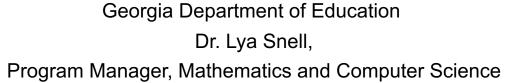


Elevating the Student Learning Experience





July 25, 2023





Introduction

- Dr. Lya Snell
 - Program Manager, Mathematics & Computer Science
 - Mathematics Enthusiast
 - STEM/STEAM Advocate
 - Background:
 - Director of Curriculum & Instruction, Title I, Title III/ESOL (Butts County Schools, GA)
 - K-12 Mathematics Coordinator (Henry County Schools, GA)
 - Mathematics Lead Teacher (Jackson High School, GA)
 - High School Mathematics Teacher (Jackson, GA and Selma, AL)
 - Pre-K Teacher (Dothan, AL)
 - Committees:
 - National Mathematics Standing Committee (NAEP)
 - High School Mathematics Pathways Task Force (NCTM)
 - Mathematics Advocacy Task Force (NCTM)
 - Launch Years Initiative Consensus Panel (Dana Center, TX)





Session Objectives

Mathematics Strategies and Resources to Support Student Learning

Participants will receive an overview of Georgia's K-12 Mathematics Standards, which are newly adopted for implementation in Fall 2023. There will be a focus on mathematics strategies and resources to support student learning.





What is Student Voice

Student Voice in mathematics is about empowering students and orchestrating opportunities for mathematical discourse focused on students' way of thinking centered around an authentic task.



Elevating Student Voice

Giving Voice to Students: Allowing students to engage in productive mathematics discourse and argumentation.

Developing Student Agency:
Creating environments where students feel empowered. They are in control of their own learning.



Questions for Teachers to Ponder:

- ✓ How often are students able to explain their thinking and learn from others?
- ✓ As an education professional, how often do you focus on instructional best practices in comparison to your time spent on other leadership responsibilities?
- ✓ What is the culture in your school or classroom as it relates to fostering the importance of STUDENT VOICE?
- ✓ In what ways do students feel acknowledged, appreciated, respected, and distinct as they are learning new content in the classroom?











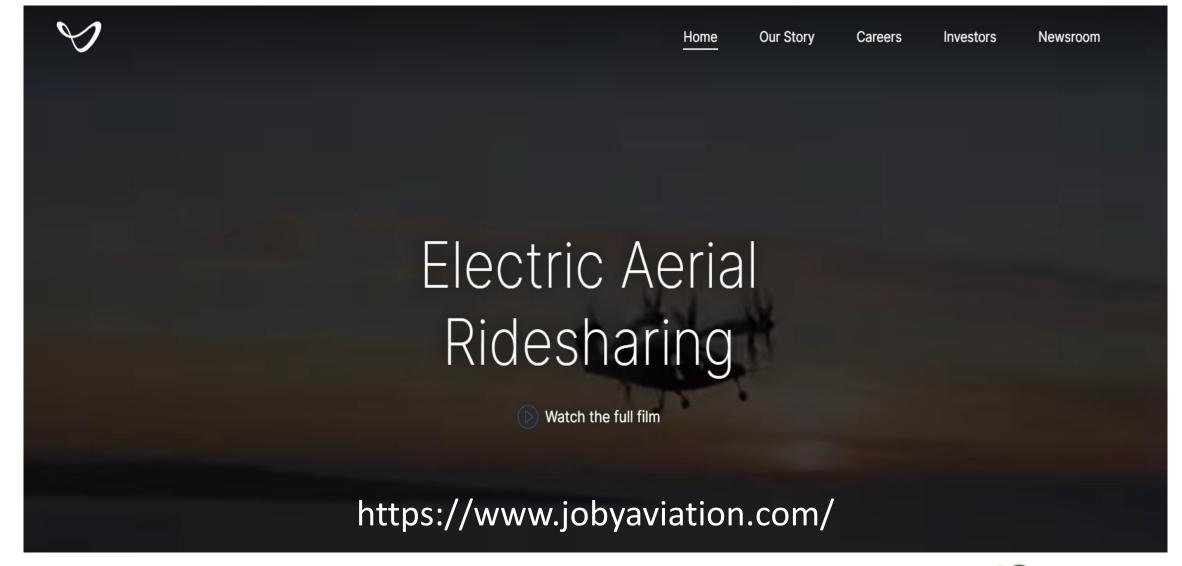




Archer Aviation, Inc. & Joby Aviation













Industry/ Workforce Needs of the Future

Preparing ALL Learners for Life



Jobs of the future will require an advanced level of mathematical reasoning and application, as well as data analysis and statistical reasoning and comprehension.



#BESTYEAREVER

"Education is the single most important job of the human race."

