

REIMAGINING EDUCATION DURING COVID-19 and BEYOND

Effective Instructional Strategies for Teaching Mathematics

2020 Fall Virtual Instructional Leadership Conference
October 6-7, 2020

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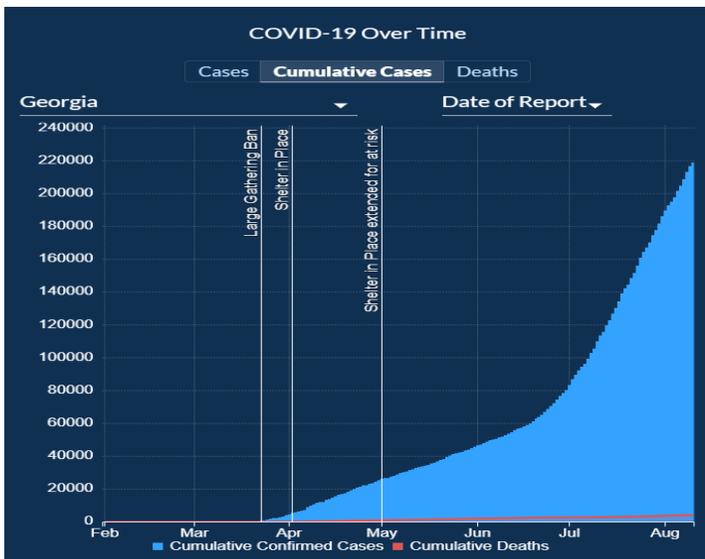
Session Logistics

- **Handouts:** Session handouts are available for download in the handouts section on your screen and at www.gadoe.org/sdeevents
- **Questions:** Use the question box to type questions or comments throughout the presentation
- **Feedback:** We ask all participants complete the pop-up feedback survey after the close of the session
- **Recording:** A link to the session recording and certificate of attendance will be emailed in 24-hours
- **On Demand:** All sessions will be available on-demand following the conference on the [SDE Events and Conference webpage](#)

Session Goals

- Provide evidence-based teaching and learning practices that leaders can provide for teachers to increase student learning
- Share high-quality resources for mathematics teaching and learning
- Provide a focus on mathematics equity for all learners

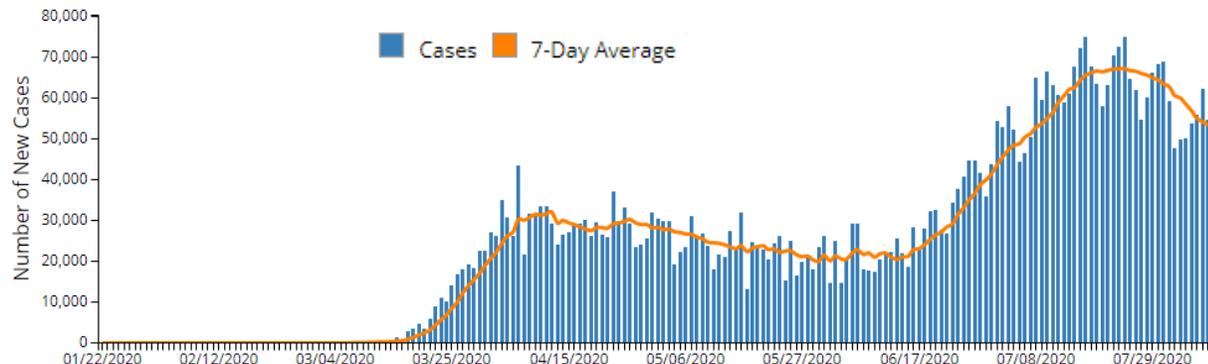
Ice Breaker – Which One Doesn't Belong?



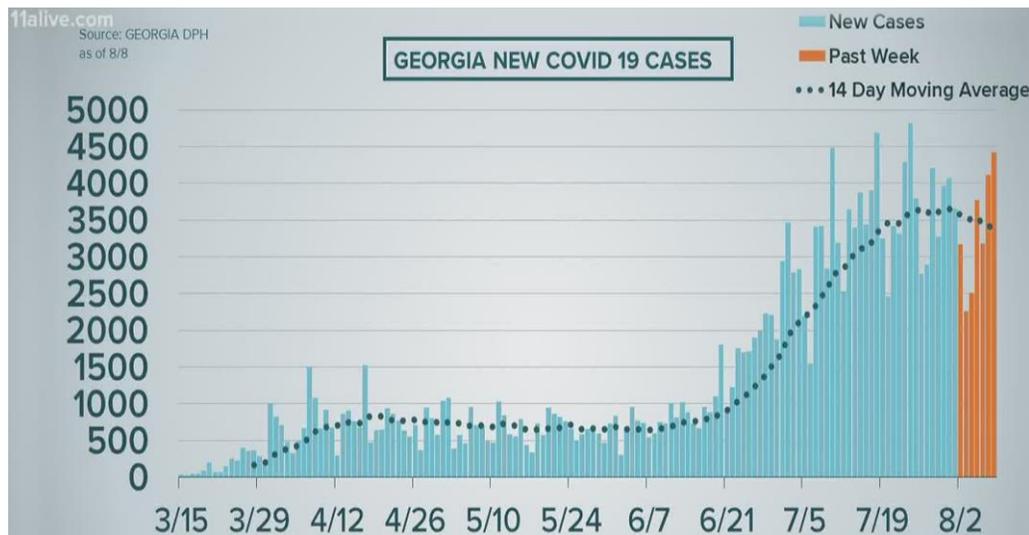
Source: <https://dph.georgia.gov/covid-19-daily-status-report>

