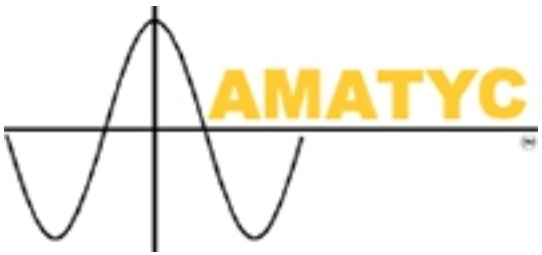
Math Pathway: A Focus on Statistics



Rachel Bates

Facilitator

I would like to thank MOMATYC for inviting me.

Rachel Bates, Redlands Community College

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Outcomes

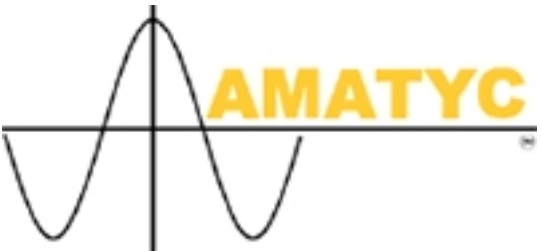
Participants will:

- Discuss and define Math Pathways.
- Examine national recommendations for content of introductory statistics courses and examples of how these recommendations are implemented in a variety of 2-year settings.
- Discuss co-requisite structures to support success for underprepared students.
- Discuss how institutions can address existing barriers that hinder Math Pathways.

Getting to Know You

During this session, we will use Poll Everywhere. You are encouraged to participate.

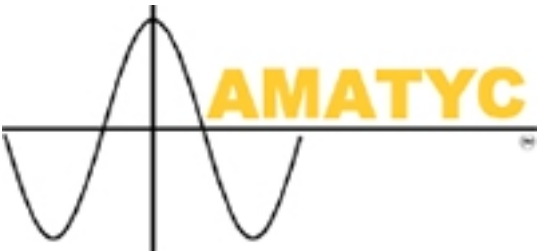
To join the group, text **RACHELBATES583** to **22333**



Who Are You?

How many years have you been teaching?

- ❑ < 1 year
- ❑ 1-3 years
- ❑ 4-8 years
- ❑ 8-15 years
- ❑ > 15 years



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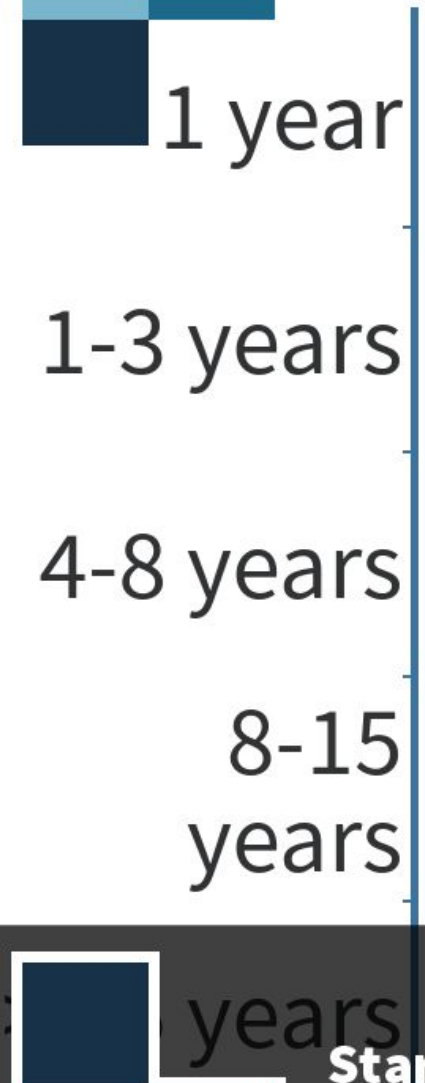

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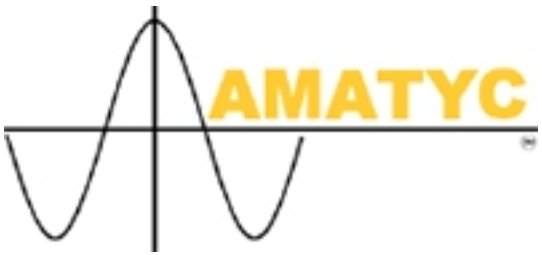
Math Pathways



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Define Math Pathway

THINK:

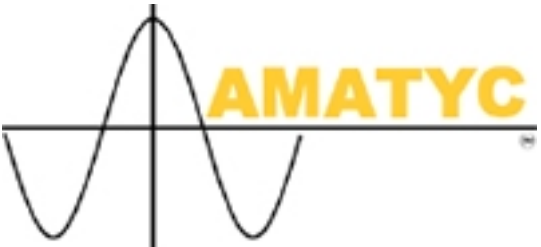
Take a moment to write down how you define a *math pathway*.

