



# ***Engage in Critical Conversations to Create a Vision for Mathematics Education***



Presented at the  
AMATYC 2020 Convention

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# Session Overview

- Background on NCTM's *Catalyzing Change* initiative
- Discussion: Implications for 2-Year Colleges
- Consider Current & Potential Partnerships, Challenges, Opportunities
- Conclusions & Next Steps





# Who are your partners in mathematics education?

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# Guiding Questions

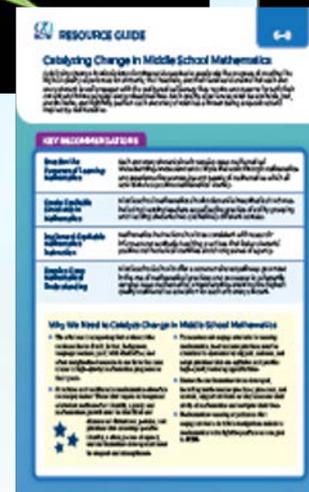
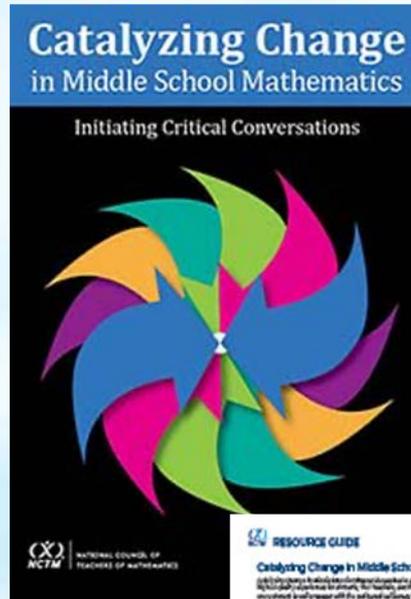
- What are the implications for students and faculty in two-year colleges?
- What partnerships can we develop to enact a shared vision to support a successful future in mathematics education?
- What critical conversations/next steps do I want to begin and why?





# Catalyzing Change Series

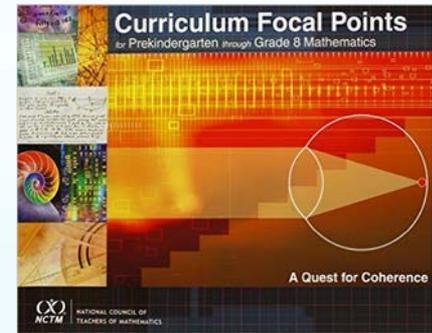
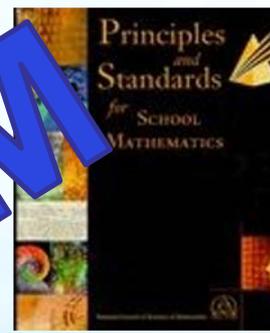
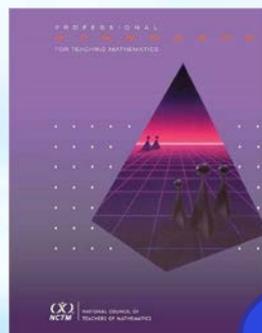
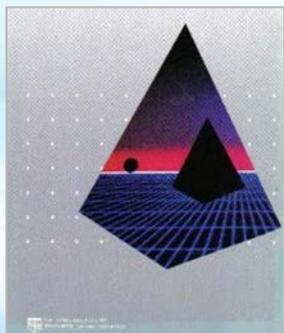
[www.nctm.org/change](http://www.nctm.org/change)