New Cases by Day

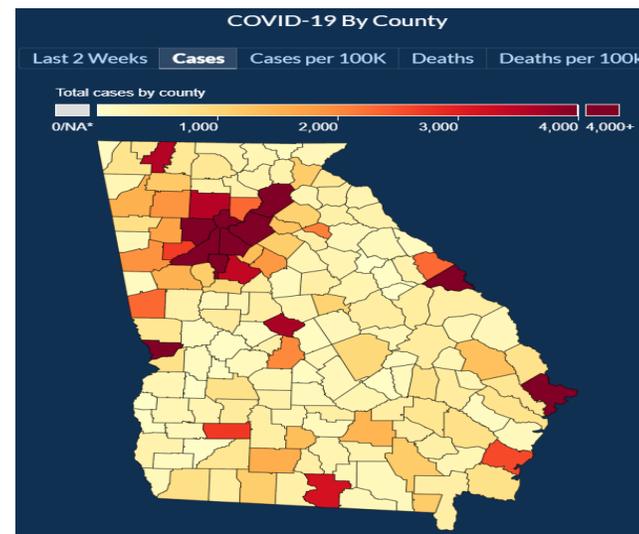
The following chart shows the number of new COVID-19 cases reported each day in the U.S. since the beginning of the outbreak. Hover over the bars to see the number of new cases by day.



Source: <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>



Source: www.11alive.com



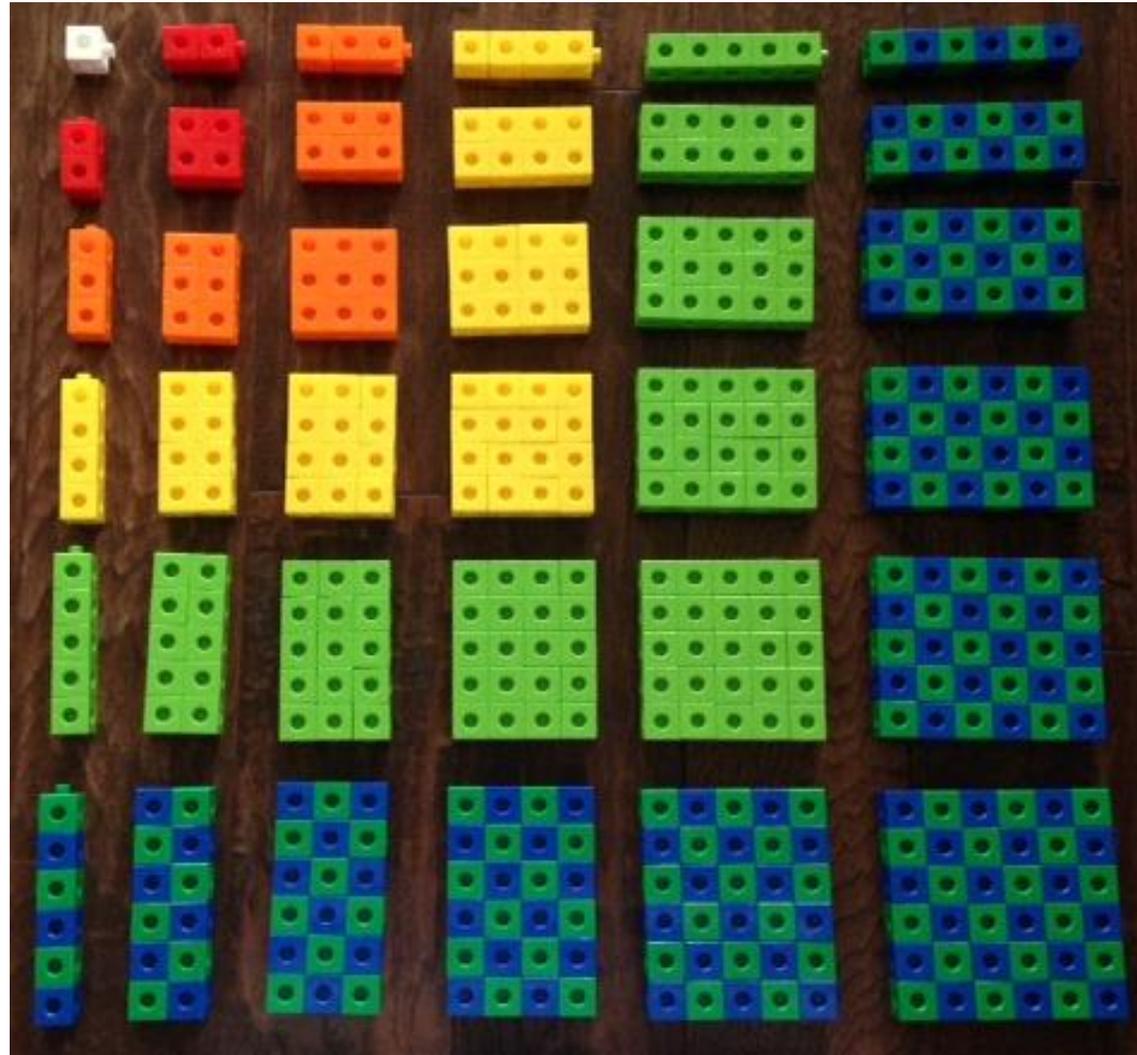
Source: <https://dph.georgia.gov/covid-19-daily-status-report>

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Notice & Wonder





•“Often people will make the mistake of looking at online learning from the perspective of what's available in terms of technology and then figuring out how to use that as a teacher. It's more important to look at how **YOU** want to teach and what's out there to help you do that.”

