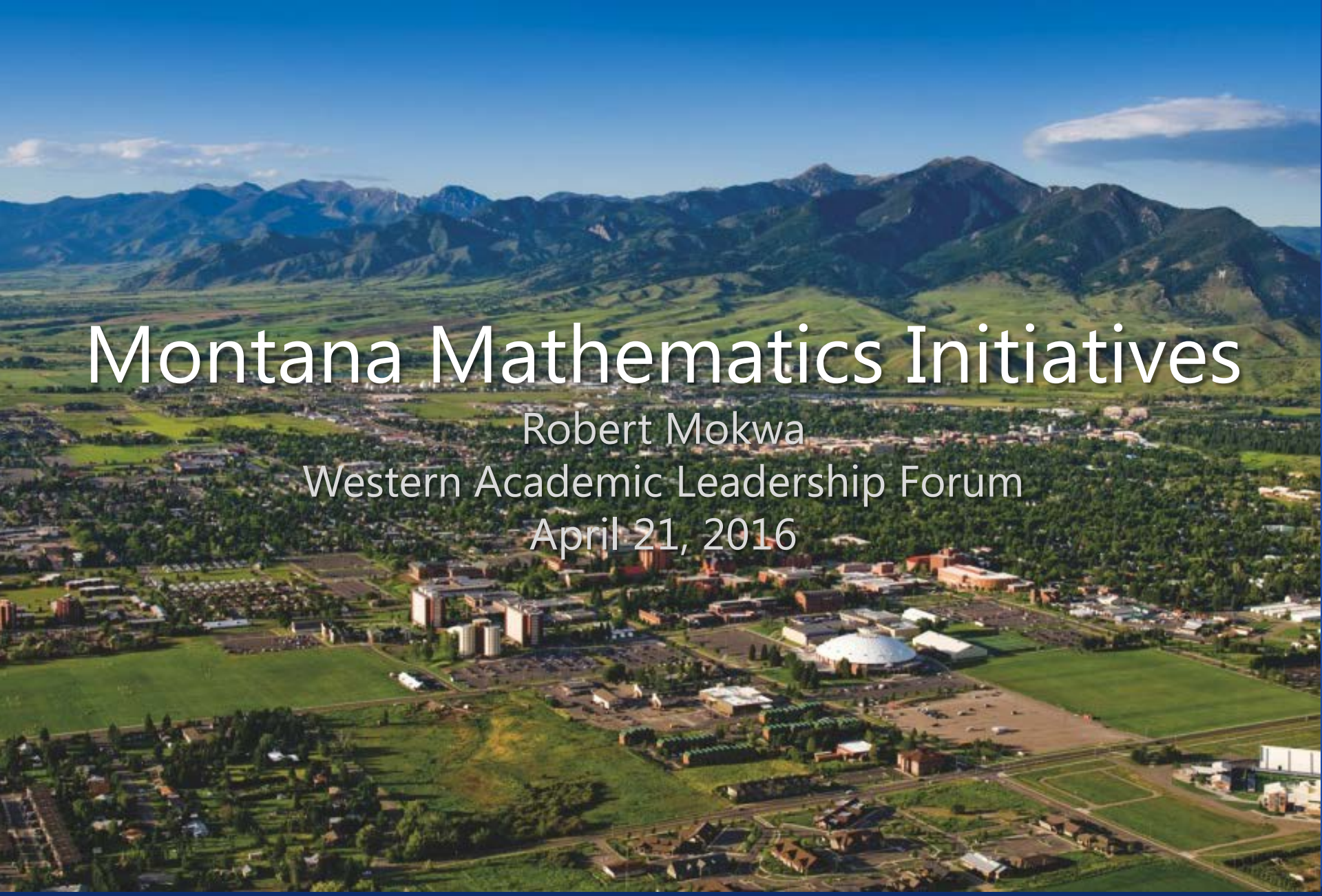
- 3-year project started in 2015, ends 2018

Individual states: Texas, Maryland

Past work: Georgia, New Mexico

Contact Information

- Amy Getz: **getz_a@austin.utexas.edu**
- General information about the Dana Center: **www.utdanacenter.org**
- Higher Education work: **www.utdanacenter.org/higher-education/**
- To receive monthly updates about the NMP, contact us at: **mathways@austin.utexas.edu**