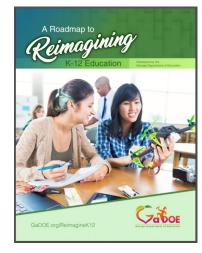
George Lucas

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Reimagining K-12 Education

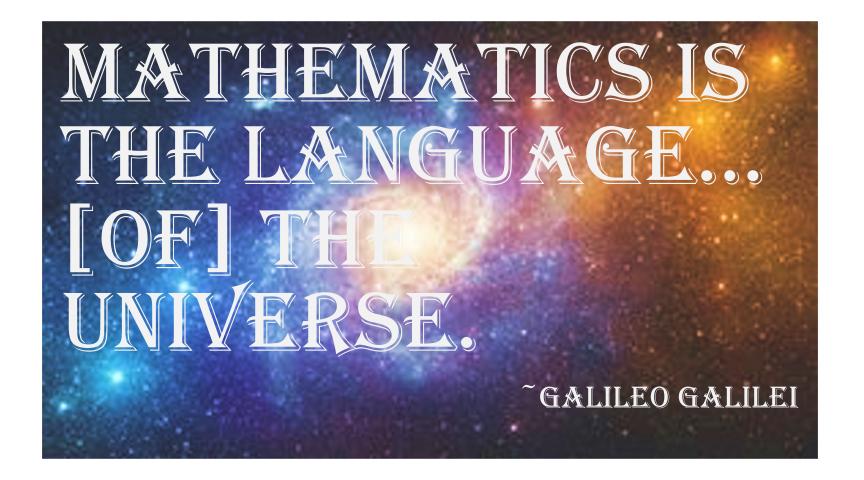
Preparing Students for Life







Mathematics is the Language of the Universe



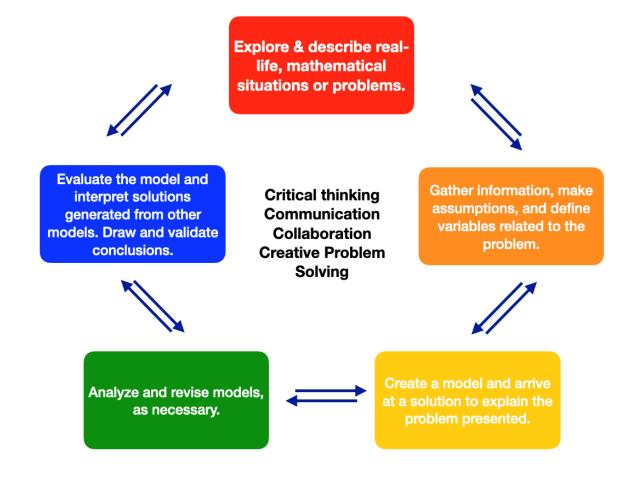


Elevating Student Voice Point #1: Jobs of the future will require an advanced level of mathematical reasoning and application, as well as data analysis and statistical reasoning and comprehension.



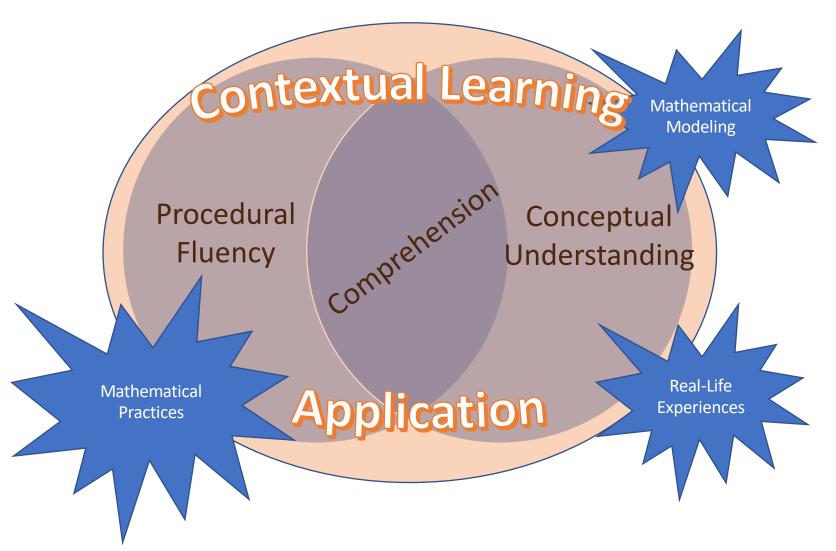
Mathematical Modeling Framework

A Mathematical Modeling Framework





Mathematics Makes Sense in Context!





Focus on Reasoning and Comprehension in Mathematics





Overarching Mathematical Practice Standard (all grade levels and courses)

MP: Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.



