NATIONAL ACADEMY of EDUCATION

MATHEMATICS INSTRUCTION IN THE COVID-19 ERA

September 2, 2020

National Academy of Education

COVID-19 and Inequities in Education Forum Series

National Academy of Education COVID-19 and Inequities in Education Forum Series

Mathematics Instruction in the COVID-19 Era

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Return to Learn:
Launching Mathematics Instruction to Address Mitigate Learning Loss and Accelerate Learning

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“Every child **deserves a champion**, an adult who will never give up on them, who understands the power of connection, and insists that they become the best that they can possibly be.”

Rita Pierson

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What will we champion for students?

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What will we champion for students?

A recognition that worse than losing mathematics content will be the loss of access to ambitious teaching.

1) The content must be on grade level and cognitively demanding.
2) All students--especially those who have been historically marginalized, disadvantaged, and underserved--should be involved in meaningful ways.
3) Students should be invited and supported to engage in learning experiences that promote agency, ownership, and identity.
4) Students ways of knowing should be elicited and built upon to meet students where they are.

What will we champion for teachers?

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What will we champion for teachers?

A recognition that a clear vision, ongoing support, and opportunities to celebrate is crucial to stem burnout.

1) Establish a focus on grade-level content and provide for the elimination of any extraneous aspects of curriculum.
2) Establish quality Tier 1 instruction with a common instructional routine to allow for better collaboration among teachers.

Cycle of Learning Example

Cycle of Learning Example for Mathematics	
Introduce a rich task/challenge to students and ask them to reflect on their initial explanations or ideas for solving.	**Resource:** Notice/Wonder
Provide students **opportunities to think** about the task, select a strategy, and attempt to solve.	**Resource:** STEM Teaching Tool- Prewrite Section

Provide students **opportunities to share their thinking** with others to reinforce their thinking and gain additional ideas and evidence to support their process and/or solution.	**Resources:**
	• Use engagement and instructional strategies
	  ○ Oklahoma Math Curriculum Framework
	  ○ K20 Center
	  ○ Oklahoma Excel Briefs
	  ■ Which One Doesn't Belong? #14
	  ■ Would you Rather? #15

Cycle of Learning Example - Part 2

Discuss as a class strategies for solving the task, potential solutions and "non-solutions", and connections to other mathematical and/or real-world examples.	**Resources:** ○ Talk Moves to encourage discussion ○ *5 Practices for Orchestrating Productive Discussion* ○ My Favorite No strategy
Provide students with an **opportunity to reflect** on their learning and demonstrate their current understanding.	**Resources:** ○ Exit Ticket using a strategy such as 3-2-1 ○ Add to STEM Teaching Tool- Post Write Section ○ Math Journal Reflection

Modifying Analog Instruction

Modifications for Analog or Digital Learning Experiences		
Math Cycle of Learning	Analog (No-Tech) Learning	Digital (Tech-Based) Learning
Introduce a rich task/challenge to students and ask them to reflect on their initial explanations or ideas for solving.	Present a Which one Doesn't Belong, Would You Rather, Open Middle, or similar problem to the class (or mail home for blended/distance learning). Ask students to write down what they notice about the problem and what they wonder about the problem.	Post a Which one Doesn't Belong, Would You Rather, Open Middle, or similar problem on your class Learning Management System (LMS), email to students, or use a Desmos Activity to present the problem. Ask students to type what they notice and wonder about the problem.
Provide students **opportunities to**	Model, explain, or discuss with students the learning goals for the day. Allow students time to think about	Provide a short video that includes the learning goals for the day using Desmos, Edpuzzle or by uploading the

What will we champion for teachers?

A recognition that a clear vision, ongoing support, and opportunities to celebrate is crucial to stem burnout.

1) Establish a focus on grade-level content and provide for the elimination of any extraneous aspects of curriculum.
2) Establish quality Tier 1 instruction with a common instructional routine to allow for better collaboration among teachers.
3) Leverage staffing arrangements to provide just-in-time acceleration and conferring opportunities.
4) Measure what matters.
5) Create opportunities to learn from each other and celebrate.

What Inequities Will be Exacerbated?

- Traditional methods of remediation already do not work.

- Making assumptions about which students are “most” impacted by “learning loss” and then applying broken interventions to them will only further reduce their access to the mathematics content and mathematics teaching all students deserve.

What are the Biggest Challenges?

- Being a great teacher is already challenging. Being a great teacher in-person, hybrid, AND virtual settings all at once is simply too much to ask.

- Teachers need the opportunity to focus, get support (or share responsibilities), and to celebrate progress.

What may be the “Best Bet”?

- Establish clear expectations for what quality Tier 1, 2, and 3 instruction and support looks like.

- Create opportunities for teachers to collaborate to modify analog instruction for digital learning experiences.

- Leverage teachers’ strengths and share responsibilities.

If we continue online (or even if we don’t), what strategies may be useful?