PAIR:

At your table, discuss your definitions of a *math pathway*.

SHARE:

Share your group's definition of a *math pathway*.



Define Math Pathway

SHARE 1:

Include definition of *math pathway*.

SHARE 2:

Include definition of *math pathway*.

SHARE 3:

Include definition of *math pathway*.

Define Math Pathway

Math Pathway Definitions

Common Vision 2025:

Provide a coherent, intriguing introduction to collegiate mathematics for **all** students.

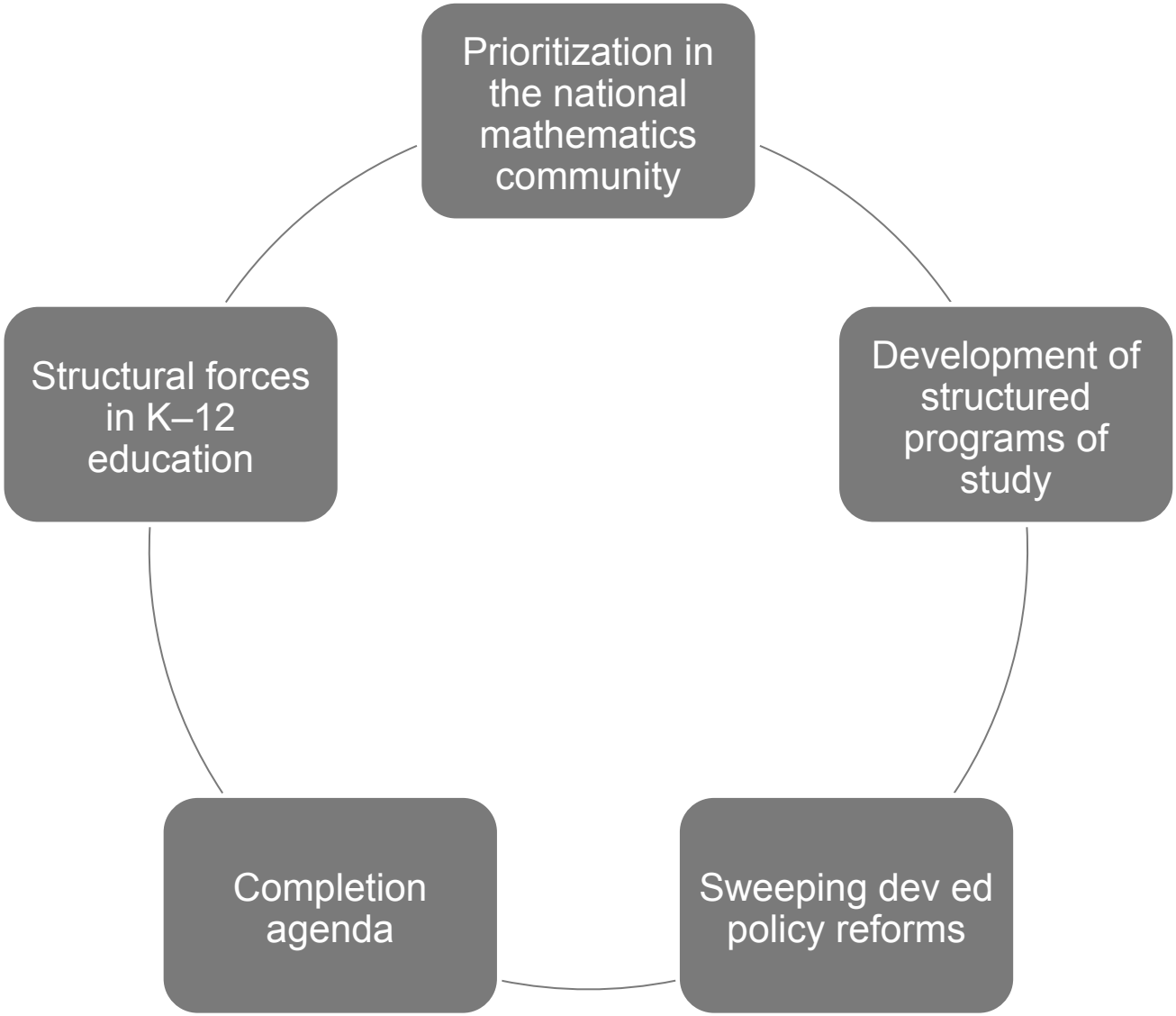
Carnegie Foundation:

Pathways aim to accelerate students' progress through their developmental mathematics sequence and a college-level course for credit.

