



# COTA Conference

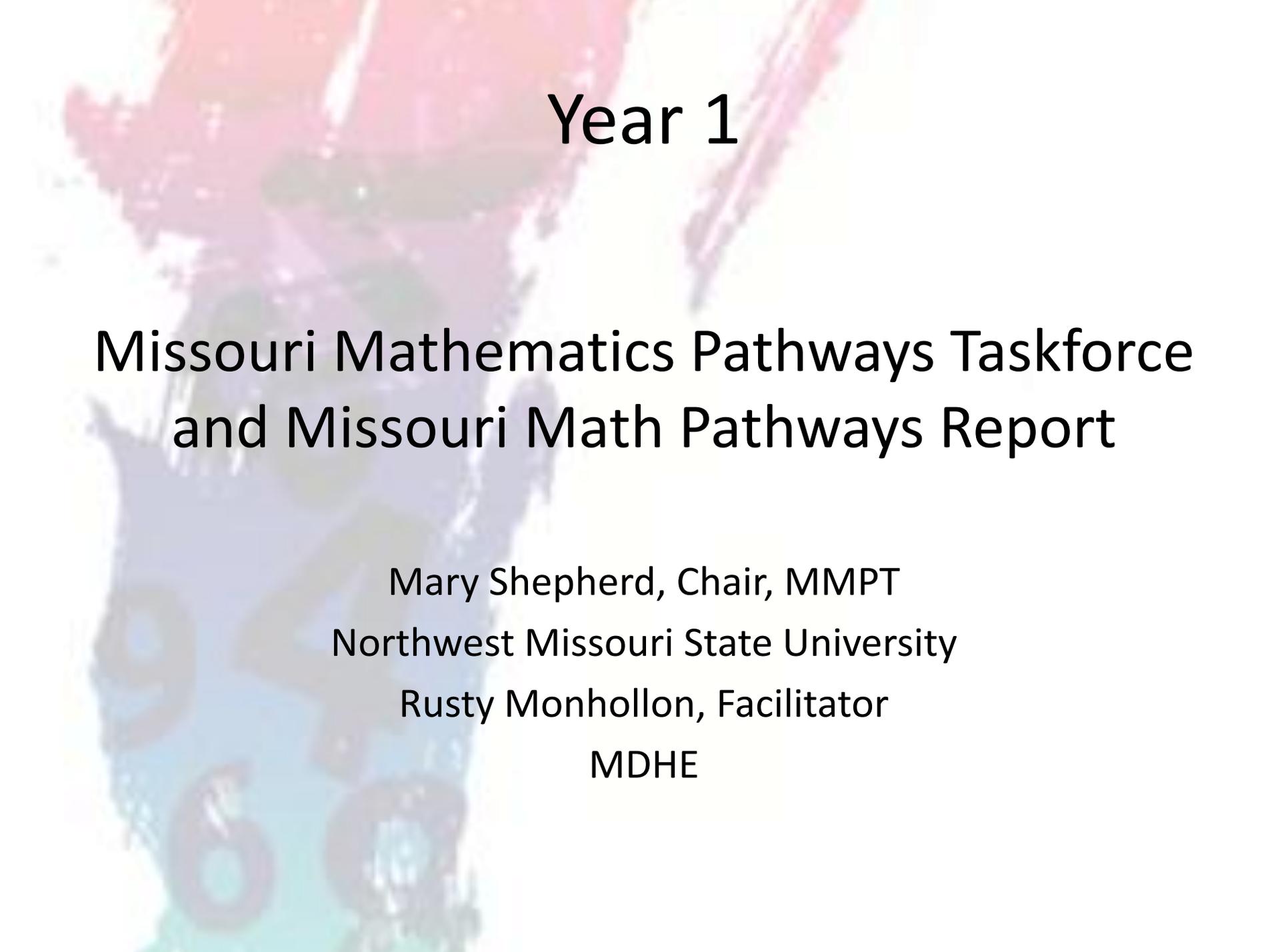
## Missouri Mathematics Pathways Initiative

Jefferson City, Missouri

February 19, 2016



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by degrees®*

A faded map of the state of Missouri is visible in the background. The map is overlaid with various mathematical symbols and numbers, including pi (π), infinity (∞), a percent sign (%), a hash symbol (#), a dollar sign (\$), a plus sign (+), a minus sign (-), a multiplication sign (×), a division sign (÷), and the number 6. The symbols are scattered across the map, with some appearing larger and more prominent than others.