Measure what matters.

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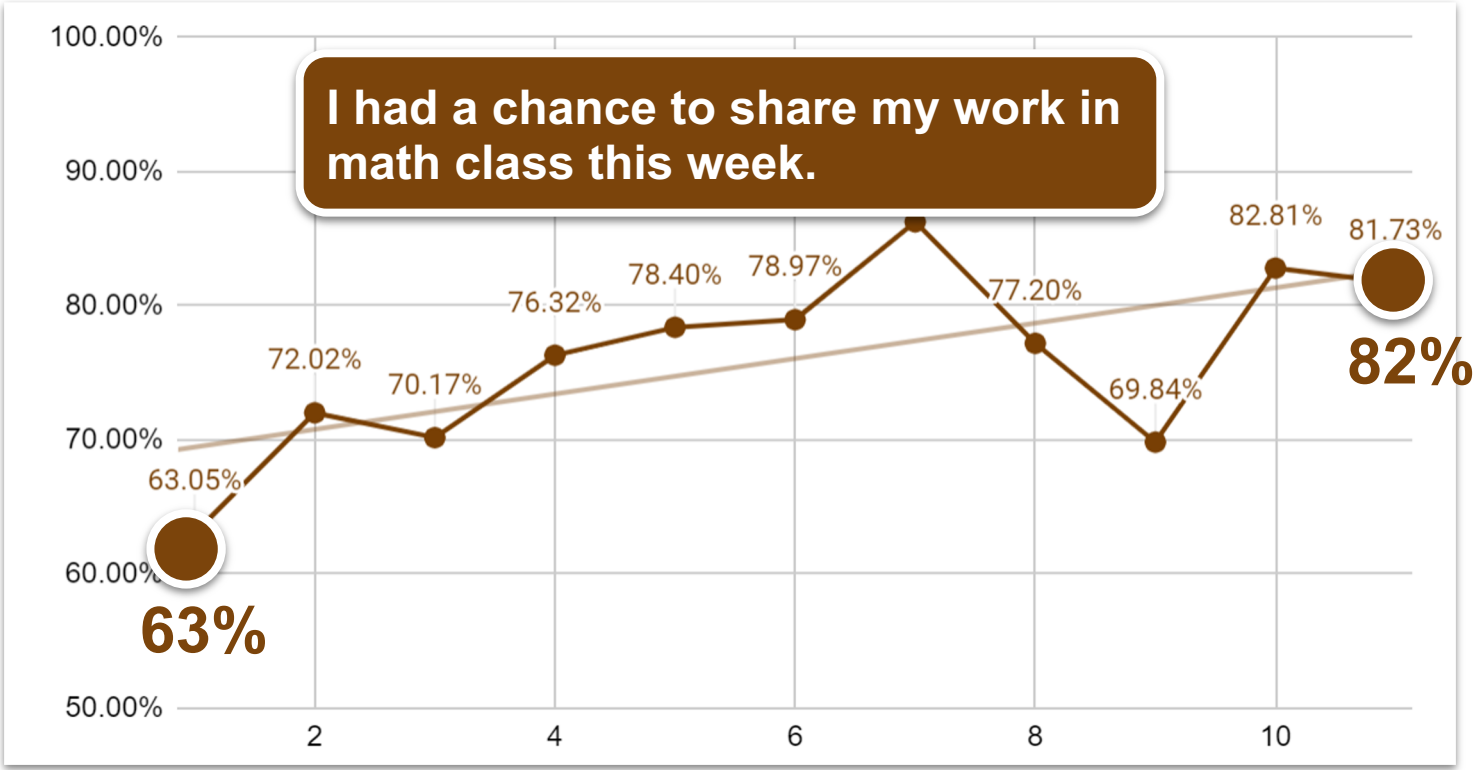
Do students have equitable access?