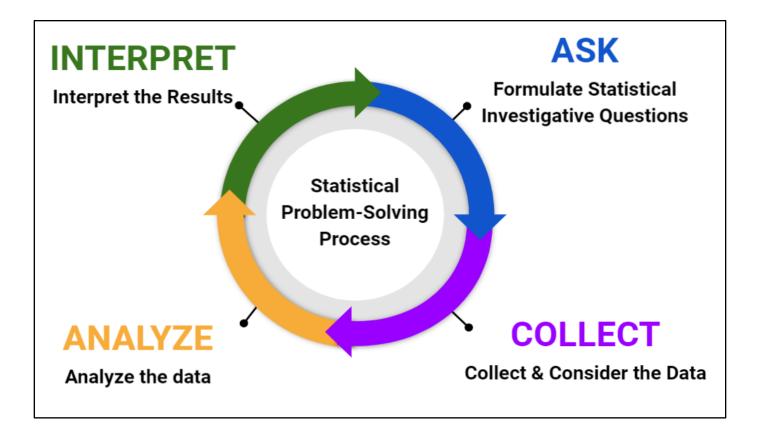
MATHEMATICAL PRACTICES

MP: Display perseverance and patience in problem-solving. Demonstrate skills and strategies needed to succeed in mathematics, including critical thinking, reasoning, and effective collaboration and expression. Seek help and apply feedback. Set and monitor goals.

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



Framework for Statistical Reasoning





Statistical Reasoning

The following four-step statistical problem-solving process can be used throughout each grade level and course to help learners develop a solid foundation in statistical reasoning and literacy:

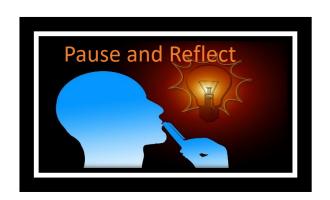
- Formulate Statistical Investigative Questions
 Ask questions that anticipate variability.
- Collect & Consider the Data
 Ensure that data collection designs acknowledge variability.
- III. Analyze the Data

Make sense of data and communicate what the data mean using pictures (graphs) and words. Give an accounting of variability, as appropriate.

IV. Interpret the Results
Answer statistical investigative questions based on the collected data.



Elevating Student Voice



- 3 Name 3 action steps you will take to normalize reasoning and sense-making in the mathematics classes in your building.
- 2 Name 2 resources you will share with your teachers to assist with the focus on reasoning and sense-making.
- 1 Name 1 action step your entire staff will take to normalize reasoning and sense-making in mathematics classes.

Elevating Student Voice Point #2:

Every student can succeed in learning deep, conceptual mathematics if we create a culture of caring and support them based on their individual uniqueness!



Reimagining What **Success Looks Like** Creating a Culture of Caring for Each and **Every Learner**



Fostering Positive Mathematical Mindsets



Promoting Positive Mathematical Mindsets

Positive mathematical mindsets are important for all mathematics classrooms. Providing students with learning tasks that promote productive student discourse, critical thinking, perseverance, and a growth mindset leads to healthy, deep learning at all levels. These types of tasks will also engage students in the <u>8 Mathematical Practices</u> that help learners develop positive thinking and discourse in all mathematics classrooms.

The following resources are intended to provide support with cultivating mathematics classrooms where positive mindsets thrive:

- Positive Mathematical Mindsets Introduction
- . Mathematics Classrooms that Cultivate Positive Growth Mindsets
- Positive Mathematical Mindsets What to Look For







Elevating Student Voice Point #3: Student learning is greatest in classrooms where the tasks consistently encourage high-levels of student thinking and reasoning and least in classrooms where the tasks are routinely procedural in nature. (Boaler and Staples, 2009; NCTM, 2017)



Engage

Real World Hook/ Introduction

How will you engage the students?

What is the real world "hook" that will intrigue their interest?

Explore

Student Engagement through Process Based Thinking

What will students be asked to do in each step of process-based thinking? What will students write and/or draw in journals for each step?

How will students connect new information to what they already know?

Instructional Design

In what ways will the student engagement allow for open-ended exploration and inquiry?

Apply

Student Presentation

How will students share their findings?
What form of presentation will they use?
Which community partners might provide

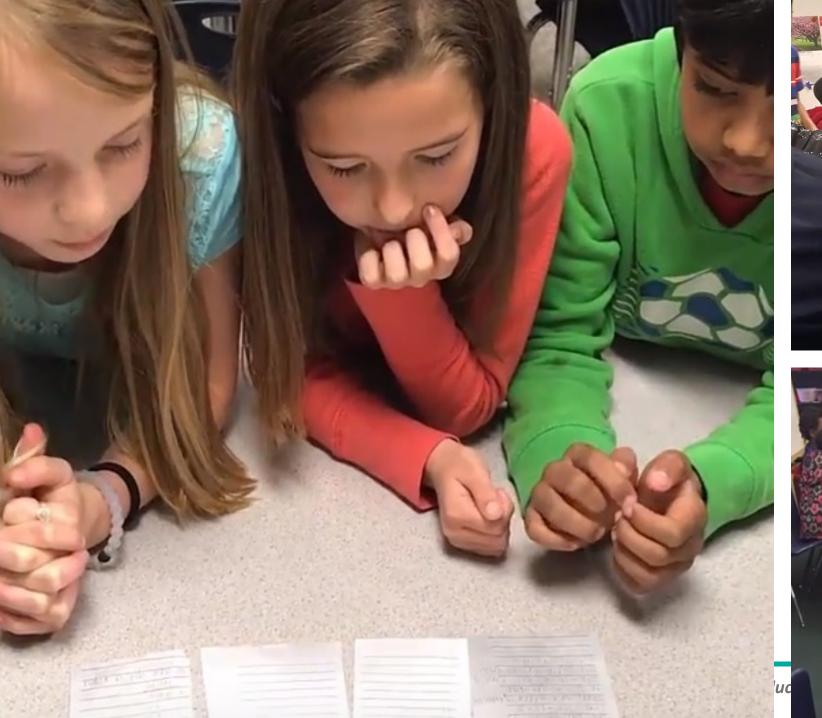
feedback?