Dana Center:

- . . . a mathematics course or sequence of courses that students take to meet the requirements of their program of study."

Why is it the "right time" for Math Pathways?



States Implementing Math Pathways

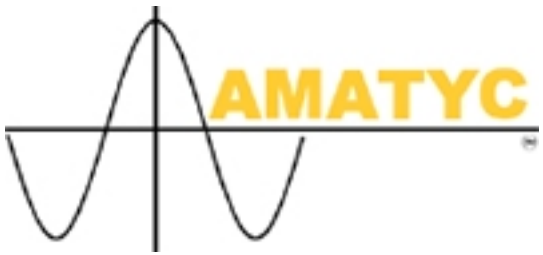
State Consultant: Dana Center

- Arkansas
- Colorado
- Georgia
- Indiana
- Maryland
- Massachusetts
- Michigan
- Missouri
- Montana
- Nevada
- New Mexico
- Nevada
- Oklahoma
- Ohio
- Texas
- Washington

Additional States:

- SUNY System
- California
- Virginia

Math Pathways Principles and Institutional Structures



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Principles for Pathways

Structural changes

Mathematics pathways are structured so that:

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

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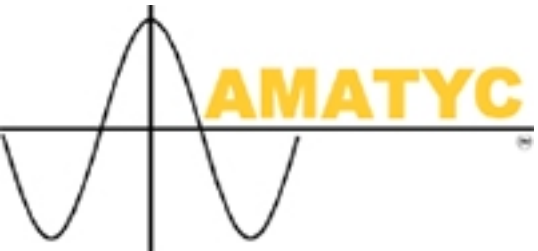
Principles for Pathways

Think - Pair - Share

At your home institution what structures do you already have to align and support these principles?

Think - Pair - Share

At your home institution, what structures are required to align and support these principles?



Mathematics Destinations

Think - Pair - Share

Are the general education core mathematics experiences aligned with your institution's degree programs?

Think - Pair - Share

What supports are needed for all students to be successful with those identified mathematics experiences?

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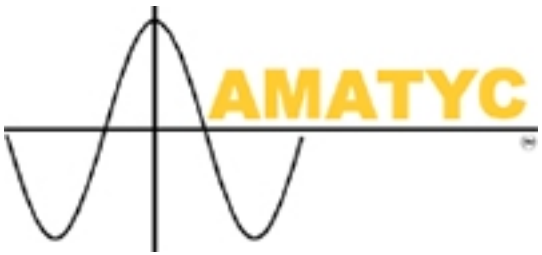
Math Pathways: A Paradigm Shift



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Math Pathways - Paradigm Shift

In math, remediation is tailored to algebra (traditional elementary and intermediate algebra topics). The goal of developmental math courses is to remediate all of the K-12 math to support students in college-level work.

Consider disciplines such as history. Are students required to re-learn all of the K-12 content prior to enrolling in a first-year college-level history course? What make a college-level history course “college-level”?

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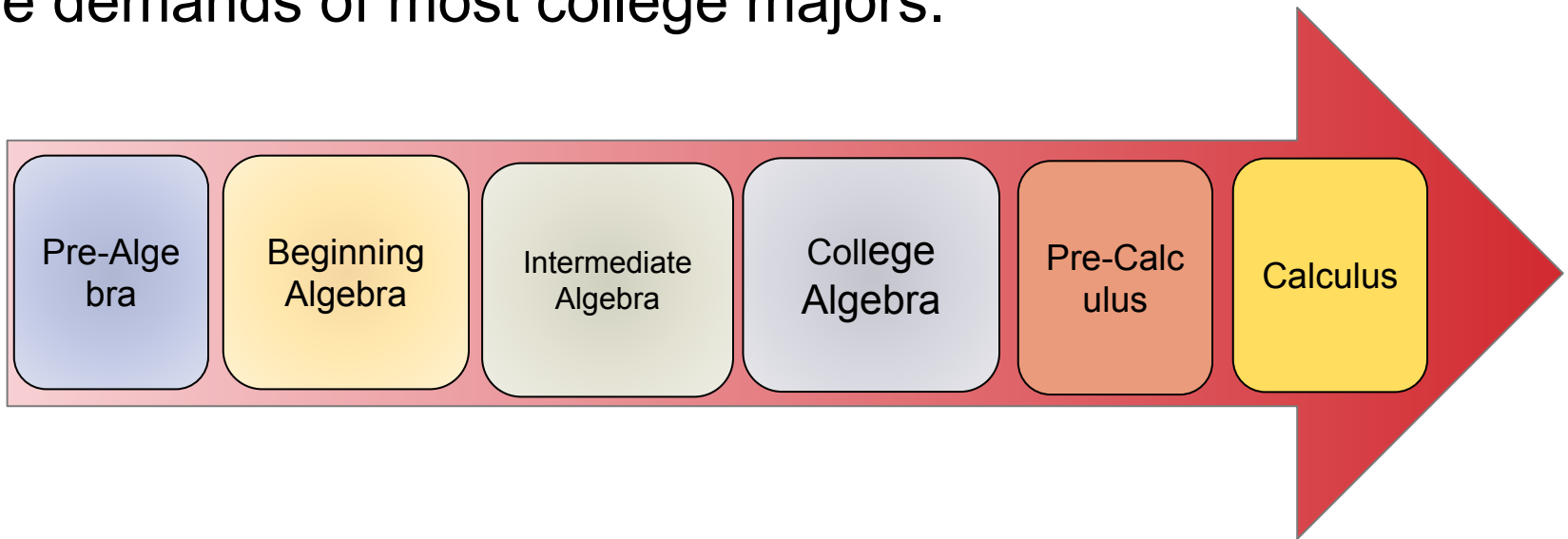
Traditional developmental math courses