$\bar{N}$ = 290



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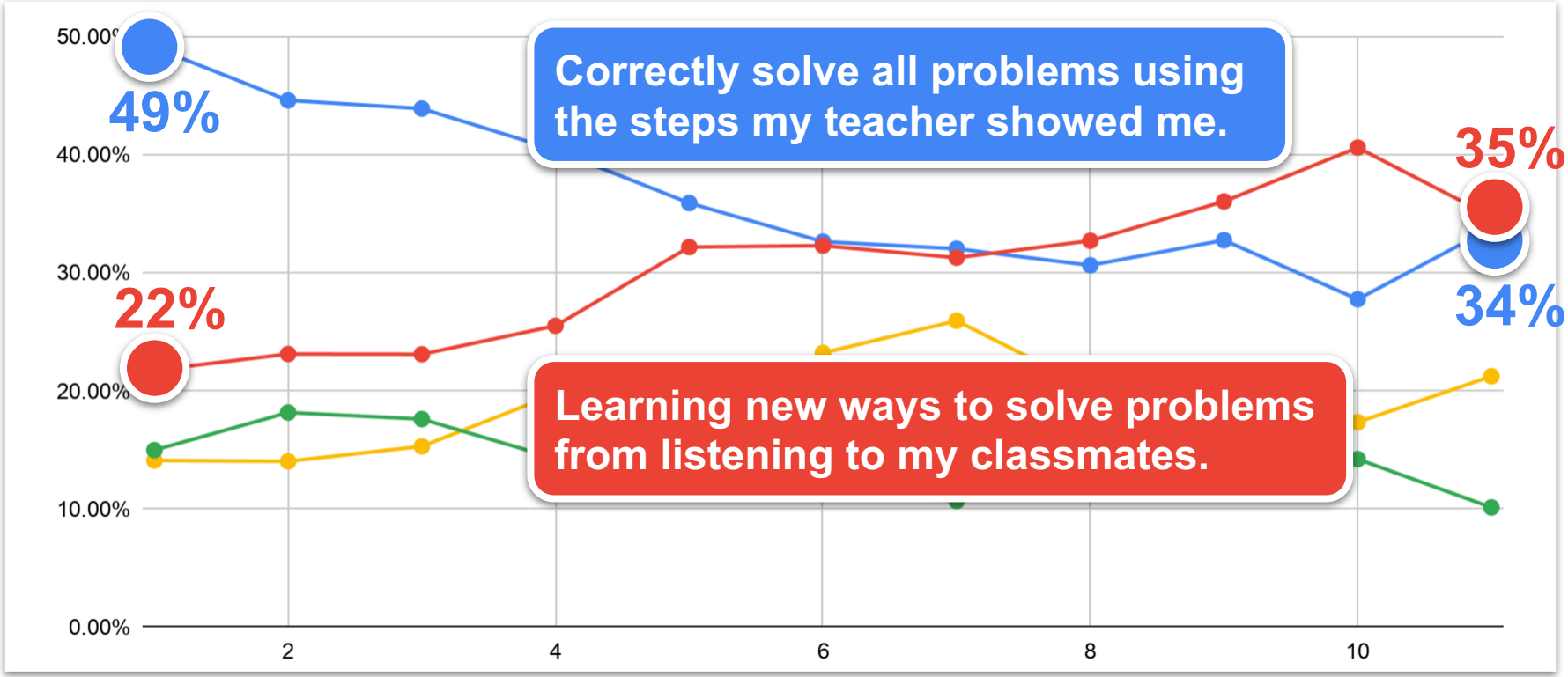
What does it mean to be successful? $\bar{N}$ = 290



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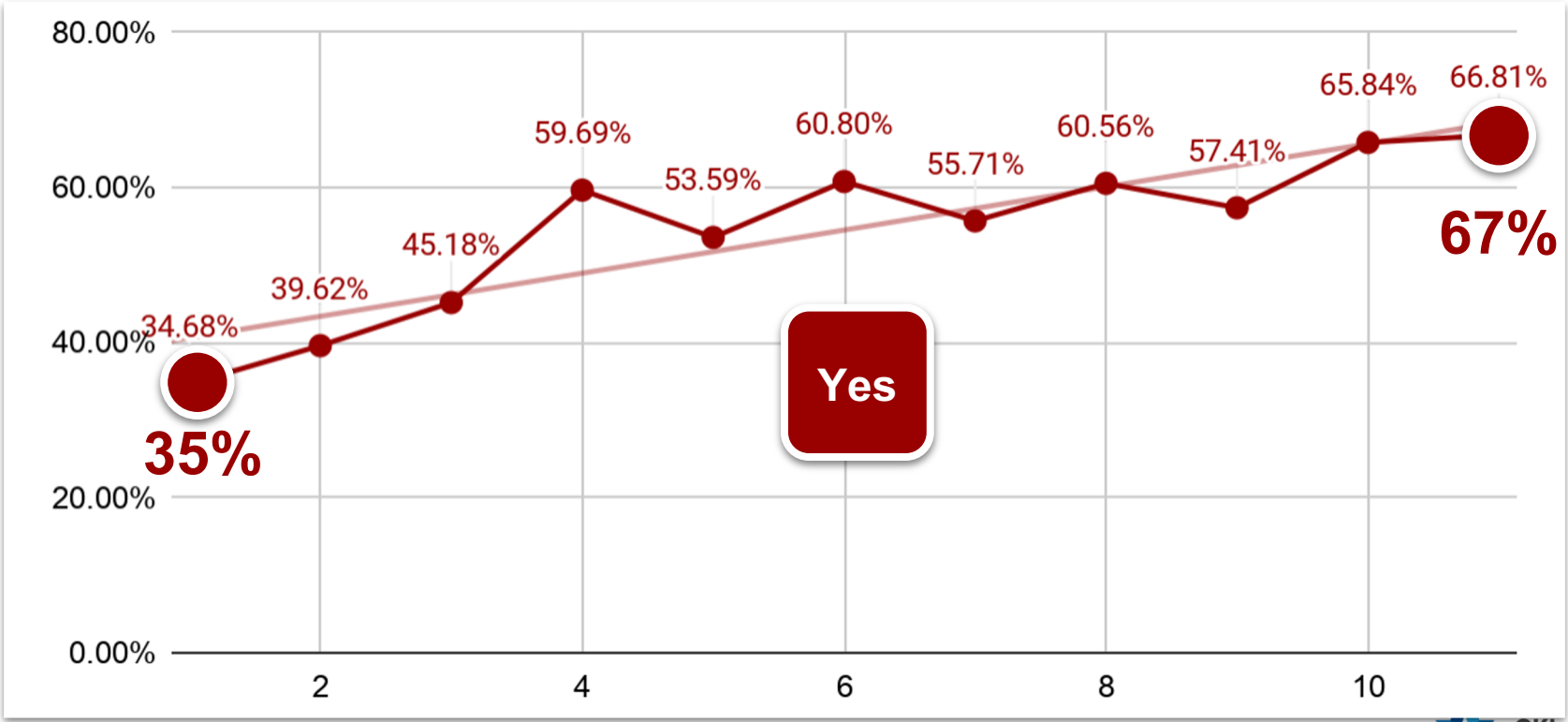
Did you get feedback this week?