Montana Mathematics Initiatives

Robert Mokwa

Western Academic Leadership Forum

April 21, 2016

Process

Keys to a successful process:

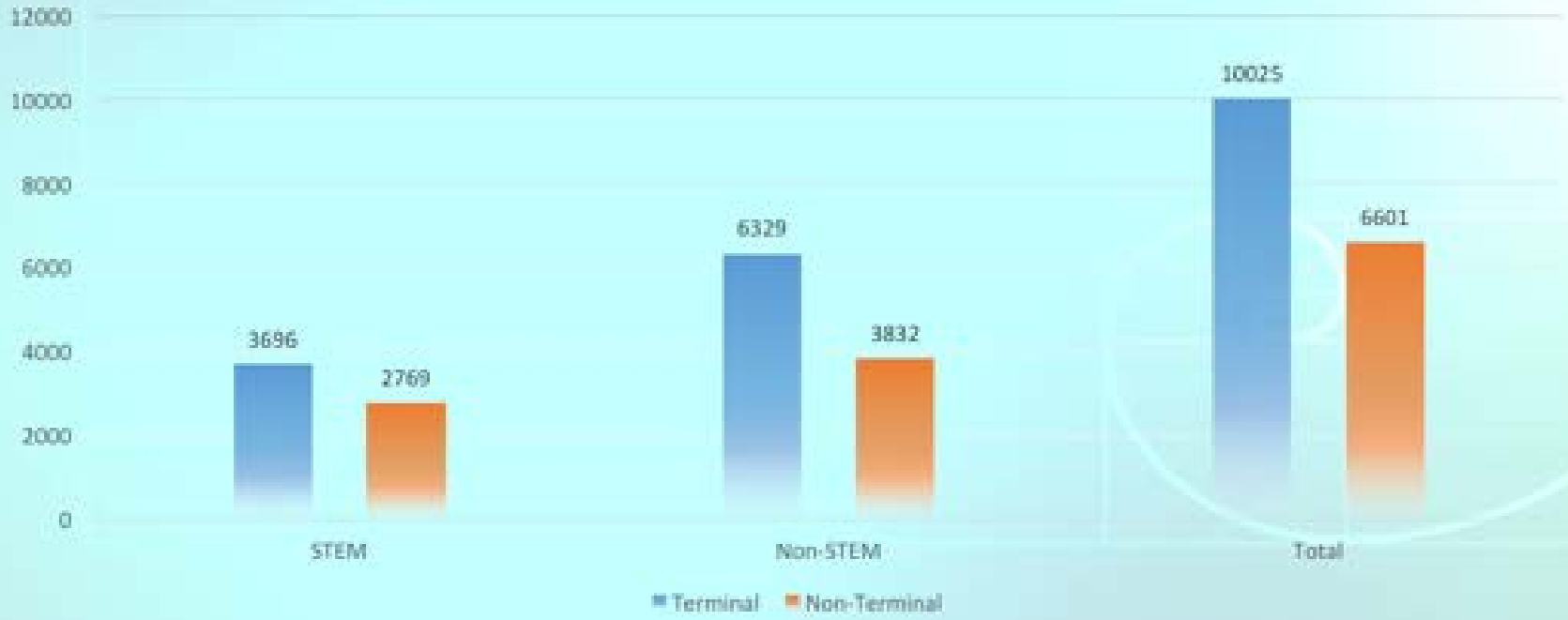
- Engage faculty
- Establish a sense of urgency
- Use an information-driven approach
- Join forces across sectors and campuses
- Emphasize the common ground → student success