Higher education has created more and more courses built to support a sequence based on skills needed for Calculus. Every student who needs “math” is forced through the same sequence. Calculus maintains a status within the mathematics community as being rigorous offering preparation for future mathematicians and engineers. However, the mathematics required for Calculus may not fit the demands of most college majors.

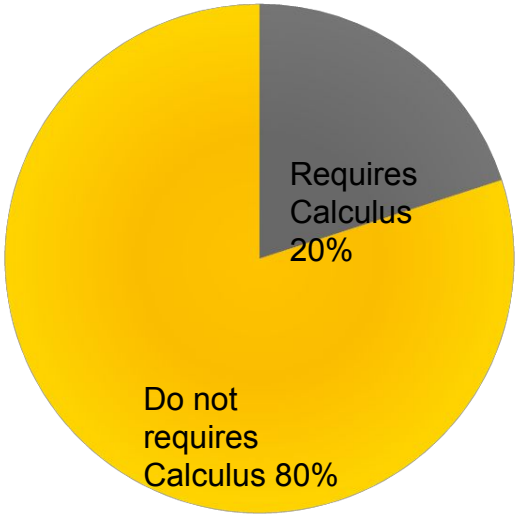


Calculus Pipeline

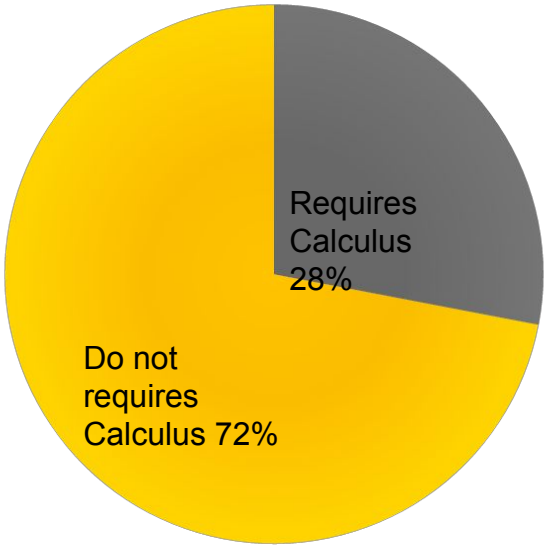
Traditionally, students have been funneled into a **one-size-fits-all algebra course sequence** (starting at the developmental level) **designed to prepare students for Calculus**, which is necessary in STEM fields, but not in others.

Most existing majors do not require Calculus - so why are most students placed in course sequences intended to prepare them for Calculus?