$\bar{N}$ = 460



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educator
child
parent
leader
Every person deserves a champion.
OKLAHOMA
Education

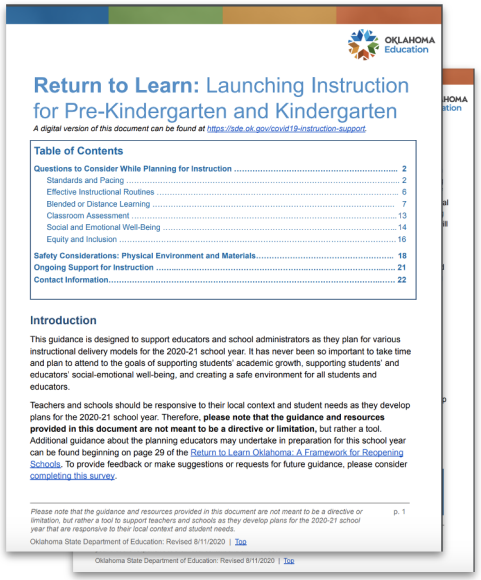
Return to Learn: Launching Instruction

- Foundational Literacy
- PreK/Kindergarten
- Grades 1-2
- Grades 3-5

- Secondary ELA
- Secondary Math
- Secondary Science
- Secondary Social Studies

- PK-12 Digital Tools
- PK-12 Fine Arts
- PK-12 PE/Health
- PK-12 World Languages

Access all guidance documents at http://sde.ok.gov/Covid19-Instruction-Support.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Return to Learn: Launching Instruction for Pre-Kindergarten and Kindergarten

A digital version of this document can be found at https://sde.ok.gov/covid19-instruction-support.

Table of Contents

Introduction

This guidance is designed to support educators and school administrators as they plan for various instructional delivery models for the 2020-21 school year. It has never been so important to take time and plan to attend to the goals of supporting students' academic growth, supporting students' and educators' social-emotional well-being, and creating a safe environment for all students and educators.

Teachers and schools should be responsive to their local context and student needs as they develop plans for the 2020-21 school year. Therefore, **please note that the guidance and resources provided in this document are not meant to be a directive or limitation,** but rather a tool. Additional guidance about the planning educators may undertake in preparation for this school year can be found beginning on page 29 of the Return to Learn Oklahoma: A Framework for Reopening Schools. To provide feedback or make suggestions or requests for future guidance, please consider completing this survey.

Please note that the guidance and resources provided in this document are not meant to be a directive or limitation, but rather a tool to support teachers and schools as they develop plans for the 2020-21 school year that are responsive to their local context and student needs. p. 1

Oklahoma State Department of Education: Revised 8/11/2020 | Top

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Linda Ruiz Davenport, Boston Public Schools
Transitioning From Director of K-12 Mathematics to Math Teacher at Boston Collaborative HS
Former member of the NCTM Board of Directors
ldavenport@bostonpublicschools.org

All art by Andrew Zimmerman

What are we seeing as the likely inequities in mathematics that have been exacerbated by COVID-19?

"Learning gaps" due to **uneven access to remote learning, study space, and readiness and availability of families to support learning at home;**

"Learning gaps" for **students with disabilities and ELs** due to uneven access to needed services; and

Students with **uneven access to ambitious teaching**

- Availability of and experience with online teaching tools
- Constraints of online platforms for instruction
- Fewer opportunities for teachers to plan and reflect collaboratively
- Interruptions to school-based and district-level PD support for teachers

What are the biggest challenges in mitigating mathematics learning loss?