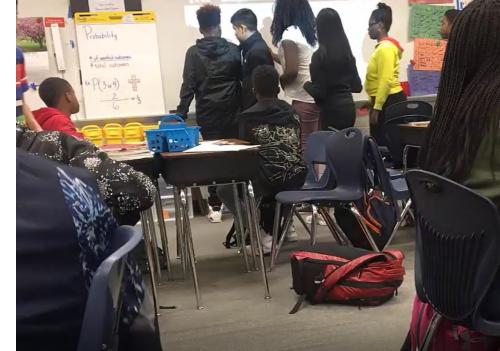
Reflect

Student Reflection

How will students summarize their efforts in this unit and pose questions that will lead to the next one?













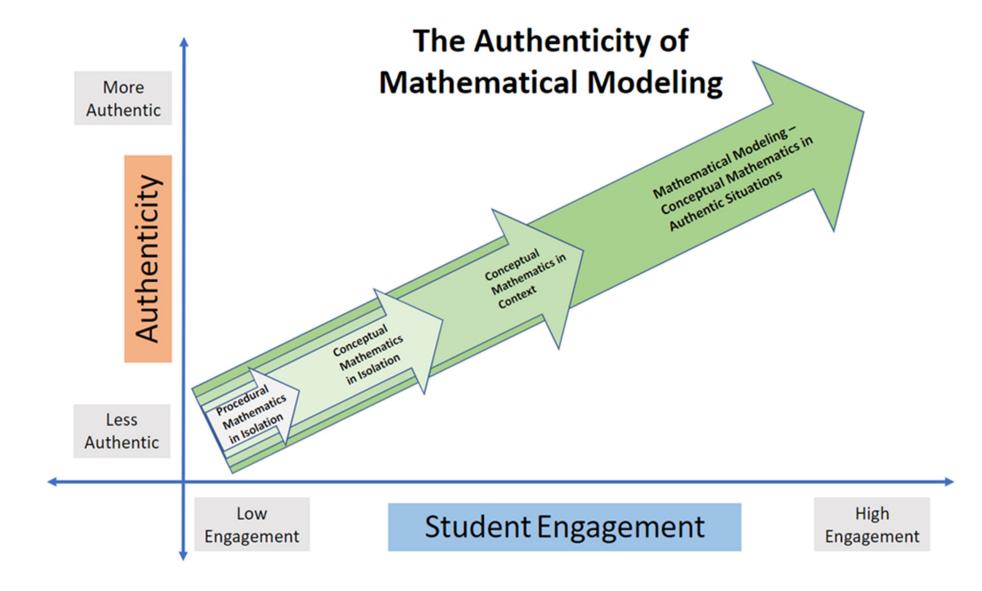
Allow students to reason and make sense of the mathematics conceptually and contextually.



Questions for Educators to Ponder:

- ✓ What are your actions to support the mathematical practices of students that enable them to develop student voice in the mathematics classroom?
- ✓ How often do students engage in rich mathematical discourse?
- ✓ How often do students participate in collaborative groups?
- ✓ How often are students engaged in authentic tasks?
- ✓ How often are students allowed to learn the mathematics content by solving meaningful problems that impact the community?







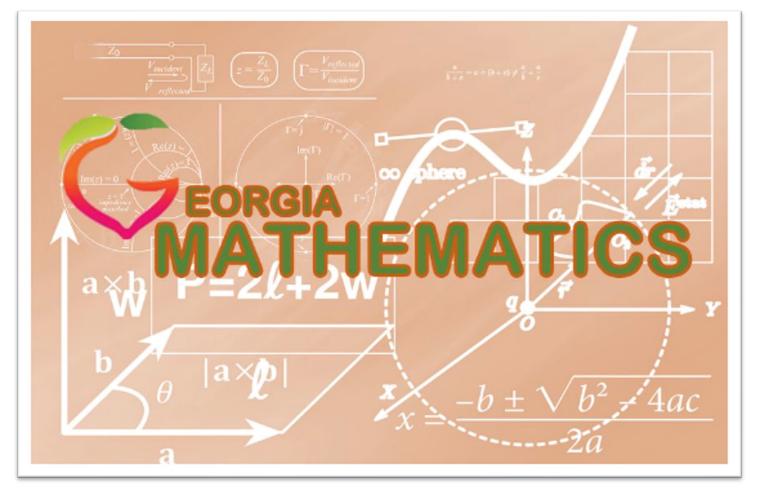
Elevating Student Voice



How can we ensure that all learners in Georgia have access to high quality teaching and learning and multiple mathematics pathways for future success?