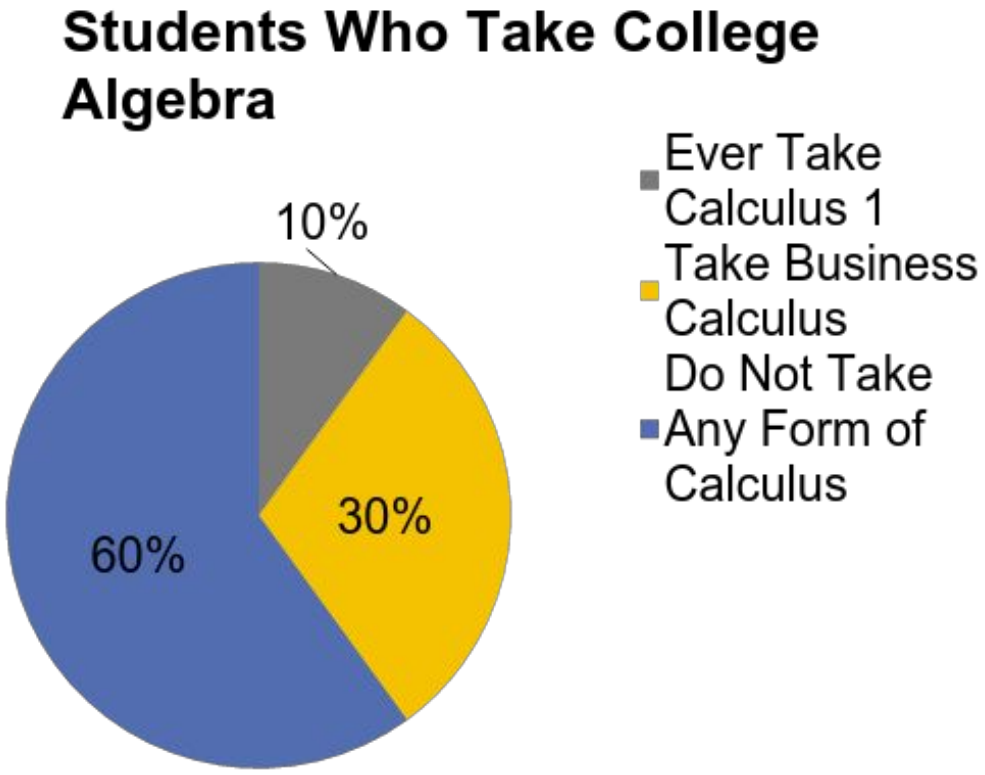
Community College Student Enrollment into Programs of Study



Four-Year Student Enrollment into Programs of Study



Misapplication of College Algebra



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Math Pathways - Paradigm Shift

"…only 10-20% of the students in College Algebra intend to pursue a STEM major that requires a yearlong sequence of mainstream calculus."

- Do you think this is a problem for student success? Why?
- Does this change your thinking about your current pathway for statistics? If so, how?

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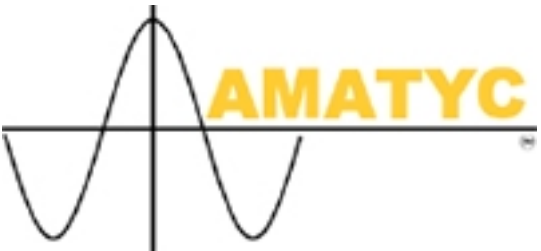
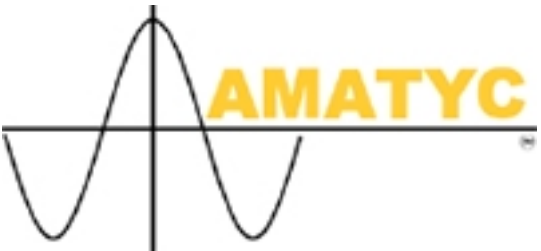