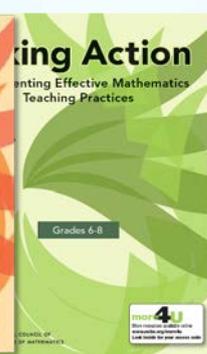
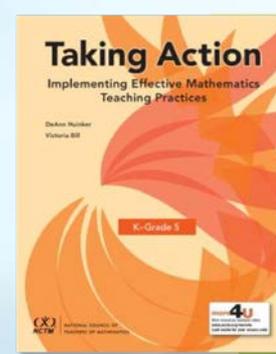
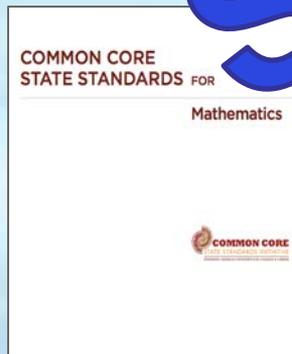
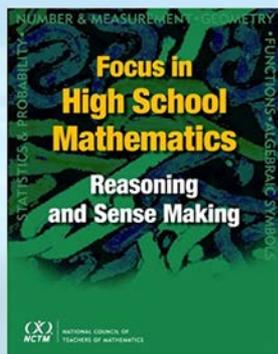
- Infographics
- Resource Guides
- Case Studies
- Webinars
- Book Study Guides
- Position Statements



# The Last Three Decades Have Seen Significant Progress in the Teaching and Learning of Mathematics



SYSTEM





# Why Catalyzing Change now?

## 2019 mathematics performance grades 4, and 12

Viewing 2020\_NAEP1... ▾

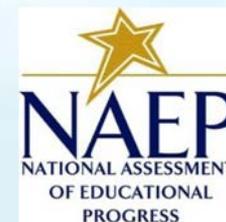
2019 performance results in mathematics compared to 2015

### MATHEMATICS

		Grade 4	Grade 8	Grade 12
Average score		◆	◆	◆
Percentile score	Lower	↓	↓	↓
	Middle	◆	◆	◆
	Higher	↑	↑	◆
At or above <i>NAEP Proficient</i>		◆	◆	◆
Below <i>NAEP Basic</i>		◆	↑	↑

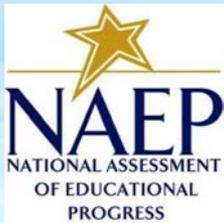
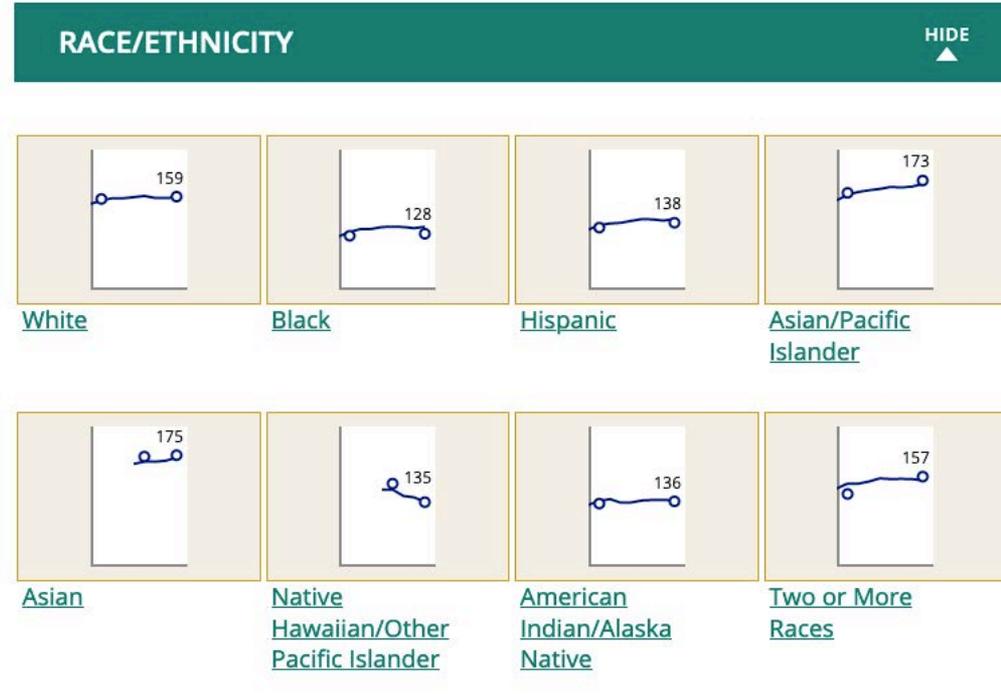
↑ Increase in 2019
↓ Decrease in 2019
◆ No significant change in 2019