—Mike Flynn (2020)

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Mathematical Proficiency

- **conceptual understanding**—comprehension of mathematical concepts, operations, and relations
- **procedural fluency**—skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
- **strategic competence**—ability to formulate, represent, and solve mathematical problems
- **adaptive reasoning**—capacity for logical thought, reflection, explanation, and justification
- **productive disposition**—habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy.

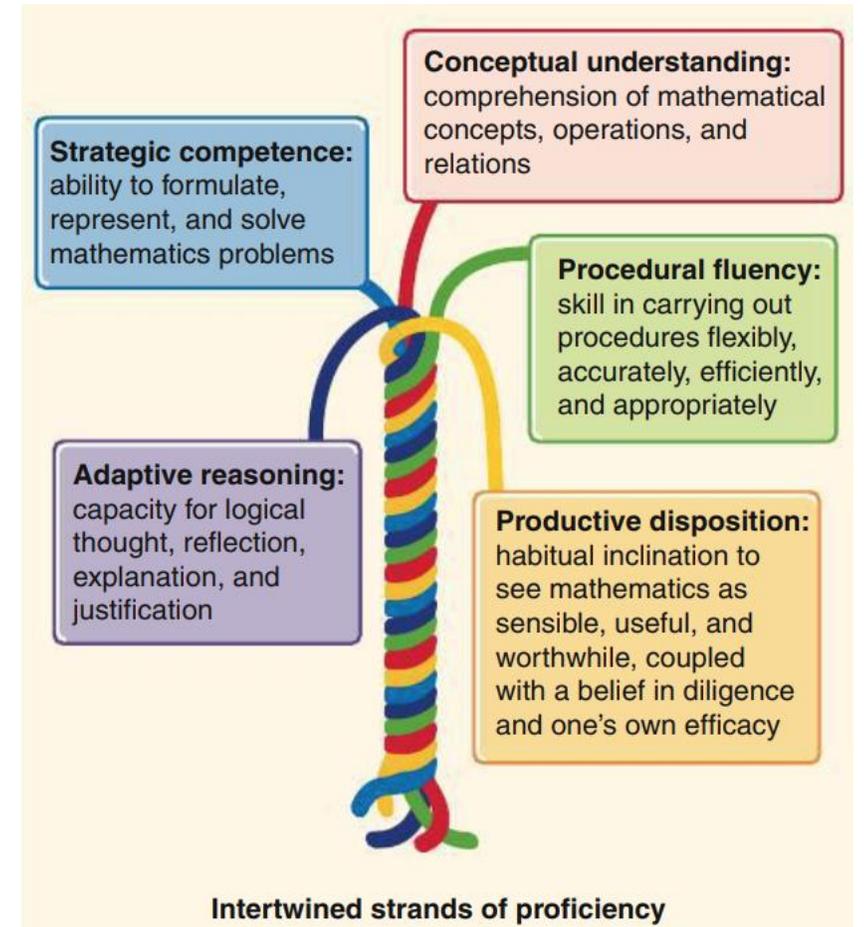


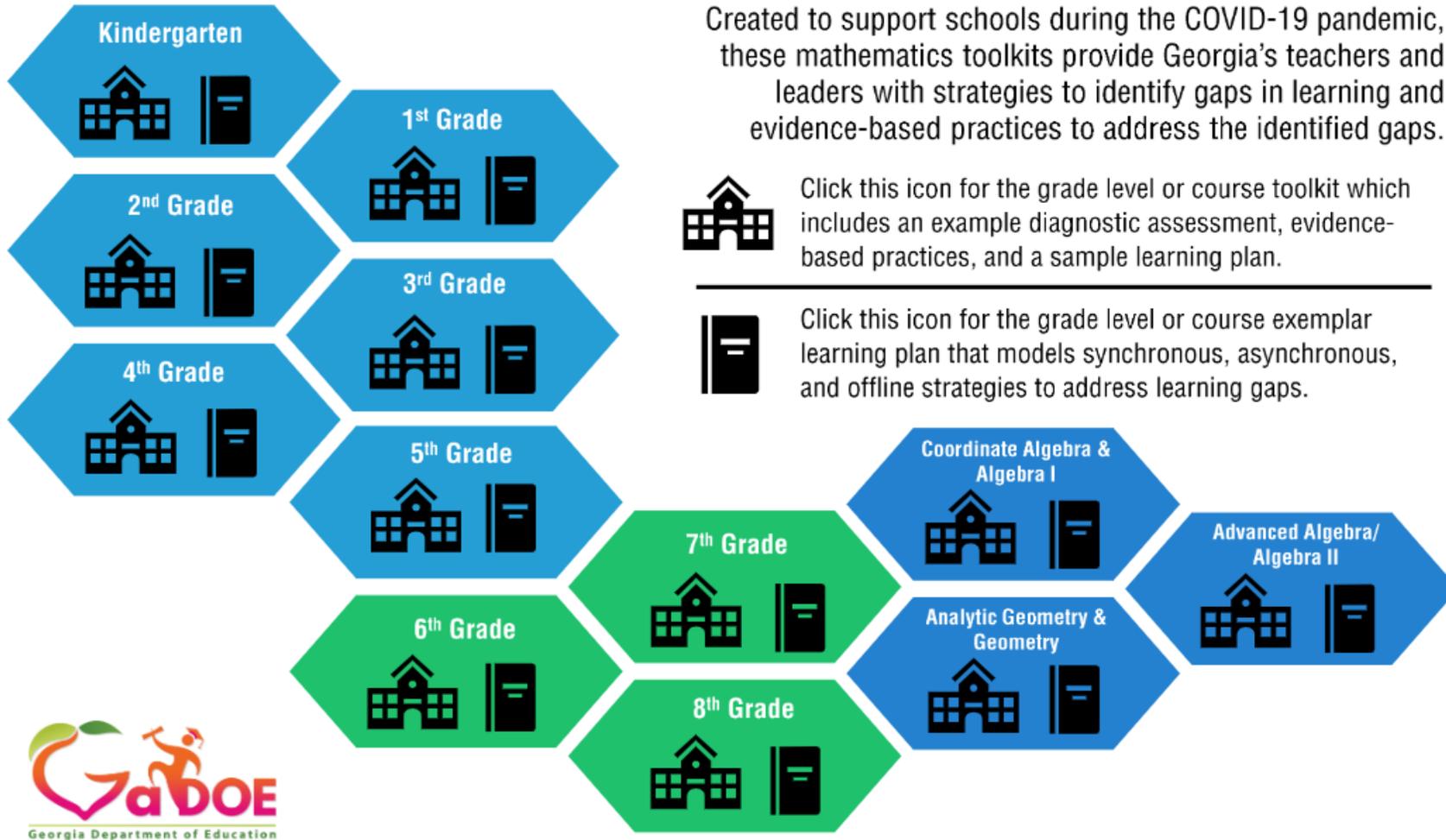
Image source: *Adding it Up: Helping Children Learn Mathematics*