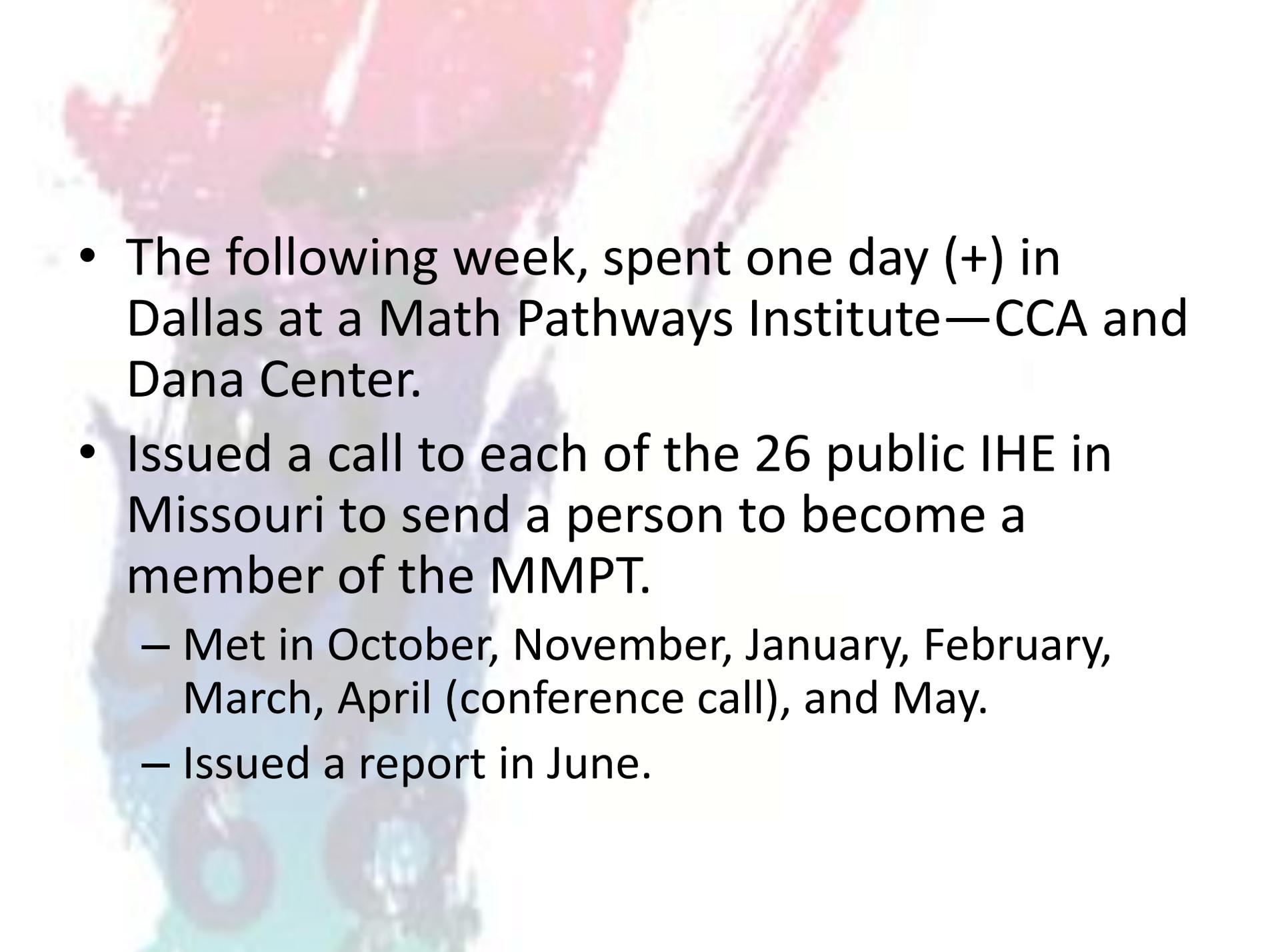
Year 1

# Missouri Mathematics Pathways Taskforce and Missouri Math Pathways Report

Mary Shepherd, Chair, MMPT  
Northwest Missouri State University  
Rusty Monhollon, Facilitator  
MDHE

# A look back

- September 12, 2014—Missouri Math Summit
- Announced the formation of a “Guiding Group”.
  - Mary Shepherd, NWMSU, Chair
  - Tammy Randolph, SEMO
  - Ann Boehmer, ECCC
  - Kim Granger, StLCC
  - Rusty Monhollon, Facilitator

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- The following week, spent one day (+) in Dallas at a Math Pathways Institute—CCA and Dana Center.
  - Issued a call to each of the 26 public IHE in Missouri to send a person to become a member of the MMPT.
    - Met in October, November, January, February, March, April (conference call), and May.
    - Issued a report in June.

# The Taskforce Members

- Ian Aberbach Professor of Mathematics and Director of Undergraduate Studies University of Missouri-Columbia
- Andrew Aberle Mathematics Instructor Ozarks Technical Community College
- Briehan Barron Mathematics Faculty State Technical College of Missouri
- Ann Boehmer Chair of Mathematics and Physical Science Division East Central College
- William O. Bray Chair of Mathematics Department Missouri State University
- Haiyan Cai Chair of Mathematics and Computer Science Department University of Missouri – St. Louis
- Jonathan Corbett Chair of Mathematics and Natural Sciences Department Harris Stowe-State University

- Tabatha Crites Mathematics Faculty Mineral Area College
- Mark Eriksson Mathematics Faculty Three Rivers Community College
- David Garth Professor of Mathematics Truman State University
- Kim Granger Professor of Mathematics St. Louis Community College
- Jennifer Hegeman Associate Professor of Mathematics Missouri Western State University
- Cheryl Ingram Chair of Mathematics and Physical Sciences Division Crowder College
- Kerry Johnson Chair of Mathematics Department Missouri Southern State University
- Bill Kalahurka Assistant Teaching Professor of Mathematics University of Missouri – Kansas City

- Donna Kessler Mathematics Instructor Moberly Area Community College
- Wanda Long Professor of Mathematics St. Charles Community College
- Phoebe McLaughlin Professor of Statistics and Mathematics University of Central Missouri
- Kimberly Miller Chair of Mathematics Division State Fair Community College
- Rusty Monhollon Assistant Commissioner of Academic Affairs Missouri Department of Higher Education
- Bill Morgan Mathematics Faculty Metropolitan Community College
- Jennifer Plemons Research Associate Missouri Department of Higher Education