SOURCE: NAEP 12<sup>th</sup> Grade Release webinar October 28, 2020.



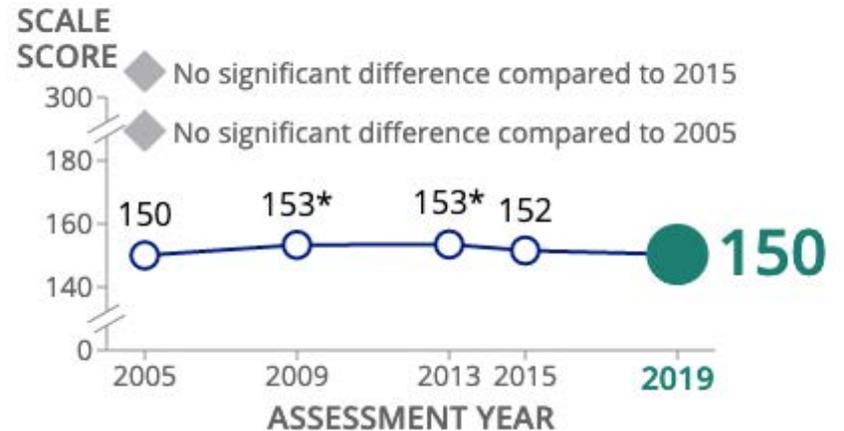


# Why Catalyzing Change now? (12<sup>th</sup> Grade Data-by Ethnicity)



<https://www.nationsreportcard.gov/>

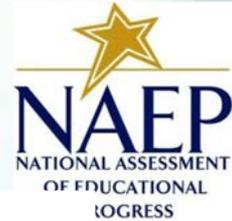
FIGURE | Trend in twelfth-grade mathematics average scores





4<sup>th</sup> Grade Data

## Data-by Ethnicity & Gender



### Results for Student Groups in 2019

Reporting Groups	Percentage of students	Avg. score	Percentage at or above NAEP		Percentage at NAEP Advanced
			Basic	Proficient	
<b>Race/Ethnicity</b>					
White	60	240	83	41	6
Black	21	215	55	13	1
Hispanic	13	228	71	26	2
Asian	2	‡	‡	‡	‡
American Indian/Alaska Native	1	‡	‡	‡	‡
Native Hawaiian/Pacific Islander	1	‡	‡	‡	‡
Two or more races	2	‡	‡	‡	‡
<b>Gender</b>					
Male	51	235	76	35	6
Female	49	232	74	31	3
<b>National School Lunch Program</b>					
Eligible	67	226	69	24	2
Not eligible	33	248	88	52	10

‡ Reporting standards not met.

NOTE: Detail may not sum to totals because of rounding, and because the "Information not available" category for the National School Lunch Program, which provides free/reduced-price lunches, is not displayed. Black includes African American and Hispanic includes Latino. Race categories exclude Hispanic origin.



## Why we need *Catalyzing Change in Mathematics*?

- Disparities exist within individual classrooms, across grade levels within schools, and across schools within districts.
- Children's growth in mathematical knowledge in kindergarten and first grade is a **strong predictor** of later mathematics success.
- Mathematical **learning experiences** that engage students in rich investigations reinstate mathematics to its rightful position as a magnet to **STEM**.
- The Concern: **Opportunity Gaps**-actions needed to support each and every student-**Issues of access**





## Conversation Starter

What are examples of effective strategies, approaches, initiatives, programs, or projects related to success for students in mathematics in two-year colleges in which you are engaged?