Process

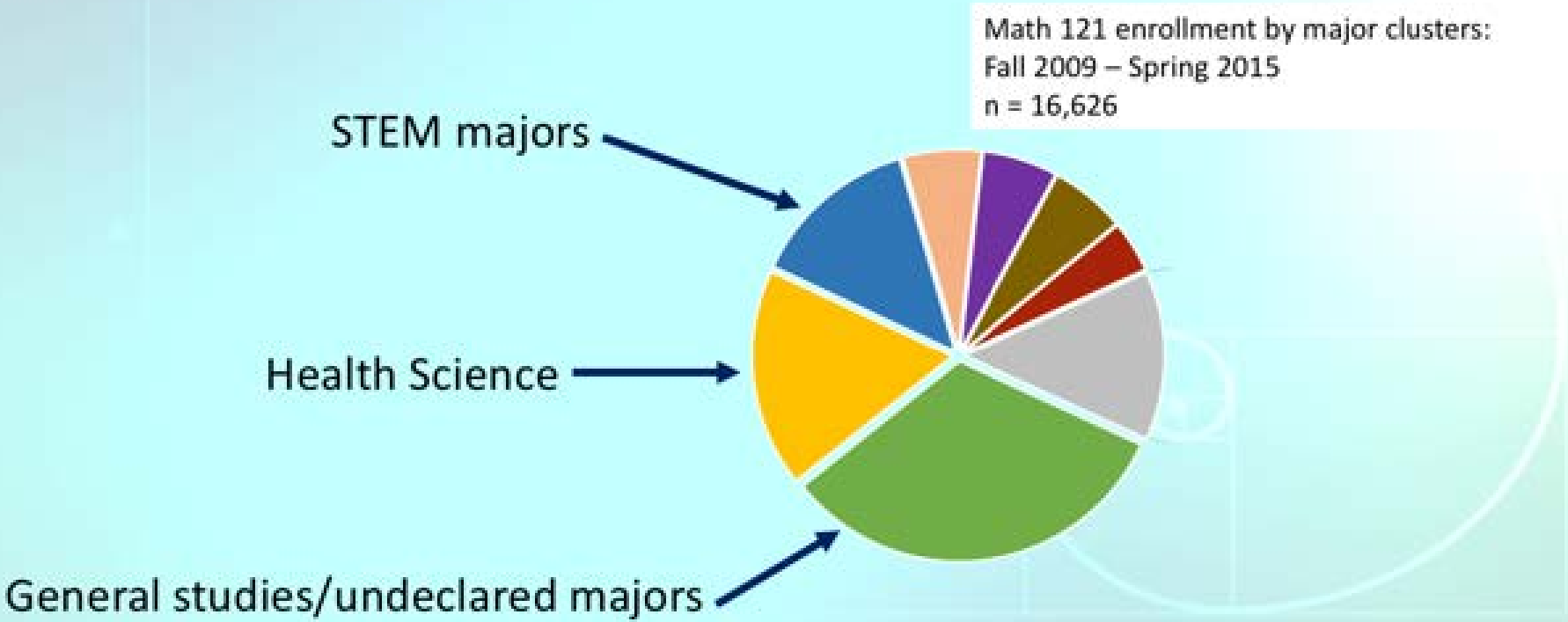
Lessons learned:

- Faculty lead the effort
- Communicate – plan ahead with positive messaging
- Avoid misconceptions and triggers
- Acknowledge and honor legitimate concerns
- Presume good intentions
- Focus on student learning and student success