Fully engaging our most vulnerable students so they are eager to participate in mathematics learning;

Building student identity and agency as learners and doers of mathematics;

Avoiding the **rush to try and fix all learning gaps;** and

Supporting teacher preparedness to address unfinished learning in meaningful and effective ways

- Knowing the learning trajectories associated with content domains
- Listening carefully to what students are saying and thinking
- Leveraging models and representations that build understanding
- Building on earlier tasks from prior years so students can more successfully use what they know to learn new content

What strategies are we using, recommending, or discussing that may be “best bets” for mathematics learning?

- Preparing teachers to address content standards aligned to grade level/course expectations while also addressing unfinished learning “in the moment”
- Ensuring that teachers can access interactive “low floor high ceiling” tasks with multiple solution paths that meaningfully engage all students
- Providing teachers with technology supports consistent with the kind of instruction we encourage
- Identifying formative assessment strategies that inform instruction and build partnerships with students
- Providing support to teachers as they plan and reflect on practice together
- Communicating with administrators about expectations
- Building supportive relationships with families including opportunities to learn about technology tools used in classrooms

BOSTON Public Schools
Focus on Children

Unit 3: Let's Be Rational: Understanding Fraction Operations

11/5/20-12/4/20 (14 problems, 19 days)

When students finish this unit they should know, understand, and fluently use algorithms for computing fractions with all four operations. This unit does not explicitly teach a specific or preferred algorithm for working with rational numbers. Instead, it helps the teacher create a classroom environment in which students work on problems and generate strategies that make sense to them. At a point in the development of each operation, students are asked to pull together their strategies into an algorithm that works for all situations involving that operation on fractions. As they work individually, in groups, and as a whole class, students practice the algorithms to develop skill and fluency in carrying them out. This development process allows students to recognize special cases that can be easily handled and also provides students with an efficient general algorithm that works for all cases within an operation.

Student Learning Outcomes:

- **6.NS.A.1** Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) (3/4) = 8/9 because 3/4 of 8/9 is 2/3. In general, (a/b) (c/d) = ad/bc. How much chocolate will each person get if three people share 1/2 lb. of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mile and area 1/2 square mile?*

Additional Learning Outcomes:

- **6.NS.B.3, 6.NS.B.4**
- **6.EE.A.2, 6.EE.B.3, 6.EE.B.6, 6.EE.B.7**

Notes/Additional Resources:

Investigation 1 focuses on adding and subtracting fractions. Investigation 2 focuses on multiplying fractions. These are 5th grade standards. Depending on students' proficiency with this content, time can be shifted from Investigations 1 and 2 to Investigations 3 and 4.

Through their work in this unit students will:

- Solve division problems involving fractional dividends and divisors;
- Develop a general algorithm for dividing fractions; and
- Recognize which operation is called for in problem situations involving fractions.

Notes about "Unfinished Learning" During 5th Grade Remote Learning

- *Students completed units on strategies for multiplication and division for large numbers before remote learning began.*
- *Students completed a unit on adding and subtracting fractions before remote learning began; and*
- *Students completed a unit on multiplying and dividing fractions and multiplying and dividing decimals during remote learning.*

Suggestions for Connecting to 5th Grade Concepts:

- *Make sure students have a conceptual understanding of how operations with fractions are the same as or different from operations with whole numbers (e.g., multiplying by a number less than 1 results in a value smaller than the multiplicand).*
- *Before students develop a general algorithm for dividing fractions, they should use area models and number lines or other representations to build conceptual understanding of what it means to divide fractions.*

BOSTON Public Schools
Focus on Children

UNFINISHED LEARNING

Each year, many students pass from one grade level to the next without achieving full proficiency with each and every Standard for Mathematical Content. This year, this is even more likely to be the case given the challenges of remote learning. What are meaningful strategies for addressing this unfinished learning?

Here are some steps we caution against:

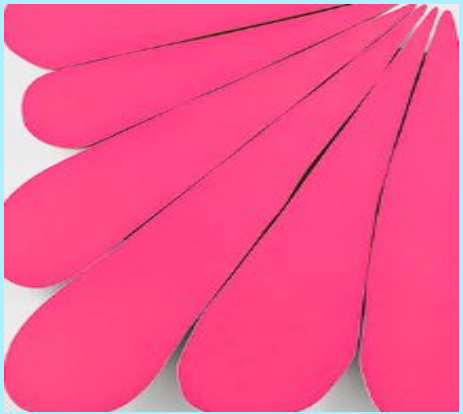
1. Resist the temptation to give an assessment at the very start of the school year to identify "learning gaps."
2. Resist the temptation to use time this fall to re/pre-teach unfinished content from last year.
3. Resist the temptation to re/pre-teach content that *you think* is needed in order for students to successfully solve problems and tasks that you are using to engage students in new learning.