*Share in the chat!*





# Four Key Recommendations

Recommendation 1

**Broaden  
the Purposes of  
Learning Mathematics**

Recommendation 2

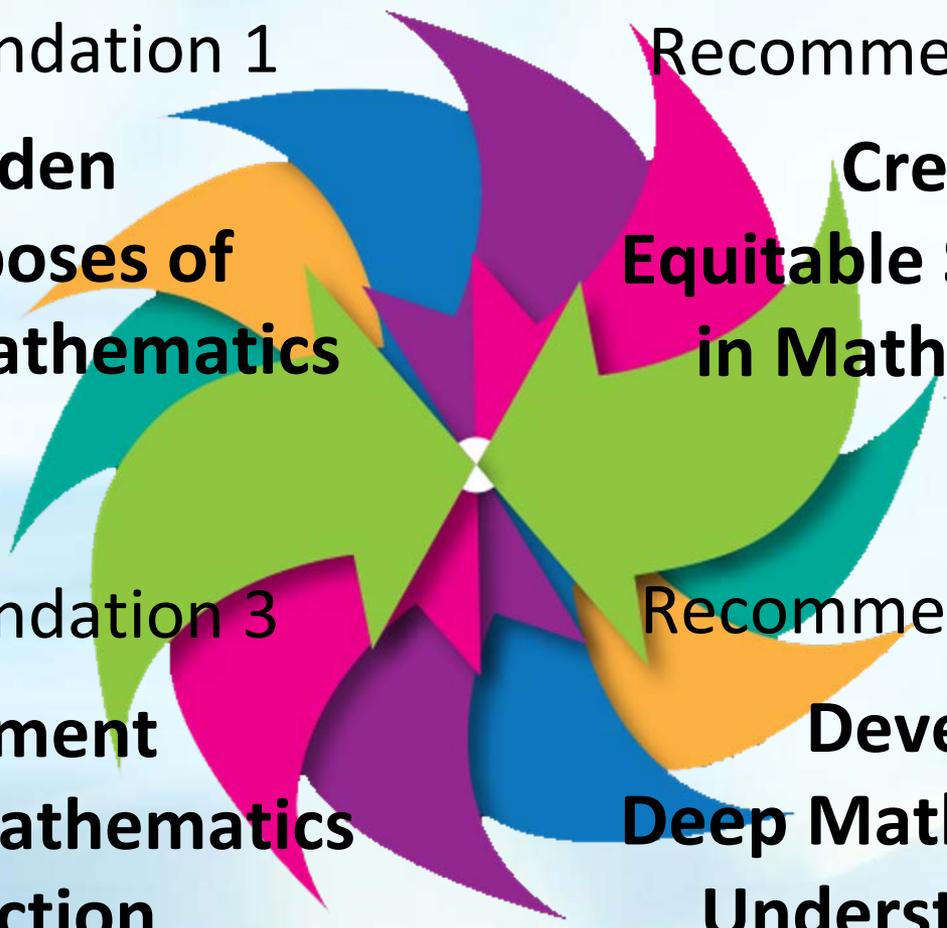
**Create  
Equitable Structures  
in Mathematics**