- Tammy Randolph Department of Mathematics Chair  
Southeast Missouri State University
- Skyler Ross Associate Professor of Mathematics Jefferson  
College
- V.A. Samaranayake Curator's Teaching Professor of  
Mathematics & Statistics, and Director of Graduate Studies  
Missouri University of Science and Technology
- Mary Shepherd Professor of Mathematics Northwest Missouri  
State University
- Ruthi Sturdevant Professor of Mathematics Lincoln University
- Tracy Welch Mathematics Faculty North Central Missouri  
College

## Alternate Members

- Stephanie Fitch Associate Teaching Professor of Mathematics  
Missouri University of Science and Technology
- Trish White Developmental Mathematics Instructor Ozarks  
Technical Community College

# Charge to the Taskforce

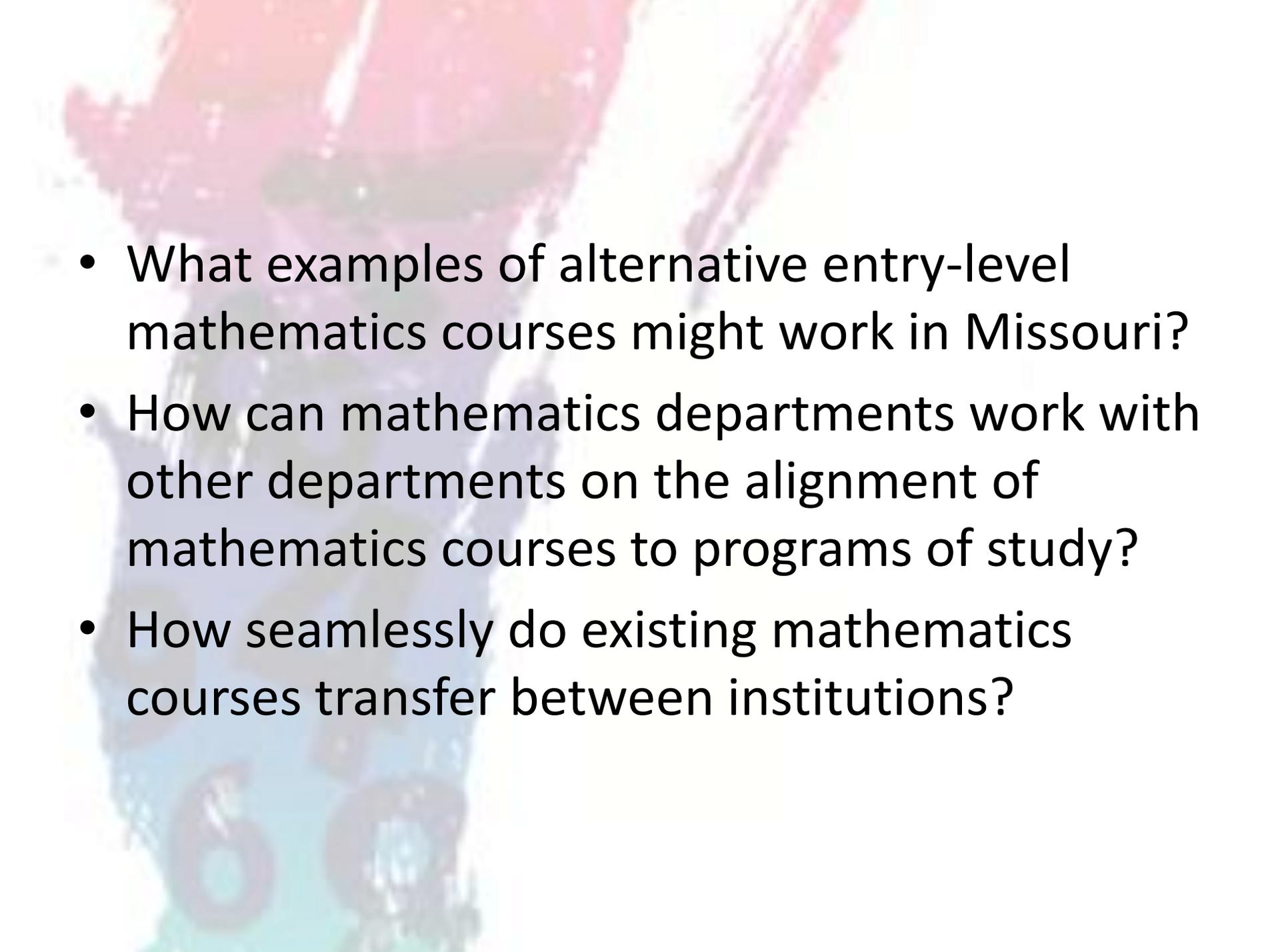
The Missouri Department of Higher Education hereby charges the Missouri Mathematics Pathways Taskforce to explore options and make recommendations that will, one, increase significantly the students' success rates in mathematics gateway courses without compromising the integrity of the mathematics; and two, increase significantly the percentage of students completing degree programs.

# In pursuit of the charge...

- How effective are college algebra and other entry-level courses as:
  - a gateway to the major in mathematics?
  - a gateway to other mathematics-intensive majors?
  - as a supportive course for majors that are not mathematics-intensive?

- We keep hearing that algebra is critical to have in the core curriculum, but the mathematics faculty increasingly does not believe this to be the case. Although college algebra can be a critically important course for some STEM students who did not adequately master algebra in high school, it is the wrong core curriculum course for our students. In fact, it is wrong in every case.