Georgia DOE Mathematics Webpage

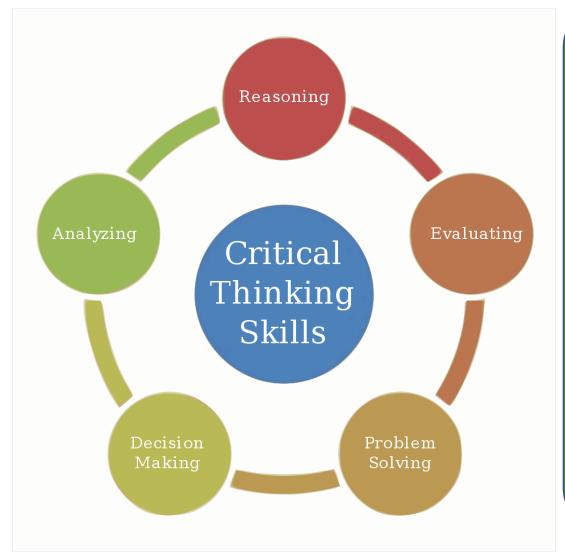




Georgia's K-12 Mathematics Standards



Mathematical Reasoning



Georgia's K-12 **Mathematics** Standards are focused on Educating Georgia's Future by cultivating critical thinkers and problem solvers who can reason and make sense of the world around them.



Georgia's Mathematics Standards

- Based on how the new content standards are written, there is a focus on reasoning and contextual learning in mathematics.
- Mathematics in context should be the focus of future instructional lessons and assessments used in classrooms.
- Lessons should allow for students to use mathematics to explain real-life phenomena.



Mathematics Big Ideas, K - 12

к	1	2	3	4	5	6	7	8	HS Algebra: Concepts & Connections	HS Geometry: Concepts & Connections	HS Advanced Algebra: Concepts & Connections
	Mathematical Modeling (MM)										
	Mathematical Practices (MP)										
	Data & Statistical Reasoning (DSR)										
Numerical Reasoning (NR)											
Patterning & Algebraic Reasoning (PAR)											
	Geometric and Spatial Reasoning (GSR)										
	Measurement & Data Reasoning (MDR)										
	Functional & Graphical Reasoning (FGR)							ing (FGR)			
							Probability Reasoning (PR)			Probabilistic Reasonin (PR)	

*The Big Ideas extend to High School 4th course options beyond Advanced Algebra: Concepts and Connections. These Big Ideas can be found within each course standards document.



Standards Structure

Big Idea and summary of concepts in this section

Georgia's K-12 Mathematics Standards - 2021 Kindergarten

	Demonstrate and explain the ts the total quantity in a set).	relationship between numbers and qu	uantities up to 20; connect c	ounting to cardi	inality (the la	st number counted	
	Expectations	Evidence of Student Learning (not all inclusive; see Grade Level Overview for more details)					
K.NR.1.1	Count up to 20 objects in a variety of structured arrangements and up to 10 objects in a scattered arrangement.	This learn objective builds on the Pre-Learning and Deve sent Standard, CD-at least 10 objects using one see correst Students should count objects using one the number names in the standard order authentic purposes. "Authentic purposes have in their everyday lives. The overall goal is for students to be able arranged in a line, a rectangle, or a circle, scattered arrangement.	Georgia Early MA2.4b: Counts spondence. some correspondence saying and to majcate quantities for "refers to experimental students to count up to 20 objects	Students show count to answer many?" quest to 20 objects variety of war rectangular a	olication uld be able to wer "how tions with up arranged in a ys (a line, a rray, or a to 10 objects scattered	Strace and Methods Dot cards, manes, ten-frames, rekenres, dominoes, beads, rocks, counting bears, and playing cards are some tools that can be used for subitizing.	
K.NR.1.2	When counting objects, explain that the last number counted represents the total quantity in a set (cardinality), regardless of the arrangement and order.	Fundamentals • This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, CD-MA1.4e: With adult guidance and when counting, understands and can respond with the last number counted to represent quantity (cardinality). • Students should know that the last number counted represents the total quantity in a set (cardinality), when counting objects regardless of the arrangement and order. • Students should instantly see how many objects are in a group without counting (subitizing).					
K.NR.1.3	Given a number from 1-20, identify the number that is one more or one less.	Fundamentals This learning objective builds on the Pre-K Georgia Early Learning and Development Standards, CD-MA1.4d: Describes sets as having more, less, same as/equal. and CD-MA1.4f: Tells numbers that come before and after a given number up to 10. Students should be able to understand that each successive number name refers to a quantity that is one larger and the previous number name is one less.					
K.NR.1.4	Identify pennies, nickels, and dimes and know their name and value.	Students should be able to identify and represent coins by name and value.	Strategies and Methods Students can use different types of coin manipulatives to extend their understanding of counting by ones. Coins manipulatives could be used for counting by ones.		Age/Developmentally Appropriate Student is able to count five nickels. Students are not expected to find the value.		