Recommendation 3

**Implement  
Equitable Mathematics  
Instruction**

Recommendation 4

**Develop  
Deep Mathematical  
Understanding**



# Recommendations Across the Grade Bands

#nctmchange



	Early Childhood and Elementary	Middle School	High School
<b>Broaden the Purposes of Learning Mathematics</b>	Each and every child should develop deep mathematical understanding as confident and capable learners; understand and critique the world through mathematics; and experience the wonder, joy, and beauty of mathematics.	Each and every student should develop deep mathematical understanding, understand and critique the world through mathematics, and experience the wonder, joy, and beauty of mathematics, which all contribute to a positive mathematical identity.	Each and every student should learn the Essential Concepts in order to expand professional opportunities, understand and critique the world, and experience the wonder, joy, and beauty of mathematics.
<b>Create Equitable Structures in Mathematics</b>	Early childhood and elementary mathematics should dismantle inequitable structures, including ability grouping and tracking, and challenge spaces of marginality and privilege.	Middle school mathematics should dismantle inequitable structures, including tracking teachers as well as the practice of ability grouping and tracking students into qualitatively different courses.	High school mathematics should discontinue the practice of tracking teachers as well as the practice of tracking students into qualitatively different or dead-end course pathways.
<b>Implement Equitable Mathematics Instruction</b>	Mathematics instruction should be consistent with research-informed and equitable teaching practices that nurture children's positive mathematical identities and strong sense of agency.	Mathematics instruction should be consistent with research-informed and equitable teaching practices that foster students' positive mathematical identities and strong sense of agency.	Classroom instruction should be consistent with research-informed and equitable teaching practices.
<b>Develop Deep Mathematical Understanding</b>	Early childhood settings and elementary schools should build a strong foundation of deep mathematical understanding, emphasize reasoning and sense-making, and ensure the highest-quality mathematics education for each and every child.	Middle schools should offer a common shared pathway grounded in the use of mathematical practices and processes to coherently develop deep mathematical understanding, ensuring the highest-quality mathematics education for each and every student.	High schools should offer continuous four-year mathematics pathways with all students studying mathematics each year, including two to three years of mathematics in a common shared pathway focusing on the Essential Concepts, to ensure the highest-quality mathematics education for all students.



## Recommendation #1

# Broaden the Purposes of Learning Mathematics





## Broadening the Purposes of Learning Mathematics

	Early Childhood and Elementary	Middle School	High School
<b>Broaden the Purposes of Learning Mathematics</b>	Each and every child should develop deep mathematical understanding as confident and capable learners; understand and critique the world through mathematics; and experience the wonder, joy, and beauty of mathematics.	Each and every student should develop deep mathematical understanding, understand and critique the world through mathematics, and experience the wonder, joy, and beauty of mathematics, which all contribute to a positive mathematical identity.	Each and every student should learn the Essential Concepts in order to expand professional opportunities, understand and critique the world, and experience the wonder, joy, and beauty of mathematics.

What short- and long-term work needs to be done in our work toward achieving this vision of broadening the purposes of learning mathematics?





## Recommendation #2

### Creating Equitable Structures in Mathematics

	Early Childhood and Elementary	Middle School	High School
<b>Creating Equitable Structures in Mathematics</b>	Early childhood and elementary mathematics should <b>dismantle inequitable structures</b> , including <b>ability grouping and tracking</b> , and <b>challenge spaces of marginality and privilege</b> .	Middle school mathematics should <b>dismantle inequitable structures</b> , including <b>tracking teachers</b> as well as the practice of <b>ability grouping and tracking students</b> into qualitatively different courses.	High school mathematics should <b>discontinue the practice of tracking teachers</b> as well as the practice of <b>tracking students</b> into qualitatively different or <b>dead-end course pathways</b> .

What happens to students who have been consistently in 'lower' tracks in Pk-12 so that when they leave high school to continue their education?

What are the implications for 2-year colleges?





# Addressing Factors Critical to Student Success

Position Statement (2018)

<https://amatyc.org/page/PositionStudentSuccess>

- Emphasize an early start to these studies.
- Emphasize the importance of number sense & computational fluency.
- Increase mathematics self-efficacy to reduce mathematics anxiety.
- Prioritize in the curriculum the ability to solve problems.
- Emphasize & assess both conceptual & procedural.
- Support risk-taking.
- Give frequent assessments, encourage self-assessment & reflection.
- Create a classroom environment that fosters a growth mindset.
- Bridge the gap for under-represented student populations



# Implementing Equitable Mathematics Instruction

	Early Childhood and Elementary	Middle School	High School
<b>Implementing Equitable Mathematics Instruction</b>	Mathematics instruction should be consistent with research-informed and equitable teaching practices that nurture children's positive mathematical identities and strong sense of agency.	Mathematics instruction should be consistent with research-informed and equitable teaching practices that foster students' positive mathematical identities and strong sense of agency.	Classroom instruction should be consistent with research-informed and equitable teaching practices.