- For students in STEM fields, precalculus and calculus are the most appropriate math courses, not college algebra. If students have not mastered algebra, they are already behind.
- College algebra is not the best choice for non-STEM majors either. College algebra was never intended to be a terminal math course; unless followed by higher level courses, college algebra provides little “value added” beyond what students should have learned in high school Algebra II. Students would be better served if they learned the math they would actually use in their work lives. They would far more likely remember their college math if they are able to apply it.

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- What examples of alternative entry-level mathematics courses might work in Missouri?
  - How can mathematics departments work with other departments on the alignment of mathematics courses to programs of study?
  - How seamlessly do existing mathematics courses transfer between institutions?

# 2-year colleges in Missouri

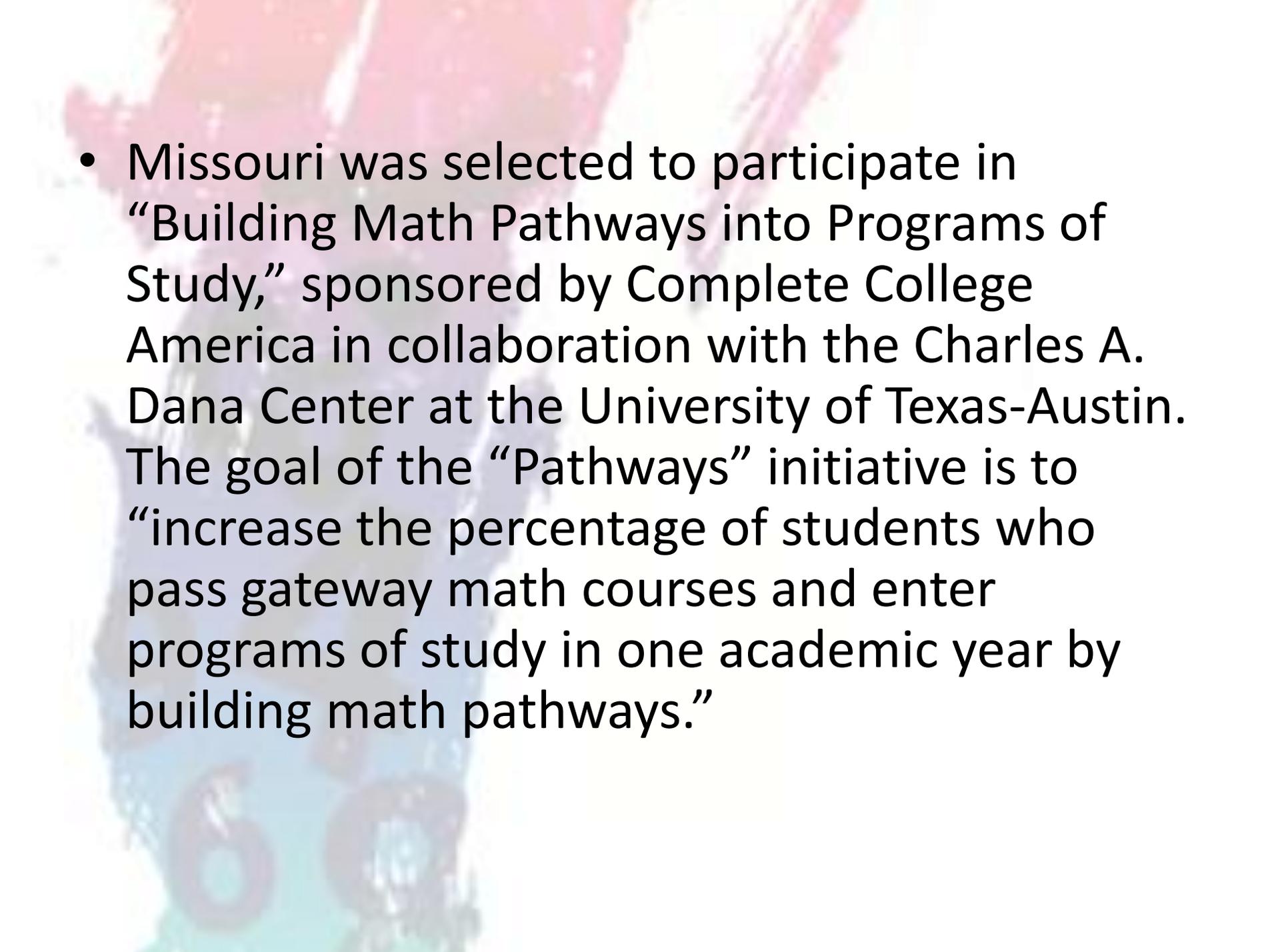
		FTIC	Comp w/n 3 yr	%
Total Enrollment	Fall 2010	24138	3456	14%
	Fall 2011	24048	3640	15%
	Fall 2012	24456	4667	19%
In any devel math	Fall 2010	11430	983	9%
	Fall 2011	12043	1108	9%
	Fall 2012	10796	1097	10%
No devel math	Fall 2010	12708	2473	19%
	Fall 2011	12005	2532	21%
	Fall 2012	13660	3570	26%