Doing mathematics in (virtual) classrooms should closely model the act of doing mathematics in the real world.

~ Elementary and Middle School Mathematics: Teaching Developmentally, 9th Edition.

2020 Guides for Effective Mathematics Instruction Overview

2020 Guides for Effective Mathematics Instruction



Scavenger Hunt (5 minutes)

Components of the BELTS framework	Evidence-based, research-based instructional strategies
Distance learning supports	Supports for students

2020 Guide for Effective Mathematics Instruction



Essential Knowledge and Skills for Mathematics High School

For a complete understanding of the essential knowledge and skills for Mathematics, read the Mathematics GSE in their entirety.
The 8 Standards for Mathematical Practices should be interwoven throughout all units of study and lessons.

<p>Coordinate Algebra (and CA Support)</p> <ul style="list-style-type: none"> Interpret relationships between quantities Analyze, graph, and solve linear equations and inequalities to interpret solutions Solve systems of linear equations and interpret solutions in context Write, interpret, and use expressions and equations based on linear and exponential relationships Use function notation to analyze, graph, interpret, compare, and contrast linear and exponential relationships Use regression analysis and descriptive statistics to interpret data Interpret linear models Experiment with transformations in the plane Verify geometric relationships of figures in the coordinate plane using algebraic thinking, including interpreting distance as well as slopes of parallel and perpendicular lines 	<p>Analytic Geometry (and AG Support)</p> <ul style="list-style-type: none"> Analyze and solve quadratic functions and use quadratic models to interpret solutions Develop an understanding of congruence in terms of rigid motions Use similarity and congruence to prove theorems Apply similarity in right triangles to understand right triangle trigonometry Investigate geometric constructions Use properties of rational and irrational numbers to rewrite expressions involving square roots to solve problems Write, interpret, and use expressions and equations based on quadratic relationships Use function notation to analyze, graph, and interpret quadratic functions Derive, model, and apply equations of circles Model problems using circles with and without coordinates Find and analyze volume of solid figures Develop an understanding of independence and conditional probability to solve problems 	<p>Advanced Algebra (and AA Support)</p> <ul style="list-style-type: none"> Draw inferences and conclusions based on data Extend the laws of exponents to rational exponents Analyze, solve, and interpret quadratic equations with complex solutions Write, interpret, and use expressions, equations, and inequalities based on quadratic, polynomial, rational, radical, exponential, and logarithmic relationships Graph different types of functions Interpret the average rate of change of a function
<p>Algebra I (and A1 Support)</p> <ul style="list-style-type: none"> Interpret relationships between quantities Analyze, graph, and solve linear equations and inequalities to interpret solutions Solve systems of linear equations and interpret solutions in context Use properties of rational and irrational numbers to rewrite expressions involving square roots to solve problems Write, interpret, and use expressions and equations based on linear, exponential, and quadratic relationships Analyze and solve quadratic functions and use quadratic models to interpret and solve problems Use function notation to analyze, graph, interpret, and compare linear, exponential, and quadratic functions Use regression analysis and descriptive statistics to interpret data 	<p>Geometry (and Geo Support)</p> <ul style="list-style-type: none"> Develop an understanding of independence and conditional probability and apply probability to solve problems Experiment with transformations in the plane Develop an understanding of congruence in terms of rigid motions Use the concepts of similarity and congruence to prove theorems Apply similarity in right triangles to understand right triangle trigonometry Derive, model, and apply equations of circles Model problems using circles with and without coordinates Find and analyze volume of solid figures Verify geometric relationships of figures in the coordinate plane using algebraic thinking, including interpreting distance as well as slopes of parallel and perpendicular lines 	<p>Algebra II (and A2 Support)</p> <ul style="list-style-type: none"> Draw inferences and conclusions based on data Extend the laws of exponents to rational exponents Analyze, solve, and interpret quadratic equations with complex solutions Write, interpret, and use expressions, equations, and inequalities based on quadratic, polynomial, rational, radical, exponential, and logarithmic relationships Graph different types of functions Interpret the average rate of change of a function

Georgia Department of Education • June 2020

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Essential Knowledge and Skills for Mathematics

Anticipating Student Thinking

Interpreting Algebraic Expressions

1. Write an algebraic expression for each of the following:
 - a. Subtract 2 from the product of 3 and b .
 - b. Subtract 2 from b and then multiply by 3.
 - c. Divide b by 3 and then add 2.
 - d. Divide the sum of b and 2 by 3.
 - e. Square the product of 3 and b .
 - f. Multiply b by b and then multiply by 3.