What partnerships should be fostered for educators' professional learning to strengthen understanding of mathematics and equitable mathematics teaching practices?





# Fostering Learning

Position Statement (2018)

<https://amatyc.org/page/PositionFosteringLearning>

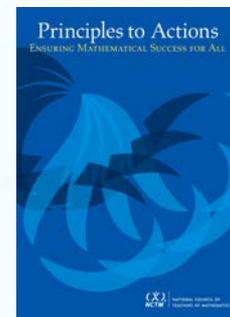
- Collaborative Learning
- Professional Development Opportunities
- Culture of high expectations
- Use of formative and summative assessments



# 8 Effective Teaching Practices

## *Principles to Actions, 2014, NCTM*

- Establish mathematical goals to **focus learning**.
- Implement **tasks** that promote reasoning and problem solving.
- Use and **connect** mathematical representations.
- Facilitate meaningful mathematical **discourse**.
- Pose **purposeful questions**.
- Build **procedural** fluency from **conceptual** understanding.
- Support **productive struggle** in learning mathematics.
- Elicit and use **evidence of student thinking**.





# Recommendation #4

## Develop Deep Mathematical Understanding

	Early Childhood and Elementary	Middle School	High School
<b>Develop Deep Mathematical Understanding</b>	Early childhood settings and elementary schools should build a strong foundation of deep mathematical understanding, emphasize reasoning and sense-making, and ensure the highest-quality mathematics education for each and every child.	Middle schools should offer a common shared pathway grounded in the use of mathematical practices and processes to coherently develop deep mathematical understanding, ensuring the highest-quality mathematics education for each and every student.	High schools should offer continuous four-year mathematics pathways with all students studying mathematics each year, including two to three years of mathematics in a common shared pathway focusing on the Essential Concepts, to ensure the highest-quality mathematics education for all students.

What supports are needed to ensure students' development of the mathematical practices and processes within their daily mathematics instruction? What is my role?