Instead of using the approaches above, we recommend doing the following:

1. Examine the math curriculum documents for the important math ideas students were expected to learn in their grade or course last year that may likely be characterized as unfinished learning.
2. Connect the math ideas associated with unfinished learning to content you will be teaching this school year.
3. Plan lessons that address this year's content in a meaningful context while also identifying ways to use this same context to explore any unfinished learning.

Excerpts from 2020-2021 mathematics curriculum documents prepared for each grade level or course by the BPS Math Department

If schools continue online learning, what are possible strategies for successful learning?



Better Support for Teachers

- Learning to position vulnerable students as strong mathematical thinkers who contribute to the work of the class
- Learning to leveraging mathematical contexts that elicit the “funds of knowledge” of vulnerable students
- Building pedagogical content knowledge needed to recognize and address unfinished learning and learning about prior content

Better Support for School Administrators

- Understanding features of ambitious teaching and how it prepares students to succeed including on high stakes tests
- Forging a shared vision with those who supervise and support school administrators

Better Support for Families

- Exploring what it means to think and reason mathematically and ideas for doing this at home
- Identifying strengths their children bring to the mathematical work of the class (and beyond)

Supporting Teachers, Students, Families, Administrators, and Other Stakeholders in Mathematics Teaching and Learning

National Academy of Education

Trena Wilkerson, NCTM President
Baylor University

Robert Berry, NCTM Past-President
University of Virginia

Shifting, Changing, Adapting

- Support teachers and provide opportunities/structures for collaboration.
- Collective Professional Collaboration and Leadership
- Social and emotional aspects are significant considerations
- Build and sustain a positive identity and disposition toward mathematics for all teachers and students.
- Communicate with, engage with, and support our families and community
- Ensure that we are increasing, not decreasing, opportunities for each and every student.
- Asset (strength-based) rather than deficit lens-Experiences students bring to the learning

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www.nctm.org/100
https://www.nctm.org/online-learning/

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Next Webinars

The Zoom rooms used for the sessions are limited to 1000 participants. In the event that we reach capacity and you are unable to enter the session, you can watch the session on Facebook Live or view the recording the following day.

Aug 31, 2020 07:00 PM EDT
Place Value Understanding Through the Lens of an Elementary Student: Seems so easy but is it?!
+ REGISTER

Sep 01, 2020 07:00 PM EDT
Reasoning Talks: Creating Number Talk Reasoning Structures for Grades 6–8
+ REGISTER

Sep 02, 2020 07:00 PM EDT
Quadratic Quandary: Where and How Do Quadratic Functions and Equations Fit?
+ REGISTER

Sep 14, 2020 07:00 PM EDT
Building Students' Mathematical Competence
+ REGISTER

Upcoming Webinars

Webinars will be held every night at 7 p.m. Eastern time for 100 days starting on April 1, 2020

Past Recordings

All sessions will be recorded and posted the day after the live event.

Presenters

A variety of presenters and topics are geared to meet all grade bands and interests.

Search

SEARCH...

Topics reset filters

All | Communication | Equity | Teaching Practices | Technology | Assessment | Curriculum | Problem Solving | Teaching and Learning Instruction | Professional Development | Connections | Research into Practice | Reasoning | Representation | Mathematical Practices | Problem

Grade Band

All | 3rd to 5th | 6th to 8th | High School | Higher Education | PreK to 2nd

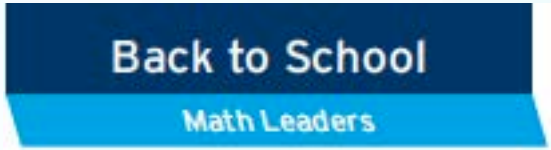
Plan/prepare for teaching and learning

- How do you translate effective classroom teaching into online strategies?
- How do you use technology to promote classroom discourse?
- Be strategic about the physical arrangement of the learning environment and the availability of instructional tools.
- In face-to-face instruction, create plans for working/ disinfecting with shared tools- such as manipulatives, rulers, etc.

Plan/prepare for teaching and learning, cont.

- In remote instruction, consider alternatives such as virtual manipulatives, objects available in most homes, easily made manipulatives, sketches of manipulatives
- Continue to empower students as thinkers and doers of Mathematics.
- Focus instructional strategies on effective mathematics teaching practices
- Attend to special populations: young children, children with disabilities & special learning needs, English learners, home environments not conducive to online learning

Back To School Task Force Webinars July 27-30, 2020



1. What Should Math Learning Look Like When We Get Back to School?
2. Understanding the Mental Toll: Signals and Strategies for Supporting Our Teachers and Students
3. Mathematics Leadership in Times of Unprecedented Change: Catalyzing, Building, and Sustaining Positive Change
4. Opportunities and Challenges at District and School Levels: Making Back to School and Teaching Mathematics Work for All Students and Teachers

https://www.nctm.org/backtoschool/

Back to School Resources

"There are many uncertainties right now. We are continuing to collaborate and listen to teachers. At the heart of their concerns are how they can best do their job of continuing to engage students in learning meaningful mathematics in this new environment."
-Trena Wilkerson, NCTM President

Back to school is different this year. The challenge, and opportunity, for each teacher to make a positive difference for each and every one of their students has never been as needed. NCTM is proud to be working alongside dedicated mathematics educators during these unprecedented times.