Evidence-Based, Research-Based

Evidence-Based Practices Overview

Evidence-Based, Research-Based Practices	Purpose										
	Increase Engagement	Integrated Framework	Contextualized Learning	Modeling with Mathematics	Math Talks	Patient Problem-Solving	Mindset	Conceptual Understanding	Numeracy Development	Productive Discussions	Critical Thinking
21st Century Learning	X	X				X					X
3-Act Math Tasks	X		X	X		X		X		X	
Arts Integration	X		X							X	
Bootstrap		X									
Cognitively Guided Instruction			X	X				X		X	X
Collaborative Groupwork	X									X	
Computational Thinking and Computational Literacy								X			X
Gamification	X										
Guts		X	X								
Incorporating the 8 Standards for Mathematical Practice			X	X		X	X	X		X	X
Modeling with Mathematics	X		X					X		X	X
Multiple Representations				X				X			X
Novel Engineering		X	X								X
Number Talks	X				X				X	X	X
Numberless Word Problems						X		X	X		X
Numeracy Intervention Resources								X	X		
Patient Problem-Solving	X			X				X			X
Pattern Talks	X				X			X		X	X
Positive Mathematical Mindsets and Productive Struggle	X					X	X				X
Problem-Based Learning	√		√	√		√					√

Instructional Design

Many of these activities have been adapted from an Illustrative Mathematics lesson titled, "Equivalent Equations". Found here:

<https://curriculum.illustrativemathematics.org/HS/teachers/1/2/6/preparation.html>

Engage

(Include an evidence-based instructional strategy that can be used as an introduction that mentally engages students to capture their interest, provides an opportunity to communicate what they know, and allow them to connect what they know to new ideas)

- **Synchronous** : Presented like a [Number Talk](#), write an equation on the board and have students think of an equivalent equation. They should be encouraged to remain quiet and think of multiple equivalent equations so that all students have time to think about their responses. Example: $6x + 9 = 12$. Responses might include: $2x + 3 = 4$, $3x + 4.5 = 6$, etc. After a few minutes, the teacher can record their responses and allow students to self-correct, listen to each other, and share strategies for finding equivalent equations. Extension: Ask students how they might represent the equation without using any numbers (i.e. pictorial representation). How do you know these equations are equivalent?
- **Asynchronous**
Using a tool such as [Flipgrid](#), present an equation to the students and instruct them to respond with an equivalent equation. They should then respond to a classmate with questions about their strategy, comments about how their equations are similar or different, an explanation of how their equations are equivalent, etc.
- **Unplugged/ Offline**
Consider having students keep a journal for daily math entries. The prompt for this day could be: Given the following equation, write as many equivalent equations as you can. How do you know when two equations are equivalent? How do you know when two equations are NOT equivalent? Support your response with at least three examples.

Explore

(Include an evidence-based instructional strategy that allows students to engage in hands-on activities to explore the new concept/big idea at a deep level)

- **Synchronous** – [Seesaw 3-Act](#) task by Graham Fletcher. [Click here](#) to read more about 3-Act tasks as a strategy for engaging students in more conceptual learning of mathematics.
- **Asynchronous** – The Seesaw 3-Act task has been reworked into an online [Desmos activity](#), [click here](#).
- **Unplugged/ Offline** -- The Seesaw 3-Act task has been adapted into an [offline activity](#). Students can complete the activity like a worksheet. It would be great to encourage dialogue between the different questions, to whatever degree you have the ability to facilitate with your students.

Planning for Instruction

- Engage
- Explore
- Apply
- Reflect
- Synchronous
- Asynchronous
- Unplugged/offline

Leadership Guidance

NEW Resources

Back-to-School Resources

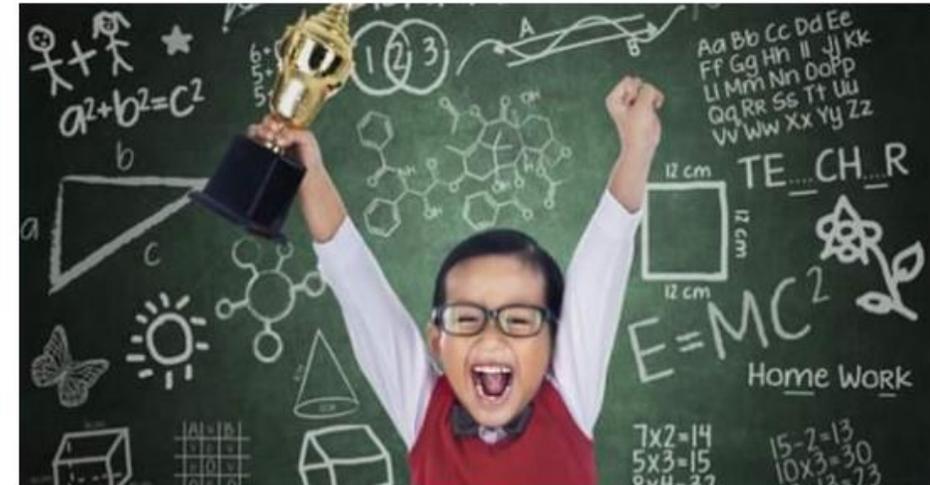
This toolkit was created for each grade level and course to support mathematics classroom teachers with the implementation of best practices in the remote learning environment. This was specifically created to support teaching professionals during the 2020 COVID-19 era.