**Mathematical processes, content, practices, pathways**





# Four Key Recommendations

Recommendation 1

**Broaden  
the Purposes of  
Learning Mathematics**

Recommendation 2

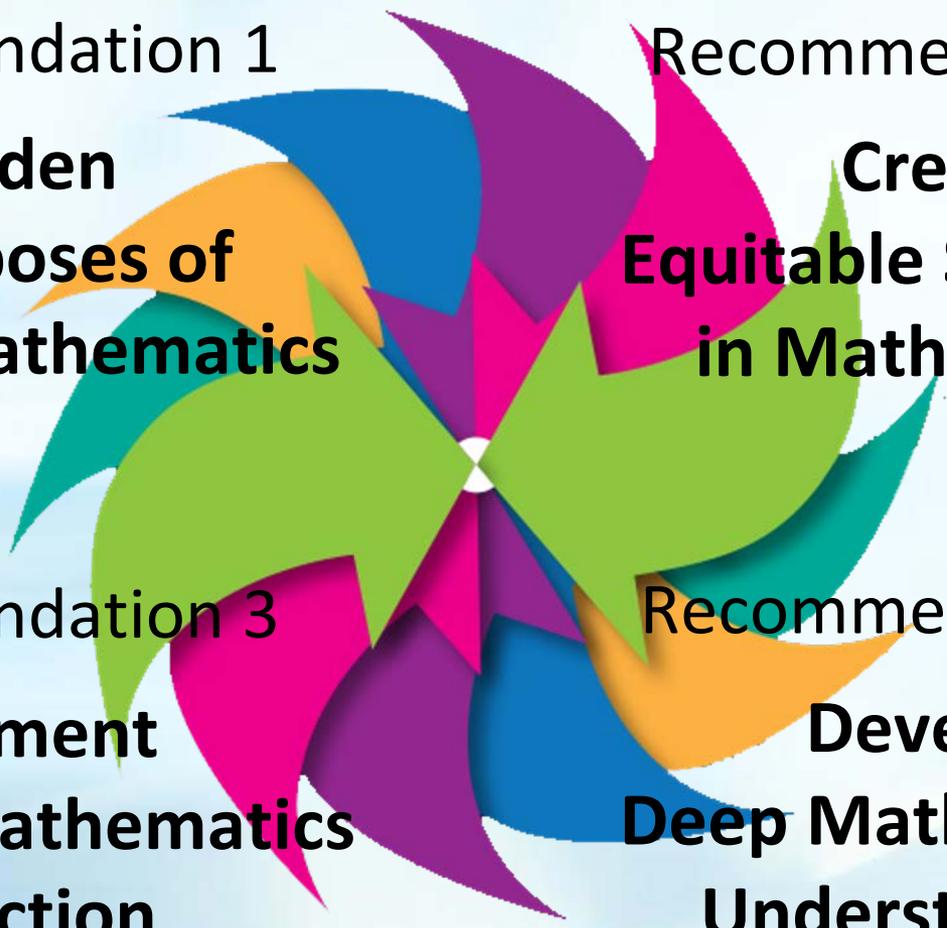
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The *Catalyzing Change* series is intended to initiate critical conversations centered around essential areas to ensure the highest-quality mathematics education for each and every student.

What will be your next steps?

What will be our next steps?

Who do we need to develop partnerships with to move forward?

(JamBoard)





# Potential Actions

- Build strong partnership for equitable mathematics instruction
- Analyze & evaluate systemic policies, practices, and procedures that restrict student access to and success in mathematics
- Provide opportunities, time and space for colleagues to collaboratively plan
- Consistently implementing research-informed, equity-based instructional practices
- Design collaborative research with partners and stakeholders
- Support instructors in their inquiry (action research, lesson study, reflective practices)





# More Potential Actions

- Ensuring strong articulation and seamless pathways between high school and postsecondary mathematics curricula
- Working with in-service and preservice teachers to support research informed and equitable instructional practices focused on the Essential Concepts
- Collaborating with school and district educators to develop additional mathematics pathways and populating courses with the Essential Concepts
- Collaborate with PK-12 schools, business, industry, and 4-year colleges/universities to challenge and dismantle structures and practices that impede access to and success in mathematics and develop quality pathways students.





# Guiding Questions

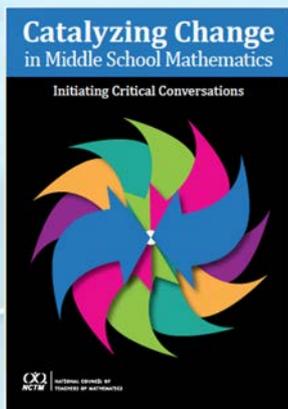
- What are the implications for students and faculty in two-year colleges?
- What partnerships can we develop to enact a shared vision to support a successful future in mathematics education?
- What critical conversations/next steps do I want to begin and why?





# Closing Comment

“Enacting long-term impactful change will require time, collaboration, communication, and hard work across many different stakeholder groups. In the end, it will be worth it.