Over the next six weeks, targeted grab and go resources from our NCTM community will work to support us in key areas and will help us to stay more connected as we share our questions and ideas through MyNCTM, Instagram, Twitter, and Facebook using the hashtag **#NCTMBacktoSchool**. Join us as we work, share, question, grow and thrive together in this endeavor!

Week 1: Back to School Task Force

Week 2: Powerful Practices

High-leverage, effective mathematics teaching practices

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

NCTM. 2014. *Principles to Actions: Ensuring Mathematical Success for All*. www.nctm.org/pta

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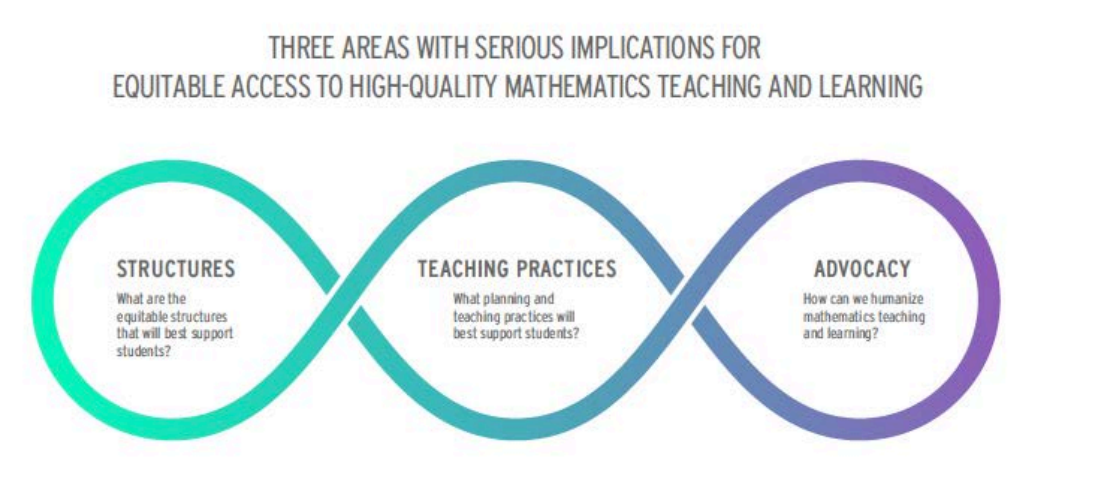
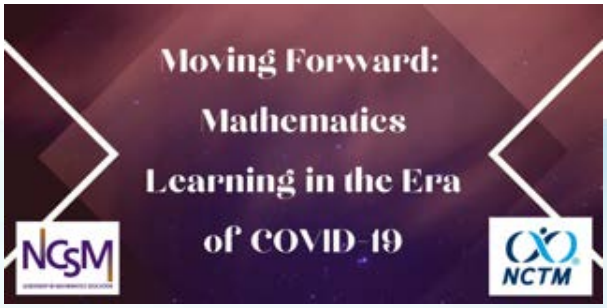
Moving Forward: Mathematics Learning in the Era of COVID-19

NCTM | NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS

NCSM
LEADERSHIP IN MATHEMATICS EDUCATION

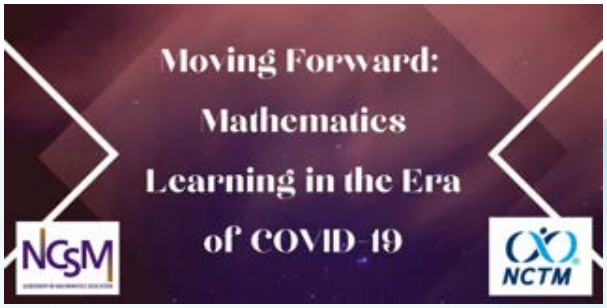


https://www.nctm.org/Research-and-Advocacy/Moving-Forward---NCSM-and-NCTM-Joint-Statement/



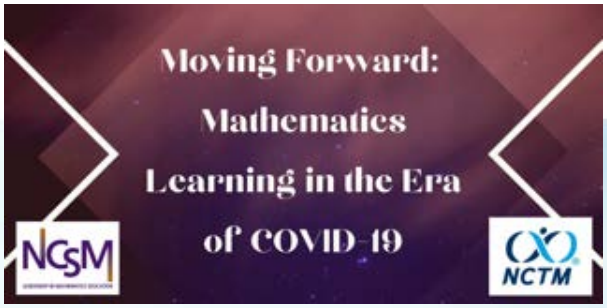
Structures

- Engage in heterogeneous groupings, both between and within classes
- Provide differentiated support for each student to reach grade-level standards
- Provide just-in-time interventions designed using effective formative assessments
- Teachers participate in regular professional learning to grow their skills and collaborate to plan effective and flexible instruction