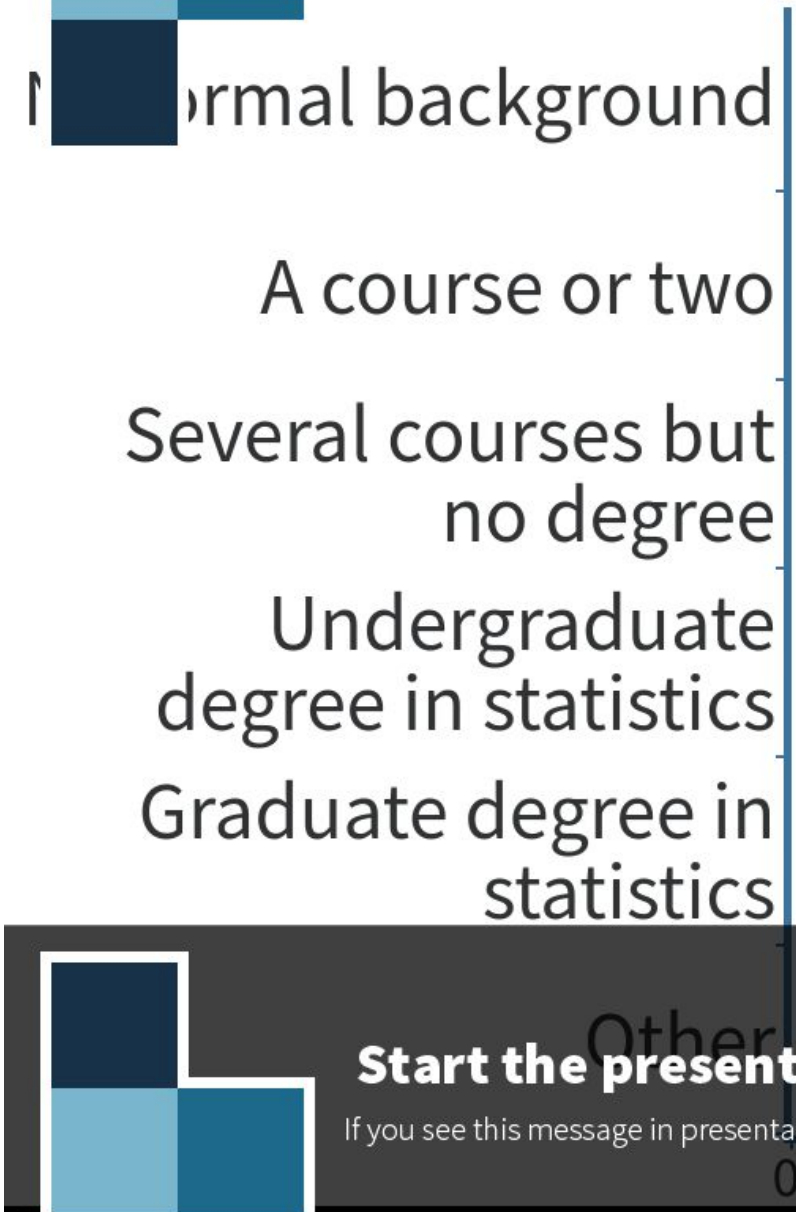
Who Are You?

What is your background in statistics?

- ❑ No formal background
- ❑ A course or two
- ❑ Several courses but no degree
- ❑ Undergraduate degree in statistics
- ❑ Graduate degree in statistics
- ❑ Other



What is your background in statistics?



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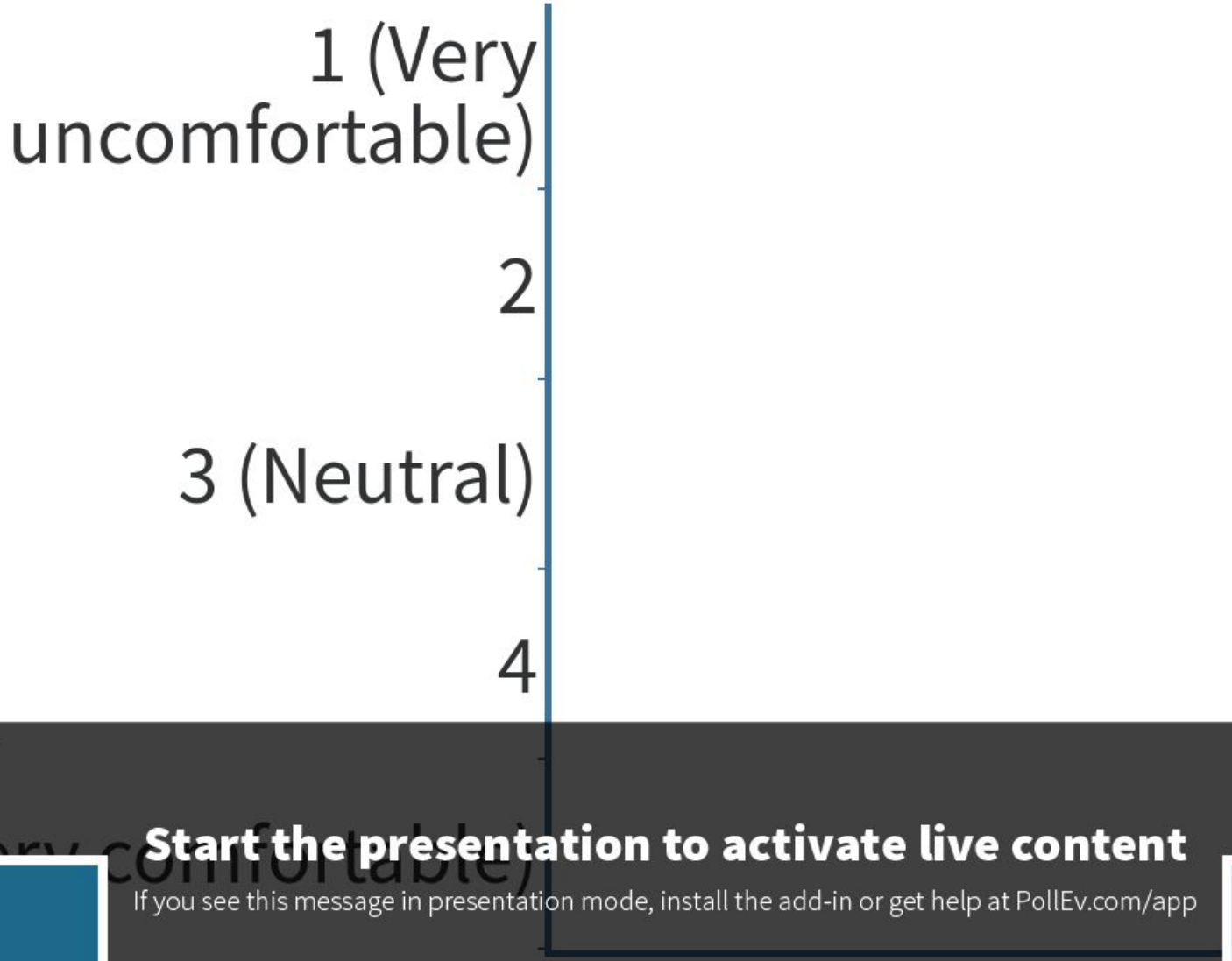