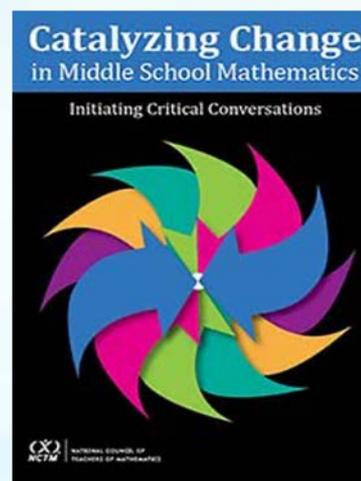
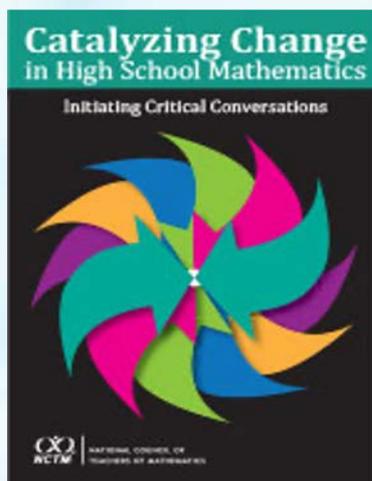
*Catalyzing Change in Middle School Mathematics*  
(NCTM, 2000, p. 100)





# Catalyzing Change Series

- Ordering information
- Books
- Resource Guides
- Book study guides
- Case studies
- Infographics
- And more



[www.nctm.org/change](http://www.nctm.org/change)

**RESOURCE GUIDE** ←

**Catalyzing Change in Middle School Mathematics**

**KEY RECOMMENDATIONS**

<b>Key Benefit: Empower Learning Mathematics</b>	Each elementary school math teacher uses mathematical proficiency practices with all students, and mathematics is a joyful, meaningful, and relevant part of students' lives.
<b>Key Benefit: Develop Mathematical Habits</b>	Mathematics teachers have a consistent, well-researched, and evidence-based approach to teaching mathematics that focuses on developing mathematical practices and habits.
<b>Key Benefit: Engage Students in Learning Mathematics</b>	Mathematics teachers have a consistent, well-researched, and evidence-based approach to teaching mathematics that focuses on developing mathematical practices and habits.
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**Why We Need to Catalyze Change in Middle School Mathematics**

- The effective teaching practices that research has identified for middle school mathematics are not being used consistently across the country.
- Research shows that middle school mathematics teachers are not using the practices that research has identified for middle school mathematics.
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**RESOURCE GUIDE** PG-6

**Catalyzing Change in Early Childhood and Elementary Mathematics: Initiating Critical Conversations**

**KEY RECOMMENDATIONS**

<b>Key Benefit: Empower Learning Mathematics</b>	Each elementary school math teacher uses mathematical proficiency practices with all students, and mathematics is a joyful, meaningful, and relevant part of students' lives.
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**Why We Need to Catalyze Change in Early Childhood and Elementary Mathematics**

- The effective teaching practices that research has identified for early childhood and elementary mathematics are not being used consistently across the country.
- Research shows that early childhood and elementary mathematics teachers are not using the practices that research has identified for early childhood and elementary mathematics.
- Research shows that early childhood and elementary mathematics teachers are not using the practices that research has identified for early childhood and elementary mathematics.

*Experience the wonder, joy, and beauty of mathematics.*



# Catalyzing Change Webinars

- The *Catalyzing Change* series empowers you to lead critical conversations to improve math education and student readiness.
- We all have a stake in the future of mathematics

[www.nctm.org/change](http://www.nctm.org/change)

**100 Days of PROFESSIONAL LEARNING**

*Catalyzing Change: An Overview of the 4 Key Recommendations for Early Childhood and Elementary Mathematics*

Speakers: DeAnn Huinker, Cathery Yeh, Nicole Rigelman, and Anne Marie Marshall

May 27, 2020 • 7:00 p.m. EDT

**100 Days of PROFESSIONAL LEARNING**

*Catalyzing Change in Middle School Mathematics: Initiating Critical Conversations Centered on the 4 Key Recommendations*

Speakers: Sarah B. Bush, Christa Jackson, George J. Roy, and Eric Milou

May 28, 2020 • 7:00 p.m. EDT





# Thank You!

## Questions? Comments?

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