2nd Grade

2020 Guide for Effective Mathematics Instruction

A Teacher Toolkit for Student Success

This 2020 Teaching and Learning Toolkit is provided to support teachers and learners in the mathematics classroom (especially during the COVID-19 era).



NEW Resources

embedded in each grade level guide

Distance Learning Resources

Sample learning plans with exemplar diagnostic assessments, evidence-based practices, resources, plugged and unplugged activities, and ideas for differentiation and acceleration for each grade and course.



Sample Mathematics Learning Plan

Big Idea/ Topic

- Experiment with transformations in the plane and develop an understanding of congruence in terms of rigid motion.

Standard(s) Alignment

MGSE9-12.G.CO.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

MGSE9-12.G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

MGSE9-12.G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

MGSE9-12.G.CO.5 Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

Diagnostic Assessment

When completing the diagnostic assessment task found at the link below, students will translate, reflect, and rotate a shape about the origin. The student will also compare transformations to determine if figures are congruent.

[Analytic Geometry and Geometry Diagnostic Exemplar Tasks](#)

This assessment task can be used to diagnose students' level of understanding of the big idea and standards addressed in this learning plan.

Over 1300 Curated K-12 Remote Learning Resources



Introduction		
Kindergarten	1st Grade	2nd Grade
3rd Grade	4th Grade	5th Grade
6th Grade	7th Grade	8th Grade
Coordinate Algebra	Algebra I	Analytic Geometry
Geometry	Algebra II - Advanced Algebra	Precalculus
	Calculus-Based HS Courses	All Other HS Courses
Additional Teacher Resources		



Georgia Home Classroom

The screenshot shows the website's navigation bar with the GPB logo and links for TV, Radio, News, Education, Sports, Events, Kids & Family, and Support Us. On the right, there are buttons for SEARCH, PASSPORT, and DONATE. Below the navigation is a large banner with a chalkboard background. The banner features the Georgia Home Classroom logo and the text "Getting Ready for K-3" in large white letters. The chalkboard is decorated with various educational icons like a planet, musical notes, a comet, a rocket, a lightbulb, a globe, and an atom.

[EDUCATION](#) | [ENGLISH LANGUAGE ARTS](#) | [MATHEMATICS](#) | [PHYSICAL HEALTH AND WELLNESS](#) | [SCIENCE](#) | [SOCIAL STUDIES](#) | [PRESCHOOL-PREK](#) | [K-2](#)

Getting Ready for K-3 Guides



These "Getting Ready" guides will help families understand what children entering K-3 have already learned and can expect to learn when they get back to school. The guides are available in English and Spanish.

Let's Learn Georgia!

gpb.org/education/learn/lets-learn-ga/mathematics

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Programs Podcasts Apps | TRENDING: Election 2020 Georgia Home Classroom High School Football Scores

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EDUCATION | LET'S LEARN GA! | MATHEMATICS | K-2 | 3-5

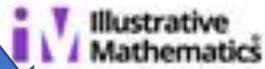
Let's Learn GA! - Mathematics



<https://www.gpb.org/education/learn/lets-learn-ga/mathematics>

Illustrative Mathematics

OERs available here



Search by grade level
or content standards



Additional resources
for distance learning

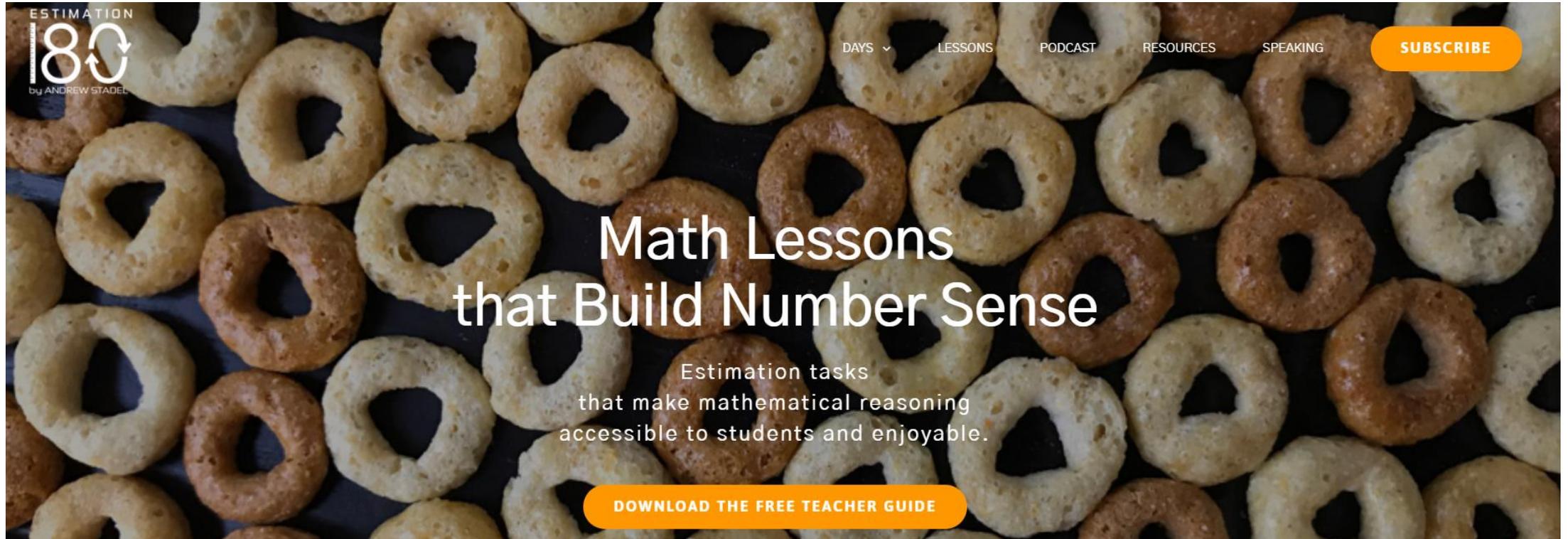


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*Creating a world where learners
know, use, and enjoy mathematics.*