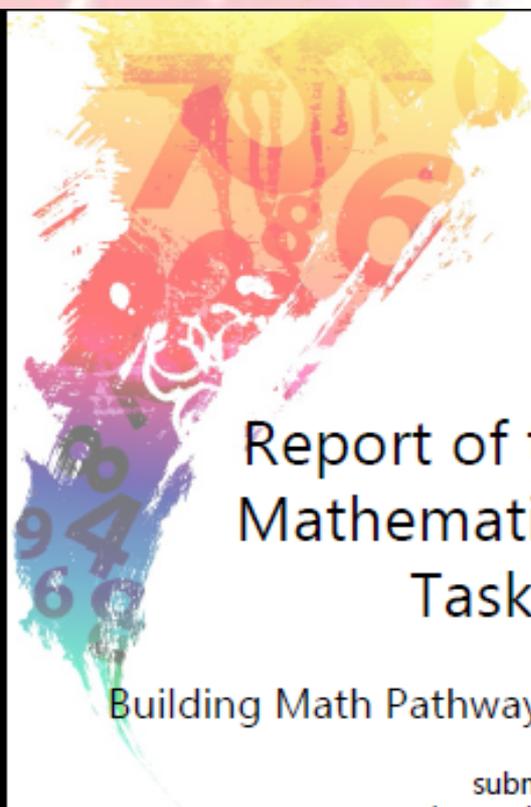
# 4-year colleges in Missouri

		FTIC	Comp w/n 6 yr	%
Total Enrollment	Fall 2008	20162	11561	57%
	Fall 2009	20304	11201	55%
Any devel math	Fall 2008	1813	563	31%
	Fall 2009	2752	764	28%
No devel math	Fall 2008	18349	10998	60%
	Fall 2009	17552	10437	59%

# HB 1042 (2012)

- “replicate best practices in remediation”
- One best practice identified by the Missouri Department of Higher Education (MDHE) and the Task Force on College and Career Readiness (TCCR) is the alignment of gateway courses—particularly those in mathematics—with academic programs of study.

- 
- Missouri was selected to participate in “Building Math Pathways into Programs of Study,” sponsored by Complete College America in collaboration with the Charles A. Dana Center at the University of Texas-Austin. The goal of the “Pathways” initiative is to “increase the percentage of students who pass gateway math courses and enter programs of study in one academic year by building math pathways.”



# Report of the Missouri Mathematics Pathways Task Force

on

Building Math Pathways into Programs of Study

submitted to

Complete College America and

The Charles A. Dana Center at the University of Texas-Austin

June 2015

**MOHE**<sup>TM</sup>

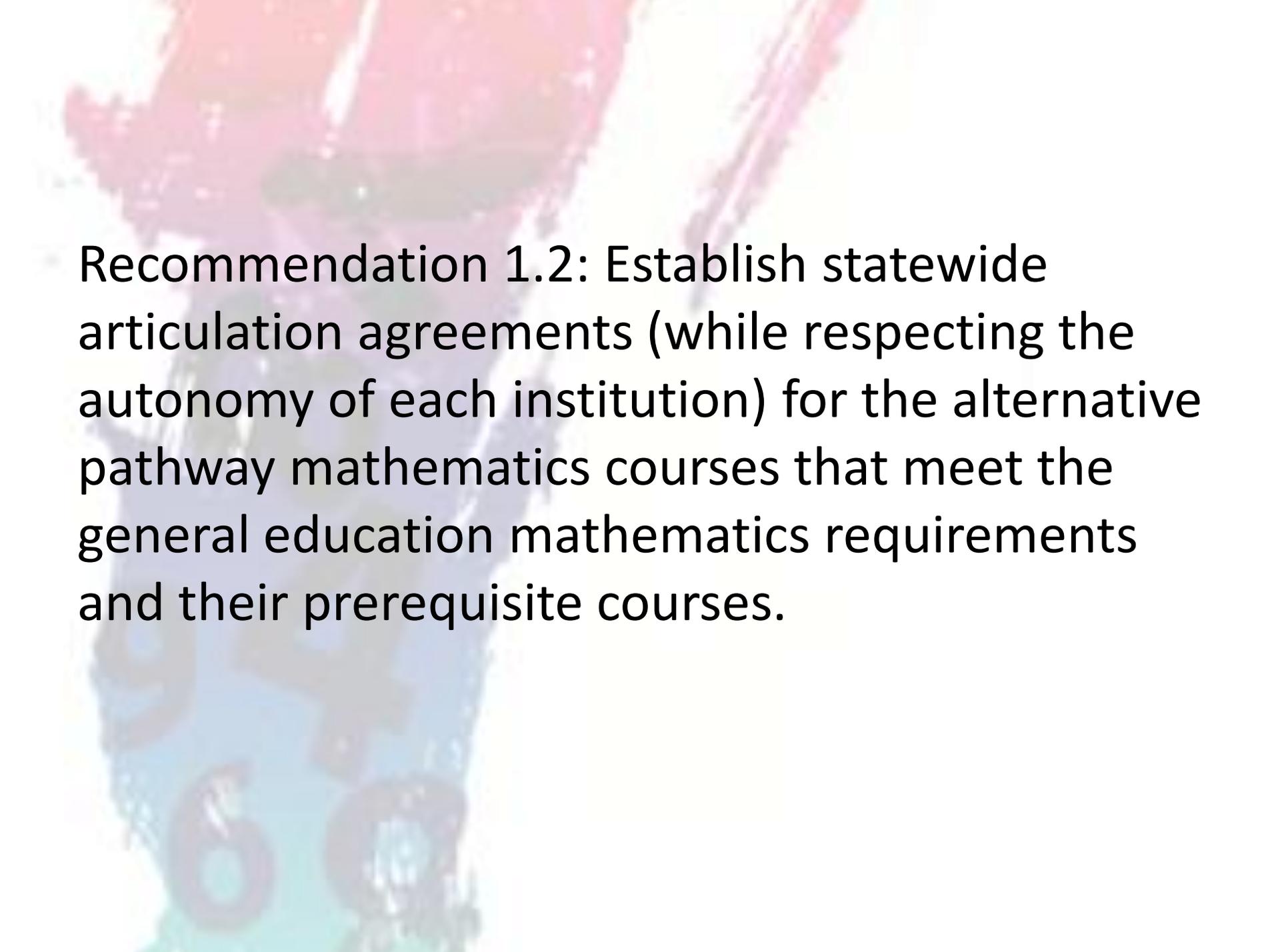
Missouri Department of Higher Education

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# Recommendations

Recommendation 1.1: Revise the CBHE policy regarding prerequisite courses for entry-level general education mathematics courses so that the prerequisite course for each college-level course is appropriate.