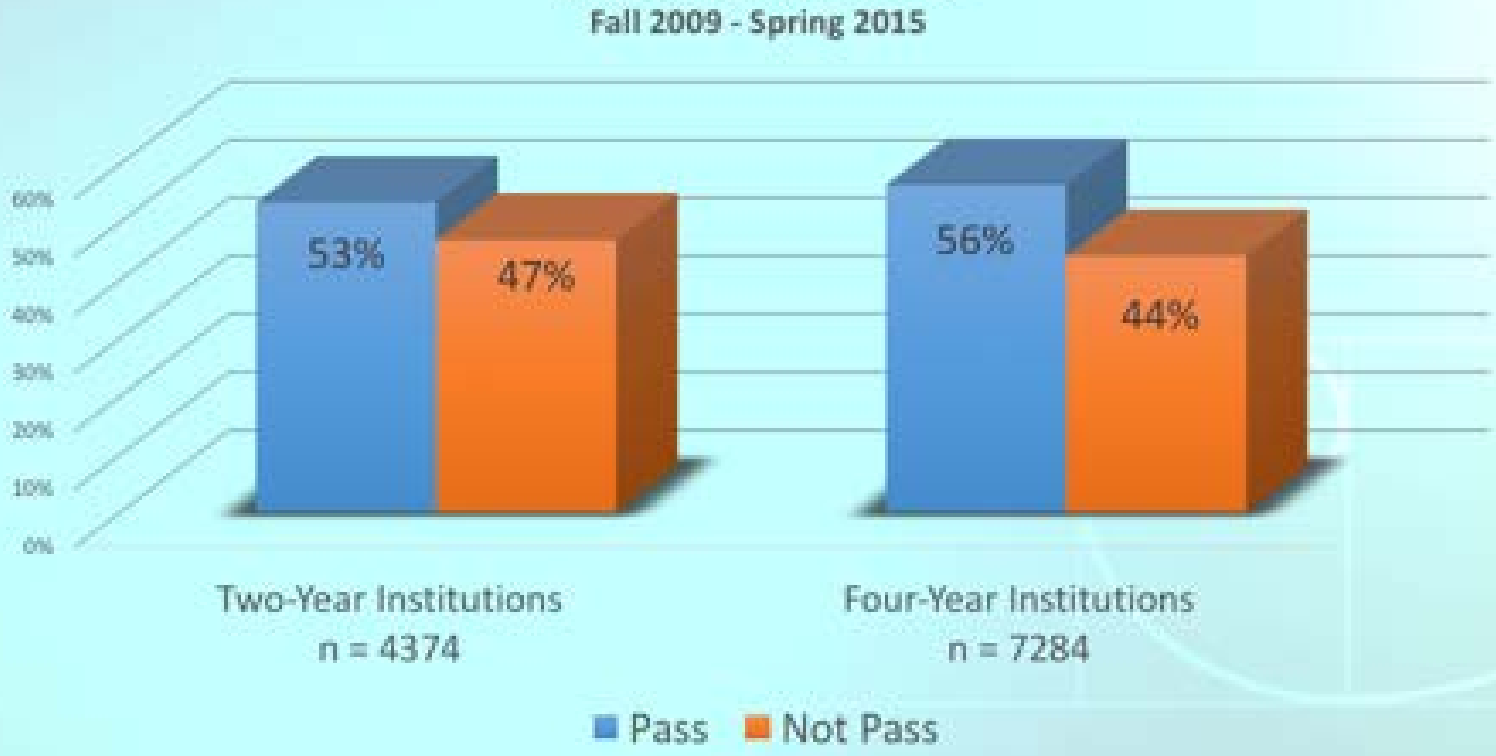
Enrollment in College Algebra



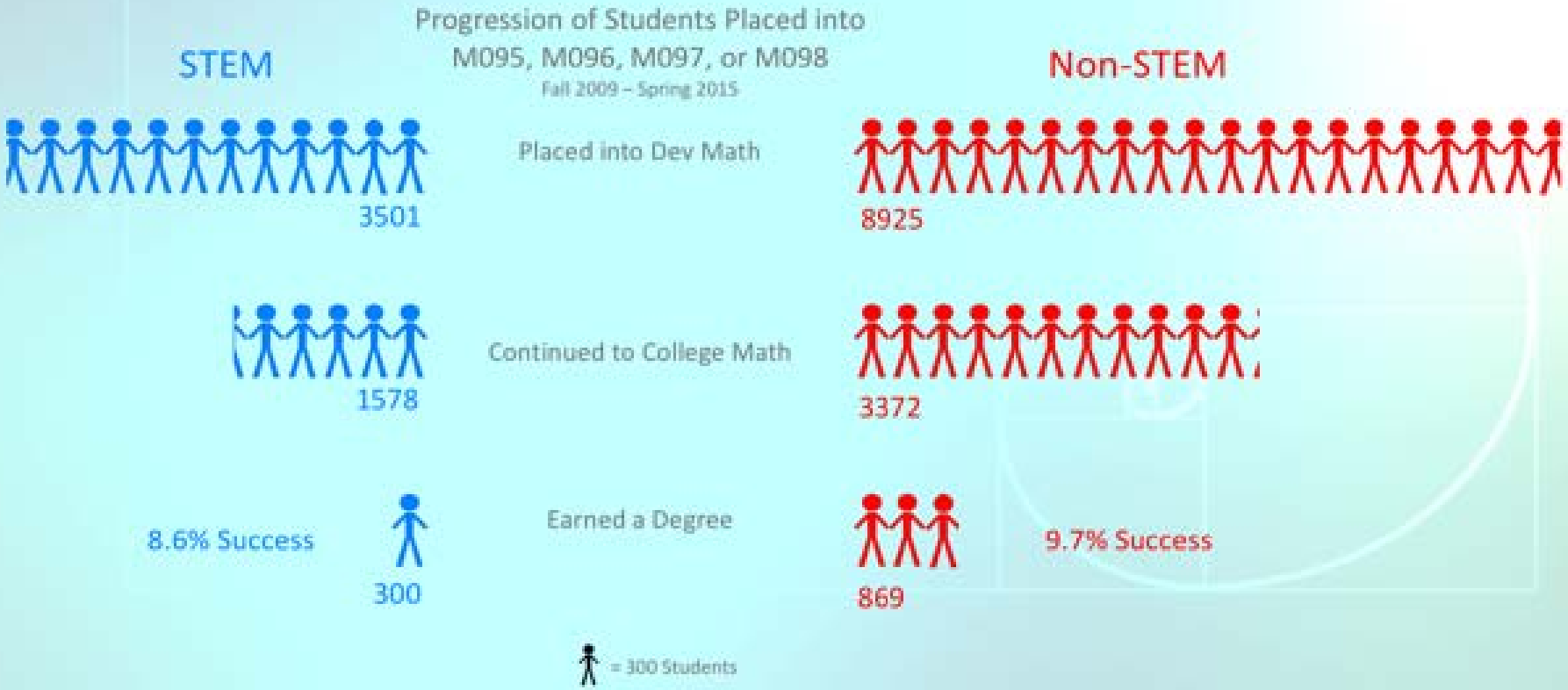
Enrollment in College Algebra



Success Rate in College Algebra

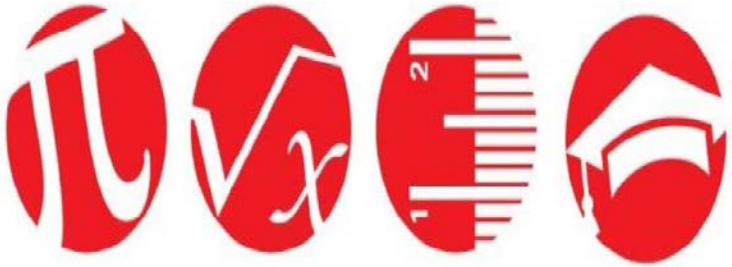


Student Attrition in Developmental Algebra Sequence



Recommendations

1. Provide clear pathways for students who pursue non-STEM majors
2. Enhance offerings of *algebraic-light* math courses for students in non-calculus meta-majors
3. Re-assess math requirements for non-STEM Majors
4. Strengthen advising processes for math/stats courses
5. Strengthen communications –360 deg– both internal and external



Ohio Mathematics Initiative

•*Re-envisioning Post-secondary Mathematics*

Steering Committee Composition (2013)

7 mathematics faculty members from 4-year state institutions

5 mathematics faculty members from 2-year state institutions

5 ex-officio members

Dr. Uri Treisman and Dr. Jenna Cullinane from the Charles A. Dana Center University of Texas at Austin

Board of Regents staff

Ohio Mathematics Initiative

•Re-envisioning Post-secondary Mathematics

Steering Committee Charge

1. increased success for students in the study of mathematics

2. a higher percentage of students completing degree programs

3. effective transferability of credits for students moving from one institution to another

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Recommendations	Essential components
1. Develop high-quality entry-level courses and pathways	• Improve student success by aligning mathematics to academic programs • Develop, implement, and evaluate co-requisite strategies to support underprepared students
2. Develop transfer policies and processes that foster effective transfer of course credits while encouraging course innovation	• Redesign OTM course criteria and processes • Increase flexibility in determining prerequisite courses and credit hours • Define “college-level”
3. Support constructive engagement of mathematics chairpersons and faculty within and across campuses	• Establish a chairs network • Improve communication among mathematics faculty and stakeholders • Encourage and promote participation in professional groups
4. Collect, analyze, and share relevant data	• Develop quality measures for improving student • success in mathematics
5. Improve student success in college-level mathematics courses by aligning postsecondary expectations and high school practice	• Strengthen collaboration and communication between K-12 and higher education • Share best practices and explore new approaches to the placement of entering postsecondary students and implementation of the remediation-free standards

Task Force (2013)

Five groups composed of faculty from both, two an four year colleges, were formed to create and develop strategies to address these 5 essential components identified in the steering committee recommendations.