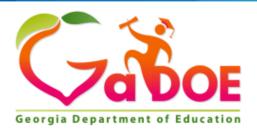
Standard

Evidence of Student Learning – instructional supports

Expectations +

'breaks down' the standard in an instructional progression





Georgia's New K-12 Mathematics Standards Grade Level and Course Overviews

IMPLEMENTATION 2023-2024 SCHOOL YEAR

K-12 Mathematical Practices K-12 Mathematical Modeling Framework

K-12 Statistical Reasoning Framework Whole Child Supports for Learner Variability

ELEMENTARY (K-5)

KINDERGARTEN

FIRST GRADE

SECOND GRADE

THIRD GRADE

FOURTH GRADE

FIFTH GRADE

MIDDLE (6-8)

SIXTH GRADE

SEVENTH GRADE

EIGHTH GRADE

ENHANCED ALGEBRA: CONCEPTS & CONNECTIONS

HIGH (9-12)

ALGEBRA: CONCEPTS & CONNECTIONS

GEOMETRY:
CONCEPTS & CONNECTIONS

ADVANCED ALGEBRA: CONCEPTS & CONNECTIONS

ENHANCED ADVANCED
ALGEBRA & PRECALCULUS:
CONCEPTS & CONNECTIONS

HIGH SCHOOL FOURTH COURSE OPTIONS

New Instructional Units





NEW Instructional Units!

All school districts in Georgia will have access to the instructional units of study for all grade levels and courses AT NO COST TO DISTRICTS AND SCHOOLS.



Relevance and Application

- ✓ How can the mathematics be taught contextually?
- ✓ How can the mathematics be used to model real life phenomena and to solve real problems that exist in the school's local community?



Interdisciplinary Connections for All Units (in all grade levels and courses)

- Aligned to workforce needs (based on industry input)
- Incorporates employability skills and workforce readiness indicators at all grade levels
- Provides innovative inspiration for interdisciplinary teaching and learning with multiple content areas and disciplines



Customized for School Community and Needs

All content areas
connected to the
mathematics standards to
provide inspiration for
teachers to implement
interdisciplinary
instruction.



Grade 4 Unit 1
Georgia's K-12 Mathematics Standards

GEORGIA'S K-12 MATHEMATICS STANDARDS INTERDISCIPLINARY CONNECTIONS GRADE 4

DRIVING QUESTION/ STATEMENT OF THE PROBLEM (REAL LIFE PHENOMENA):

		reasoning?		
COMPUTER SCIENCE CONTENT & CONNECTIONS		ENGLISH/ LANGUAGE ARTS CONTENT & CONNECTIONS	SCIENCE CONTENT & CONNECTIONS	
Use with ider cres ima Computation Dev for a prol pow	Designer and Creator a variety of technologies in a design process to titify and solve problems by ating new, useful, or ginative solutions. nal Thinker relop and employ strategies understanding and solving blems in ways that use the ver of technological methods levelop and test solutions.	Write a persuasive speech to detail how getting up earlier will be of benefit to you getting ready for school and deserving of an increase in your allowance.	 Record in a chart the weather for the next ten days to include temperature, weather fronts, pressure, precipitation, moon phase, and cloud types. Students will use this data to answer the question: Does the change in weather impact the quality of your sleep? 	

MATHEMATICS CONTENT & CONNECTIONS

Unit 1

Making Relevant Connections with Place Value Understanding, Addition and Subtraction of Whole Numbers

4.NR.1, 4.NR.2, 4.MDR.6, 4.MP.1-

Previously, students worked within 10,000 for place value, addition, and subtraction. In this unit students will be building on this understanding to add, subtract, and round numbers within 100,000. This unit also incorporates problem solving with money, intervals of time, and metric measurements for liquid volume, distance, and weight. Students will engage in the framework for statistical reasoning to ask and answer questions in order to solve problems. To explore the driving question outlined above, students can engage in an Interdisciplinary Challenge, Buying Time.

SOCIAL STUDIES CONTENT & CONNECTIONS	HEALTH AND PHYSICAL EDUCATION CONTENT & CONNECTIONS	CTAE & WORKFORCE READINESS CONTENT & CONNECTIONS
 Identify the elements of a personal budget (allowance, expenses, and savings) and explain why personal spending and saving decisions are important. 	 Explain the impact on your health of waking up earlier and determine the appropriate time to go to bed to ensure enough hours of sleep. 	Possible career connections: Pulmonologist Quality Control Engineer Meteorologist Environmental scientist The interdisciplinary workforce goal is for students to explore and start to make connections to the world of work through career exploration.