Estimation 180



ESTIMATION
180
by ANDREW STADEL

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Math Lessons that Build Number Sense

Estimation tasks
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accessible to students and enjoyable.

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desmos

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Let's learn together.

We're on a mission to help every student learn math and love learning math.

Graphing Calculator

DESMOS

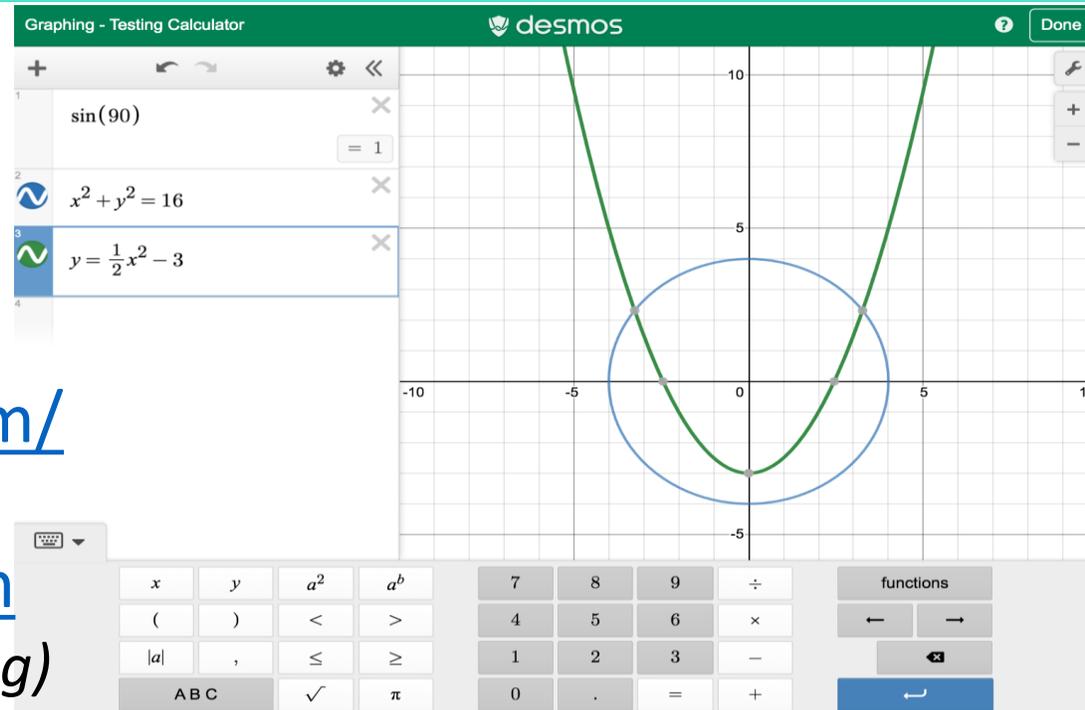
www.desmos.com

<https://teacher.desmos.com/>

(Teacher Resources)

<https://learn.desmos.com>

(Resources for Distance Learning)



Four Corners (5 minutes)

A.

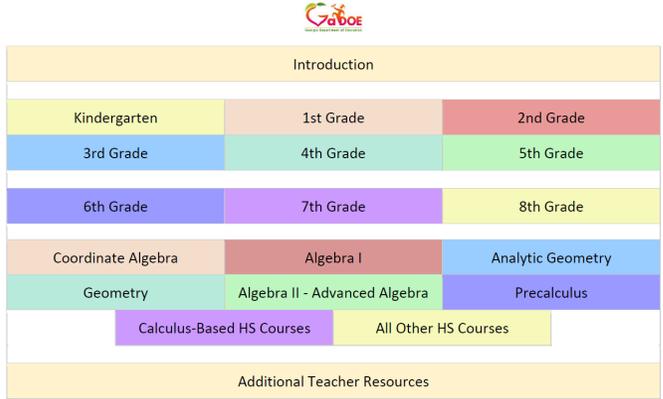


Table of Contents
2

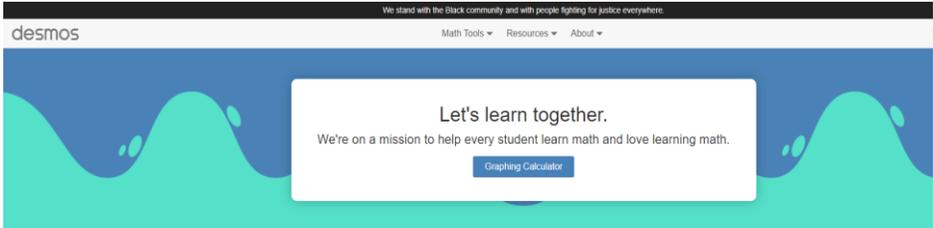
B.



C.



D.