Teaching

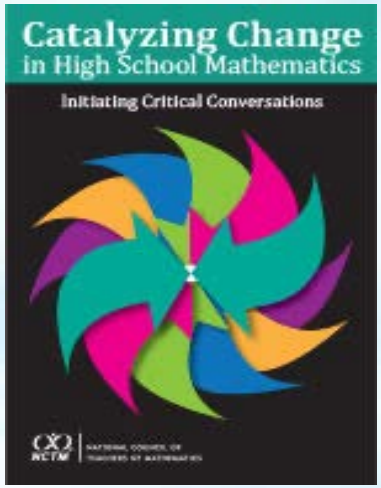
- Focus on essential learnings
- Ensure vertical coherence
- Use formative assessment tasks to support essential learnings
- Use evidence of student thinking to inform teaching practices and advance student learning
- Allocated the time and created the structures for collaborative planning
- Support teachers using the eight mathematical teaching practices

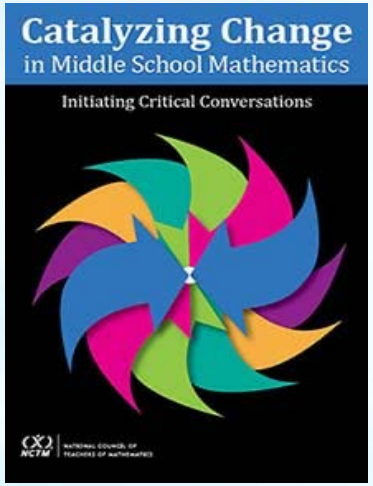


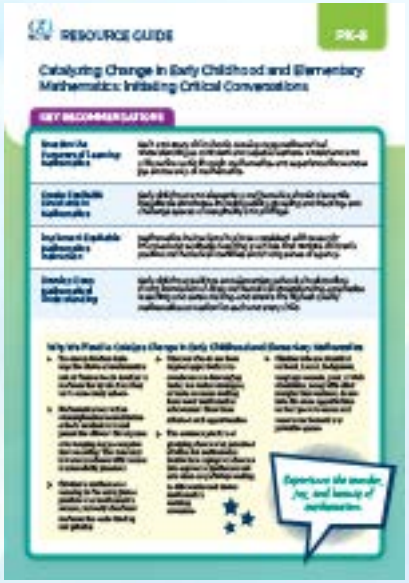
Advocacy

- Create a culture where professional learning and increasing teacher capacity are priorities
- Prioritize time and value teacher collaboration Integrate the use of tools and technology
- Increase transparency

Catalyzing Change Series







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

NCTM. (2018 & 2020). *Catalyzing Change,* Reston, VA: NCTM.

Broadening the Purposes of Learning Mathematics

	Early Childhood and Elementary	Middle School	High School
Broaden the Purposes of Learning Mathematics	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.

In what ways can individuals in our school and district communicate with educators, families, and children about broadening the multiple purposes of school mathematics and related shifts in learning?

Creating Equitable Structures in Mathematics

	Early Childhood and Elementary	Middle School	High School
Creating Equitable Structures in Mathematics	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.
What are the support structures needed to dismantle and disrupt policies, practices, and procedure that limit students' access to high-quality mathematics teaching and curriculum?			

Implementing Equitable Mathematics Instruction

	Early Childhood and Elementary	Middle School	High School
Implementing Equitable Mathematics Instruction	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?			

Develop Deep Mathematical Understanding

	Early Childhood and Elementary	Middle School	High School
Develop Deep Mathematical Understanding	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?

Actions for Teachers, Schools, & Districts

Catalyzing Change, 2018, 2020

- Analyzing and evaluating systemic policies, practices, and procedures that restrict student access and success in mathematics
- Consistently implementing and linking research-informed instructional practices and equity-based instructional practices
- Develop assessment that are aligned with and emphasize deep understanding of mathematical processes, practices, and content—not used to categorize students
- Providing teachers and mathematics curriculum leaders with time to collaborate

Actions for Teachers, Schools, & Districts

Catalyzing Change, 2018, 2020

- Providing teachers with time and space to collaborate with one another on instructional issues and continue their own professional learning
- Recruit, support, and retain a diverse and high-quality mathematics teaching workforce.
- Analyzing teachers' assignments to provide high-quality, engaging learning experiences for all students
- Strengthen partnership with families and communities

Thank You!

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National Academy of Education COVID-19 and Inequities in Education Forum Series

Mathematics Instruction in the COVID-19 Era

Thank You!

Summary report available at

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