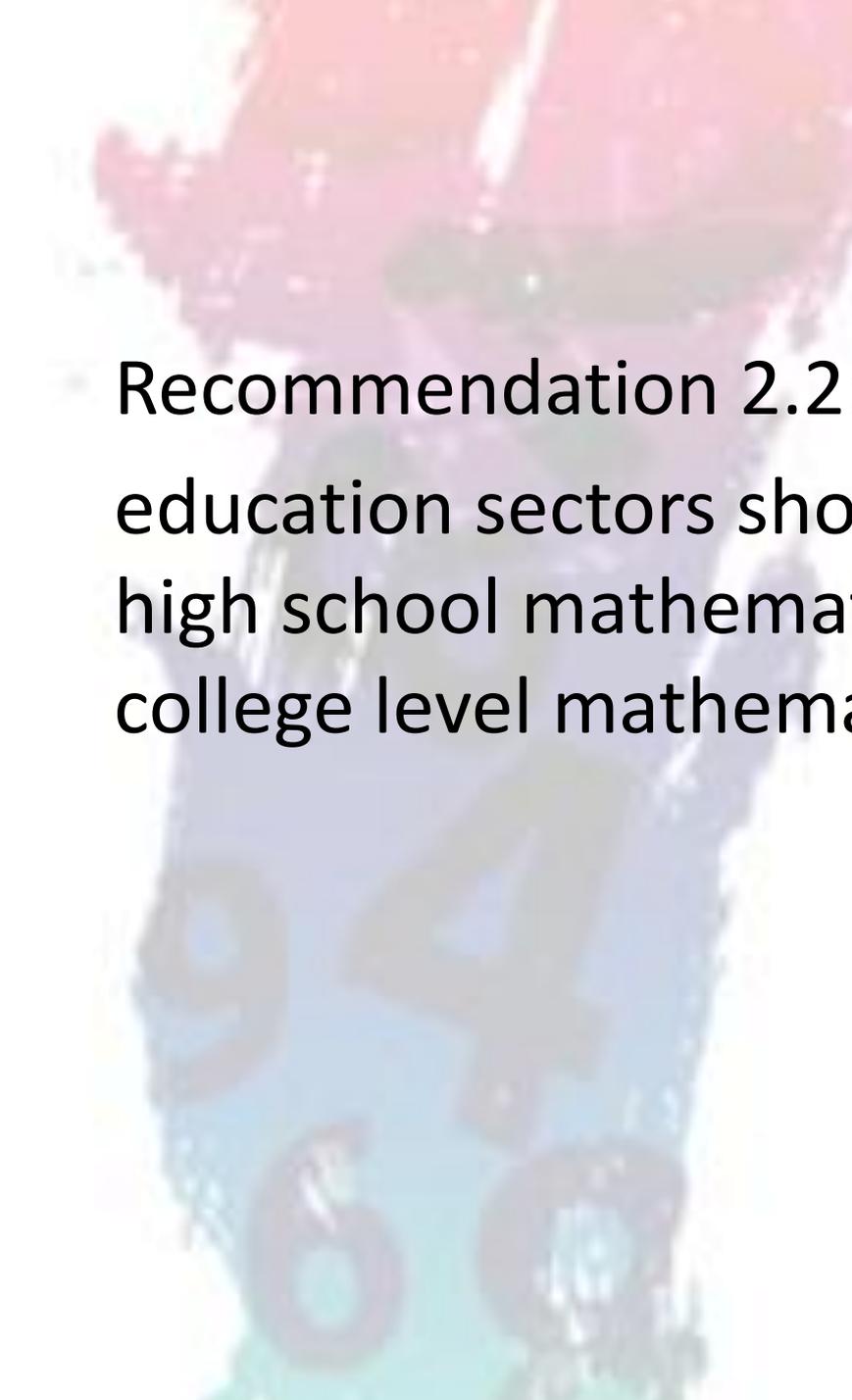
*To develop students' understanding of fundamental mathematical concepts and their applications. Through rigorous courses aligned to their field of study, students should develop a high degree of quantitative literacy that will prepare them for success in their chosen degree path.*