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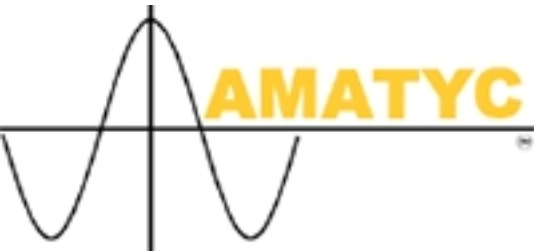
Who Are You?

How comfortable are you with teaching a first-year statistics course (use scale of 1 – 5)?

- ❑ 1 (Very uncomfortable)
- ❑ 2
- ❑ 3 (Neutral)
- ❑ 4
- ❑ 5 (Very comfortable)



Who Are You?

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- ❑ 8-15 years
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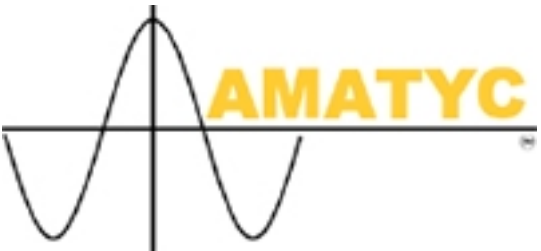

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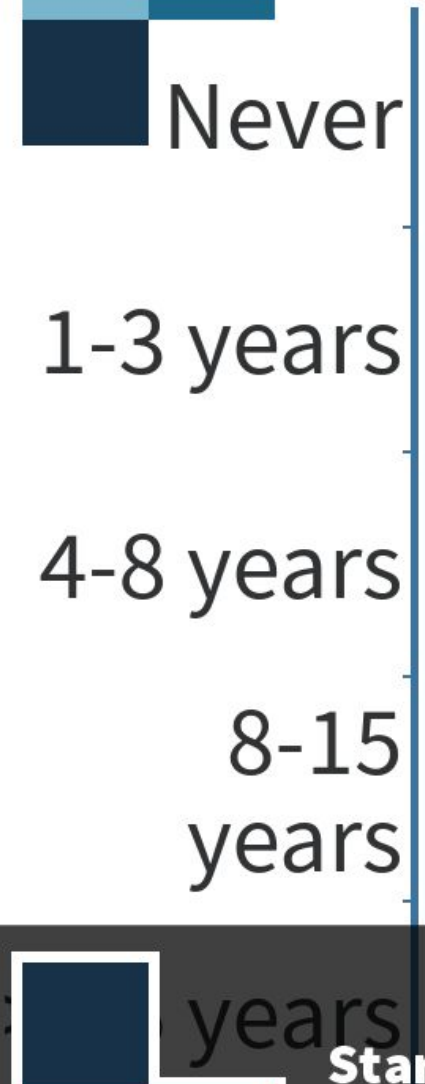

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Statistics Pathways

Two types of lower division statistics courses

- Introductory Statistics Methods course
- Statistical Literacy/Statistical Reasoning course

May have…

- Different audiences
- Different focus/approach
- Overlapping content

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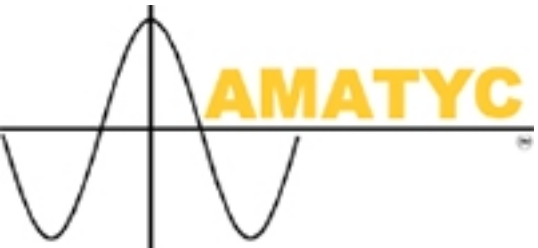
Statistics Pathways

- Most two-year colleges have only one lower-division statistics course, which is usually the introductory statistical methods course.
- Our discussions will focus on the introductory statistical methods course.
- Begin by considering content of this course.