Subgroup 1	New and Alternative Pathways
Subgroup 2	Mathematics, Statistics, & Logic Review Panel
Subgroup 3	Communication, Outreach, & Engagement
Subgroup 4	Data Collection, Analysis, & Sharing
Subgroup 5	Alignment between Secondary & Postsecondary Content & Instruction Expanded its membership to include high school mathematics faculty

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Work to date

Ohio Transfer Module (OTM) Mathematics, Statistics, and Logic (2015)

Learning Outcomes:

The course directly emphasizes at least one of the learning outcomes for the Transfer Module. Which of these learning outcomes are addressed and how?

a. Communicate effectively: All general education programs include a component for writing; many also include a component for oral communication or presentation.

b. Evaluate arguments in a logical fashion: Competence in analysis and logical argument are explicit learning goals for most general education programs, although these skills go by a variety of names (e.g., critical thinking, analysis, logical thinking, etc.).

c. Employ the methods of inquiry characteristic of natural sciences, social sciences, and the arts and humanities: The tools for solving problems vary across disciplines; general education introduces students to methods of inquiry in several fields of study and thereby prepares students to integrate information from different disciplines.

d. Acquire an understanding of our global and diverse culture and society

e. Engage in our democratic society: One of the overarching goals of general education is to prepare students to be active and informed citizens, the development of a disposition to participate in and contribute to our democracy is full of equal importance to the goal of having the skills to do so intelligently.

Guidelines

Guideline 1: A credit-bearing, college-level course in Mathematics must use the standards required for high school graduation by the State of Ohio as a basis and must do at least one of the following: 1) broaden, or 2) deepen, or 3) extend the student's learning.

Guideline 2: Course does not cover variable learning outcomes from term to term.

Guideline 3: Course is not an upper-division course.

Guideline 4: Course is in the areas of mathematics, statistics, and logic.

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1 Statistics Pathway

College-level introductory statistics courses designed for students without a Calculus background and who do not require College Algebra or Calculus
Part of the general education requirement for majors in the fields that may include the following:

- Nursing
- Nutrition
- Social Work
- Associates in Business

2 Quantitative Reasoning Pathway

College-level courses designed to emphasize quantitative thinking and problem solving using quantitative methods
Part of the general education requirement for majors in the fields that may include the following:

- Communication
- Criminal Justice
- Fine arts
- Education (Elementary, History, Social Studies, etc.)

3 STEM-Preparation Pathway

College-level courses (i.e., College Algebra, Pre-Calculus, Trigonometry, Business Calculus, and/or Calculus) designed for students in mathematics-intensive majors
Part of the general education requirement for majors in the fields that may include the following:

- Business
- Chemistry
- Engineering
- Education (Math, Science, Technology etc.)
- Physics

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Re-envisioning Post-secondary Mathematics

Key Ideas

Faculty are leading these changes

Statewide effort

Chairs network is key in implementation

Ohio is engaging K-12

Faculty and stakeholder participation and education is imperative to the success of the initiative

Institutional support for the faculty involved in the initiative plays an important role in re-envisioning post-secondary mathematics

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Upcoming Events

April 2016
Regional Workshops (2) on Scaling Up Corequisite Strategies in Mathematics and English

May 2016
Update on Draft Models for Institution-Level Data Collection and Analysis

June 2016
Community colleges scale up use of multiple measures for student placement.

July 2016
Faculty panels evaluate impact of changes to SAT assessments, including Accuplacer.

August 2016
Ohio public institutions implement expanded array of assessments for Statewide Uniform Remediation-Free Standards.

August 2016
Ohio Mathematics Pathways courses are embedded into IHE curricula.

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Resources	
Ohio Mathematics Initiative Website	https://ohiohighered.org/mathematics-initiative-documents
Ohio Mathematics Initiative Speaker Request Form	https://www.ohiohighered.org/mathematics-initiative-resources/presenter-request
OTM Guidelines/Learning Outcomes	https://www.ohiohighered.org/mathematics-initiative
OTM with Learning Outcomes (TMM Courses)	https://www.ohiohighered.org/mathematics-initiative
Ohio Remediation Free Standard	https://www.ohiohighered.org/data-reports/college-readiness

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