<https://padlet.com/georgiamathematics/MathematicsResources>

Integrated Instructional Supports for All Students



Richard Woods, Georgia's School Superintendent

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Home → Teaching and Learning → Curriculum and Instruction → Integrated Instructional Supports for All Students

Libraries

Content Areas

- Computer Science
- English Language Arts
- Fine Arts
- Gifted Education
- Health & Physical Education
- Literacy Reading
- Mathematics
- Science
- Social Studies
- STEAM/STEM
- World Languages & Global Initiatives

Other Programs

- L4GA
- Early Intervention Program (EIP)
- Instructional Materials/Learning Resources/Toolkits

Integrated Instructional Supports for All Students

Integrated Instructional Supports for All Students provides resources for students, families, and teachers curated and developed by our Curriculum and Instruction Content Integration Specialists. A dedicated team member in each content area works with our Special Education Services and Supports to inform and coordinate efforts as we strive to educate the Whole Child.

New Resources

The Georgia Department of Education's Content Integration Specialists are pleased to release content (Social Studies, ELA, Math, and Science) specific resources to serve the needs of all students participating in distance/virtual learning.

Getting Ready for K-3rd Guides

- As part of Georgia Home Classroom, the Georgia Department of Education (GaDOE) has identified key skills for children getting ready for kindergarten through third grade. These skills will help families understand what children have already learned and can expect to learn when they get back to school.

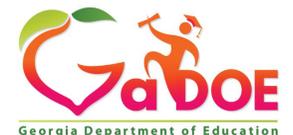
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Jennifer Zoumeris



Equity Instructional Planning Look For Document

- This document is to assist teachers in evaluating their lessons for equity during the planning process.
- This document can be found in the Teacher Resource Link (TRL) essential tool kit in the need to know bucket
- Link to [Look Fors document](#)



Equity Instructional Planning Look Fors

Big Ideas	Teacher Look Fors	Student Supports
Content Standards	<p>This lesson aligns to the Georgia Standards of Excellence.</p> <p>This lesson addresses all parts of the Georgia Standards of Excellence (not just the content).</p>	<p>All our students should be working toward learning the content that is outlined in the Georgia Standards of Excellence.</p> <p>Making content more accessible for all students can be accomplished using High Leverage Practices. These high leverage practices can be used to in every classroom to assist students in learning the material. <i>Some examples of high leverage practices are providing scaffolded supports, use explicit instruction, use flexible grouping and use strategies to promote active student engagement. More information is available on the CEEDAR-GA Project website. Use the following link to access that information: Georgia Department of Education</i></p>
Multiple Modalities	<p>This lesson utilizes the principles of Universal Design for Learning to assist ALL students in accessing, using and expressing the material.</p>	<p>Present materials in multiple ways. <i>This could include using articles, videos, verbally explaining to the student, making the lesson tactile, making the lesson visual and having inquiry.</i></p> <p>The students should be able to show their knowledge in multiple formats. <i>Some of these formats could include writing, verbally explaining, discussion, creating a play, drawing or creating a presentation.</i></p>
Coherent Instruction	<p>This lesson considers the needs of students in the classroom and provides for the needs of those students using differentiated instruction to reach ALL students.</p>	<p>Providing equity in the classroom can take many forms depending on the student population which leads to the importance of differentiated instruction. The teacher should consider student needs and then differentiate instruction. A few examples of things to consider when differentiating are included below:</p> <ul style="list-style-type: none"> • Add some time for students to process material. • Provide explicit instruction in using graphic organizers, other instructional materials and social-emotional behaviors. • Chunking the material. • Repetition may be required for some students. • Provide visual representations.
Individualized Education Program	<p>This lesson is providing Specially Designed Instruction for each student with disabilities in the classroom.</p>	<p>The accommodations that are laid out by the IEP are required by federal law and the IEP committee has determined that the student requires this accommodation to be successful in the general education classroom. Make sure to add in any accommodations that are required by each student's IEP before proceeding.</p> <p>Ensure that the lesson adapts content, methodology and delivery of instruction as part of Specially Designed Instruction to address each student's unique needs in the class based on their disability to ensure access of the child to the general curriculum so that students can meet the same education standards that apply to all children. More information is available at the following link Georgia Department of Education.</p>



Elevator Speech

- Explore the Integrated Instructional Supports for All Students website
- What one resource would you share in your speech?



QUESTIONS????



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- (K-5): <https://www.edweb.net/georgiamathematicsk-5>
- (MS): <https://www.edweb.net/georgiamathematics6-8>
- (HS): <https://www.edweb.net/georgiamathematicsHS>



The logo for edWeb.net features a green arc above the text "edWeb.net" in a dark blue, serif font.

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WE ARE HERE TO SERVE YOU!

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Important Websites to Obtain Additional Information

www.gadoe.org/mathematics Georgia Mathematics Program Updates

www.edweb.net Professional Learning Communities

www.georgiastandards.org Curriculum Resources

Session Feedback

The Georgia Department of Education believes in continuous improvement and would appreciate your feedback to ensure the presentations we provide are of the highest quality and meet the needs of the specific audience.

Please take a moment after the session ends to complete the pop-up feedback survey.

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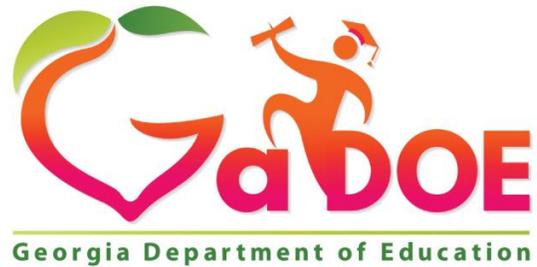
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**EDUCATING
GEORGIA'S FUTURE**