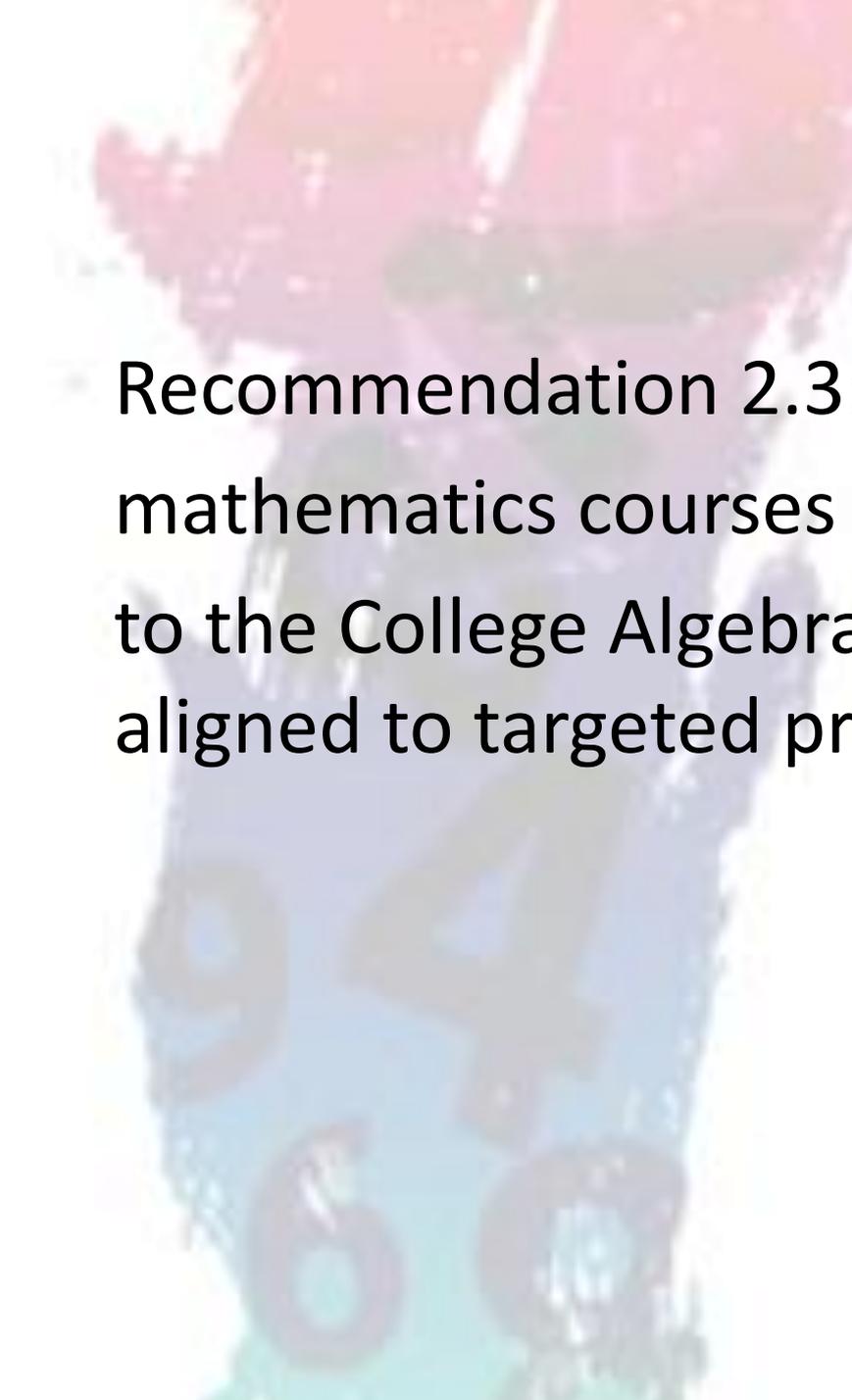
Recommendation 1.2: Establish statewide articulation agreements (while respecting the autonomy of each institution) for the alternative pathway mathematics courses that meet the general education mathematics requirements and their prerequisite courses.



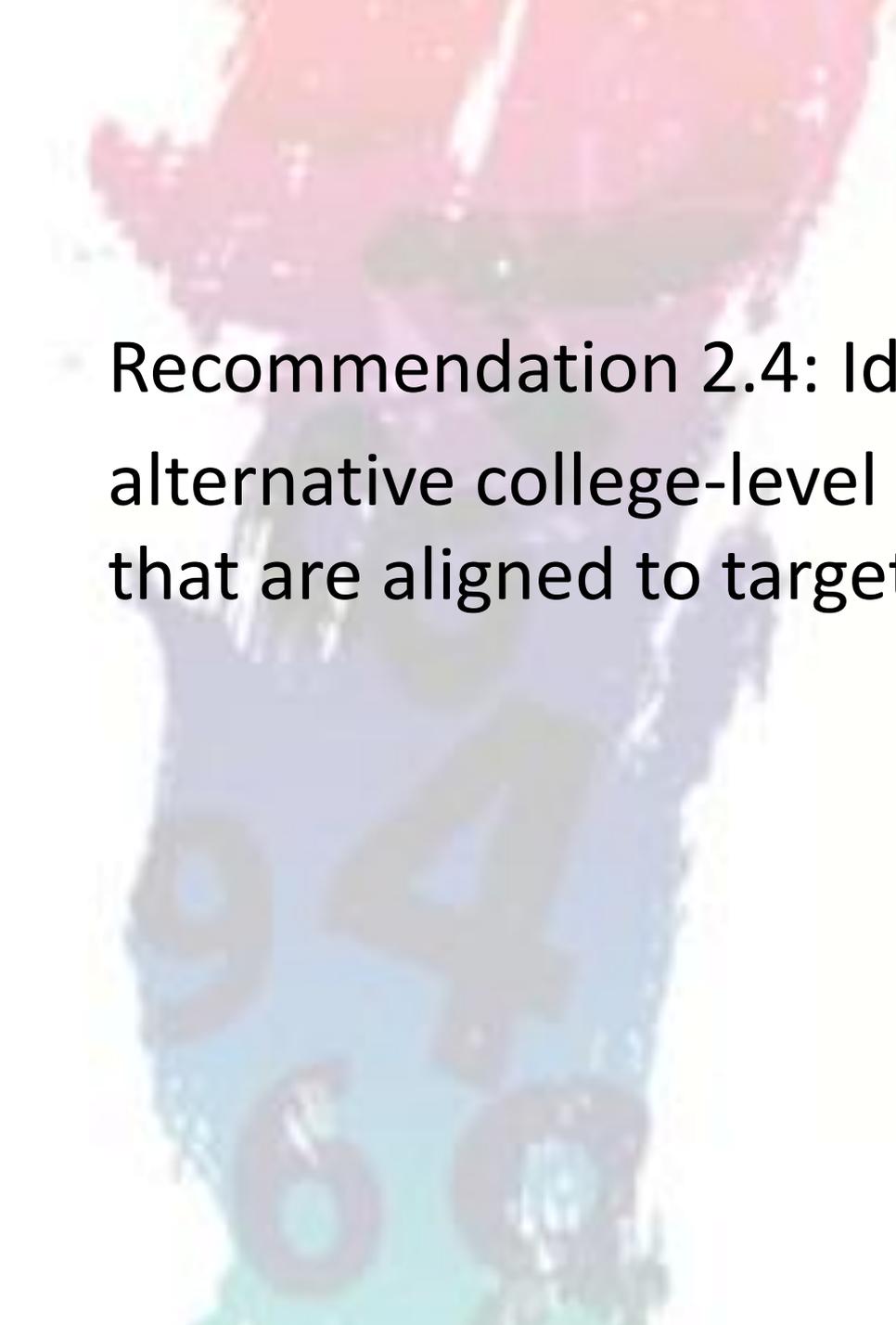
Recommendation 2.1: Institutions should align the process of placing students in credit-bearing courses with alternative pathway courses.