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Interdisciplinary approaches to teaching and learning

Strong connections with mathematical modeling





Interdisciplinary Challenges

Grade 4 Unit 1 Georgia's K-12 Mathematics Standards

MATHEMATICS INTERDISCIPLINARY CONNECTIONS

Unit 1

Making Relevant Connections with Place Value Understanding, Addition and Subtraction of Whole Numbers

4.NR.1, 4.NR.2, 4.MDR.6, 4.MP.1-8

Previously, students worked within 10,000 for place value, addition, and subtraction. In this unit students will be building on this understanding to add, subtract, and round numbers within 100,000. This unit also incorporates problem solving with money, intervals of time, and metric measurements for liquid volume, distance, and weight. Students will engage in the framework for statistical reasoning to ask and answer questions in order to solve problems.

Interdisciplinary Challenge: Buying Time

Students will explore the relationship between time, money, and weather. Many factors impact our daily lives in multiple manners. But three variables that may have a tremendous amount of impact on our lives can be traced back to time, money, and the ever changing weather. Industry depends on their products to be delivered on time, under budget, and without the impact of weather delaying shipments. If one of these three factors are not in balance with the other two, companies are going to be impacted adversely. Leaders of large corporations and companies depend on teams of people to make sure products are created, shipped, and delivered on time daily and without weather delaying shipping trips. In the instance of bad weather, alternate plans can be made.

The same principle can be shared with students and the impact of weather, time, and money impacting their daily lives. This unit's question is "Does weather impact students and their ability to sleep and make money based on their time of rest?"

The industry product here is each student and their amount (time) and quality of sleep based on the nightly weather. Students will figure out exactly how much time would be gained by waking up at 6:15 am rather than 7 am for five school days. Students have been told by their parents that they can earn \$2 if it is an even number of minutes or \$3 if it is an odd number of minutes by waking up earlier. Students calculate how much they can earn in a day and a week with their new allowance by waking up earlier. Students will also chart their amount of sleep and the weather for 10 days to gather the data needed to answer the following questions:

- · Does the change in weather impact the quality of your sleep?
- Does weather impact your sleep patterns?

Students will need to write a persuasive paper on their sleep patterns based on the nightly weather, and if they are able to function daily in school and if they are able to make money by getting more sleep.

INDUSTRY INTERDISCIPLINARY CONNECTIONS

These suggested industry connections could be great places for you to go for guest speakers, industry visits, and class presentations or activities. This connection would also be a great opportunity for industry partners to collaborate during teacher planning for this unit activity. If industry partners are not available, please reach out to your local high school and their Career, Technical and Agriculture Education (CTAE) programs for high school students to visit and present to students. Relate the Buying Time Interdisciplinary Challenge to but not limited to:

- Business, Management and Administration- Health Information Technology
- Manufacturing
- Transportation, Distribution and Logistics
- Health Science

Each industry can relate with students some of the objects they work with on a daily basis in their careers. Industry partners can bring some of these items to share with students in the class demonstrations. Students can then categorize each item accordingly, ask questions about the items and related pieces, and then discover more about possible careers in each industry. Career Discovery will be the primary component of this connection and presentation to fourth graders.

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Quality Assurance Instructional Resources Rubric