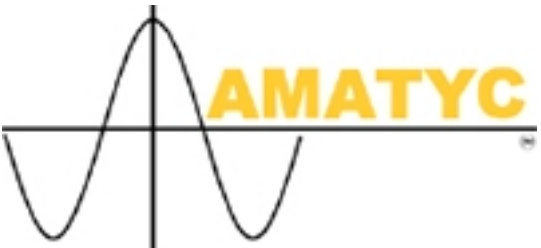


Statistics Pathways – Group Discussion

- What content do you consider essential for the introductory statistical methods course?
- What content would be “nice to have if there is time,” but not essential.
- What makes the topics on your “essential list” essential?

Statistics Pathways – Group Share Out

- Two minute summary of discussion from each group.
- To what extent was there overlap between the “essential lists” from different groups?
- Could we identify an “essentials list” that would facilitate transfer across institutions and applicability to various degree requirements?

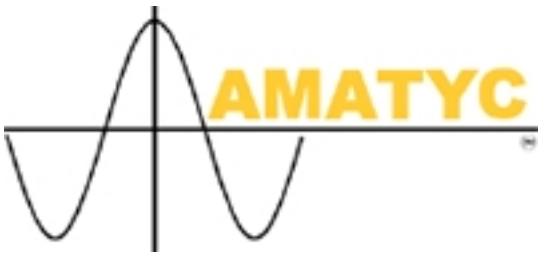


Statistics Pathways – Prerequisites

- Mathematics content linked to content in the introductory statistics course that are dependent on mastery of the mathematics content.

- Example prerequisites (six general categories)
  - Numbers and the number line
  - Operations on numbers
  - Sets
  - Equations and inequalities
  - Graphing points and lines in two dimensions
  - Reading tables and graphs and approximating areas

Math Pathways: Barriers



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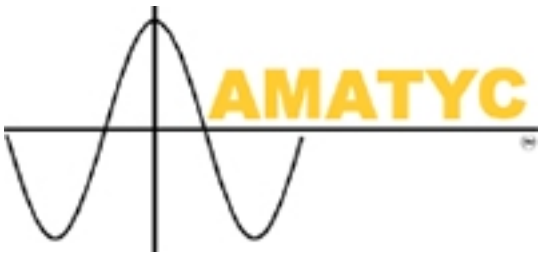
Statistics Pathways – Possible Barriers

- Course must articulate-transfer to 4-year institution.
- Determine how students will be placed.
- Design efficient and effective solutions for students who require additional preparation.
- Qualified faculty concerns.
- Sufficient classroom space.

Math Pathways: Resources



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Statistics Pathways – Sample Resources

- Sample syllabus from 2015 CUPM Curriculum Guide
- Sample syllabus from MAA Statistics Education Committee
- Excerpt from 2016 GAISE Report – *Suggestions for Topics that Might be Omitted from Introductory Statistics Courses*
- Co-requisite at scale
- Austin Peay State resources – Dr. Loretta Griffy

MAA *Common Vision* Report

Call to Action

- To ensure students graduate with **skill sets to match expectations of prospective employers**, our community must **modernize curricula** with input from representatives in partner disciplines, business, industry, and government.
- While intellectual domains fragment and coalesce over time, a central task for mathematics faculty at institutions of higher education, and more broadly, the mathematical sciences community as a whole, is to **create a coherent, intriguing introduction to collegiate mathematics for all students.**

MAA *Common Vision* Report

Call to Action

- This work should aim to **narrow the gap** between mathematics as **practiced** in the academy and other employment sectors and mathematics as **experienced in higher education's instructional programs.**
- “Collective action”
  - A coordinated effort supported by major players from all existing sectors is more effective than an array of new initiatives and organizations. (Kania & Kramer, 2011, on “collective impact”)

Moving Forward - Build, Collaborate

- A primary point emphasized by all the guides is **that the status quo is unacceptable**. **Change is unquestionably coming** to lower-division undergraduate mathematics, and it is **incumbent on the mathematical sciences community to ensure it is at the center of these changes, not on the periphery**.

- We hope other individuals and groups will come alongside us in this effort, **capitalize on the momentum** we have built and goodwill we have established, and **move this effort forward** into a second phase focused on implementation initiatives.

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Questions

Thank you for attending this session.

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