Recommendation 2.2: The K-12 and higher education sectors should collaborate to align high school mathematics courses with entry college level mathematics courses.



Recommendation 2.3: Create college-level mathematics courses that serve as alternatives to the College Algebra course and that are aligned to targeted programs of study.



Recommendation 2.4: Identify prerequisites for alternative college-level mathematics courses that are aligned to targeted programs of study.

Recommendation 3.1: Hold a second Mathematics Summit to disseminate information and policy recommendations regarding the work of the MMPT.

*This summit will be geared towards generating support from institutions for the implementation phase of the project, engaging faculty from other academic disciplines, and providing an opportunity for non-math faculty to share any concerns or insights they may have as the project moves forward.*

(The second Mathematics Summit was held in October, 2015.)



Recommendation 3.2: Develop a process for the collection and analysis of data regarding the success of alternative courses.

# Focus is on the students and their success

- Students are the focus of all our work—Students will be better served if the mathematics they learn will be used in their work life.
- The “problem” is not the teaching. Most of the teachers of these students care very much for their students and work hard with the students. The problem is the system.
- We want to create relevant mathematical experiences, that are meaningful to the students and excite them, while maintaining high standards.

# Why?

- Why propose mathematics pathways?
- If these math pathways are built well, the mathematics in them will be relevant to students' programs of study

# Initial proposed pathways for Missouri students

- STEM (or maybe a better name is algebraically intensive)
- Statistics
- Quantitative Reasoning/Contemporary Math
- Elementary Education

# How?

- Establishing student learning outcomes
- (Re)designing courses
- Defining “meta major” mathematics pathways (also called Guided Pathways)
- Getting advisors on board.

# Anticipated results

- Student success
- Increased retention
- Students better prepared for careers in their chosen areas.

# Much work needed in designing pathways and beyond

- Missouri is a leader.
  - Not any completed models to follow
- Not a short term project
- Requires working with other disciplines to determine broad groups of programs with similar mathematical needs for their students.
- Requires bringing in Advising people.
- Requires institutional commitment to bring this to scale.

# Year 2 (through 4)

- Pathways to Completion
- Co-Chairs:
  - Mary Shepherd (Northwest)
  - Donna Kessler (Moberly Area CC)

# Pathways to Completion

- Missouri applied and has been accepted as one of 5 states the Dana Center will be working with over the next three years.
- The MMPT has invited the private IHEs to become part of this process, DESE has a representative on the task force. Others will be called in as needs arise. Are there Advising/Transfer/Articulation people here who would be interested? Contact Rusty!

# Goals

- Initially—get Student Learning Outcomes for the different courses
- Get institutional buy-in and commitment to implement mathematics pathways aligned to programs of study. (Phased in??)

# Program Requirements Guide

- MDHE has collected information from all 13 four-year institutions on the general education requirement (if specified) for each degree program. We will be working to get this information into a usable format in the next several months.

# Sample of the data from Northwest

Program Name for 6-Digit CIP Code	Institution's Program Title	Degree	Gen. Ed. Math Requirement	Additional Math Requirement
Chemistry, General.	Chemistry	BS	MATH 120-Calculus I	MATH 114- General Statistics I, MATH 121- Calculus II, and MATH 321- Multivariate Calculus
Geology/Earth Science, General.	Geology	BA	MATH 118- College Algebra	MATH 119-Trigonometry
Geology/Earth Science, General.	Geology	BS	MATH 118- College Algebra	MATH 119-Trigonometry
Psychology, General.	Psychology	BA	MATH 114-General Statistics I	
Psychology, General.	Psychology	BS	MATH 114-General Statistics I	

# After today

- Read the taskforce report (google 'mdhe math pathways report')
- Talk with your campus member (champion) of the taskforce. Let us know your ideas!

# The commitment

- Every student in the state of Missouri will have access to one of several first college-level math courses aligned to their program of study.
- These courses are fully transferable within the course of study around the state.