Georgia's K-12 Mathematics Standards

Mathematics Instructional Materials Quality Assurance Rubric

Focus	4	2	0				
rocus	Fully Aligned	Minimally Aligned	Not aligned				
Alignment	The resource is in direct alignment to key competencies/ overarching standards for the grade level. The resource is also directly aligned to the Essential Instructional Guidance components included within the standards. The information and tools within the resource connect to the GaDOE resources through a cluster-based approach to the key competencies/ standards and learning objectives.	The resource shows alignment with the mathematics learning objectives with limited alignment to the key competencies/overarching standard. OR The resource shows limited alignment to the Essential Instructional Guidance components of the standards.	The resource is not aligned with all components of Georgia's K-12 Mathematics Standards, including the Essential Instructional Guidance.				
Instruction	Interdisciplinary learning tasks are provided in this resource to help	Real-world problems and word problems are included in	There is no evidence that this resource has a				
through a lens of Mathematical Modeling	students learn the mathematics through real-life contexts and phenomena.	the resource with limited emphasis on process-based thinking through the use of the Mathematical Modeling Framework.	focus on teaching mathematics through relevant situations.				
	The tasks and learning resources included in this resource are student- centered and regularly engage students in creative and patient problem- solving provoking thought leading to understanding.	The resource is student-centered with some activities that involve students in the student actions that lead to understanding; however, there are some lessons that limit student thinking and ownership.	The resource is largely teacher-centered with limited or no guidance on how to create environments that promote student thinking and sense-making.				
Student Actions	The resource includes lessons and activities that regularly engage students in productive discourse and collaboration when learning mathematics. The materials in the resource help students build a positive attitude toward and an appreciation for mathematics through engaging, student-centered classroom tasks and lessons.						
Mathematical Practices	The tasks, activities, and lessons included in the resource help bring to life the 8 Mathematical Practices. There is direct alignment to multiple mathematical practices in each lesson.	The tasks, activities, and lessons included in the resource are aligned to the 8 Mathematical Practices at a surface level. There is indicated alignment to one or two mathematical practices in some lessons.	There is no attempted alignment with the 8 Mathematical Practices. The tasks, activities, and lessons included in the resource are not aligned to any mathematical practice.				
Student Supports for Learner Variability	The resource supports students' prior knowledge by building upon the previous skills maintained and providing the necessary scaffolds of support to access the new content. The resource includes embedded tiered supports for all lessons.	The resource includes some supports for learner variability, but these supports are not tiered to benefit all learners.	The resource does not include targeted, specific supports for learner variability embedded within the lessons.				
Mathematical Reasoning and Sense-Making	The concepts presented in the resource are not overly procedural and encourage higher-order thinking and mathematical modeling through the instructional lessons outlined. All lessons include a focus on mathematical reasoning and sense-making.	Some concepts presented foster a focus on answer- getting in isolation of reasoning and sense-making	The concepts presented in the resource focus on procedures and answer-getting in isolation of comprehension and understanding.				
Flexibility in Strategy Selection and Problem Solving	The resource is developed to promote student-centered teaching and learning of mathematics based on the tasks and activities included. The tasks and activities encourage students to use their own reasoning flexibly allowing choice in their strategy selection and problem-solving methods.	The tasks and activities limit student voice and choice in the selection of strategies and problem-solving methods.	The tasks and activities are teacher-centered and include limited to no involvement from students with regards to computation and problem-solving.				

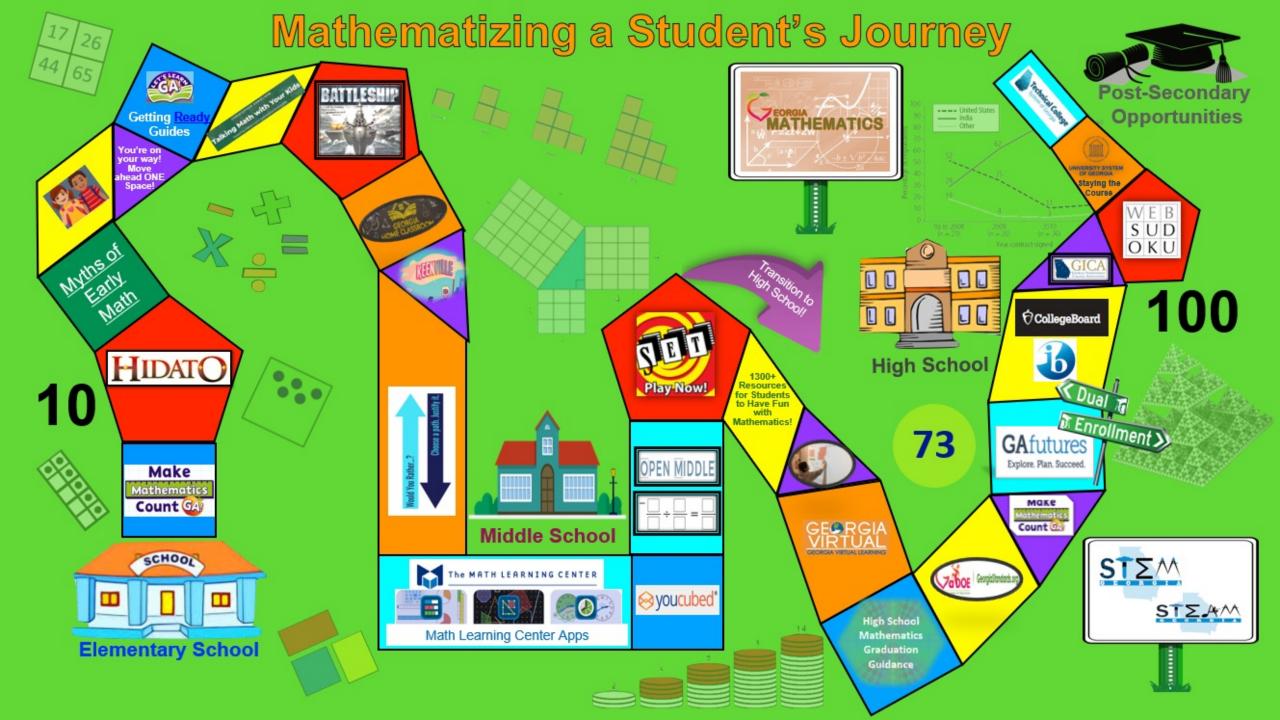
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Elevating Student Voice
Point #4:
Each and every learner in Georgia will have access to high-quality mathematics instruction that leads to flexible mathematics pathways for success in

the future.











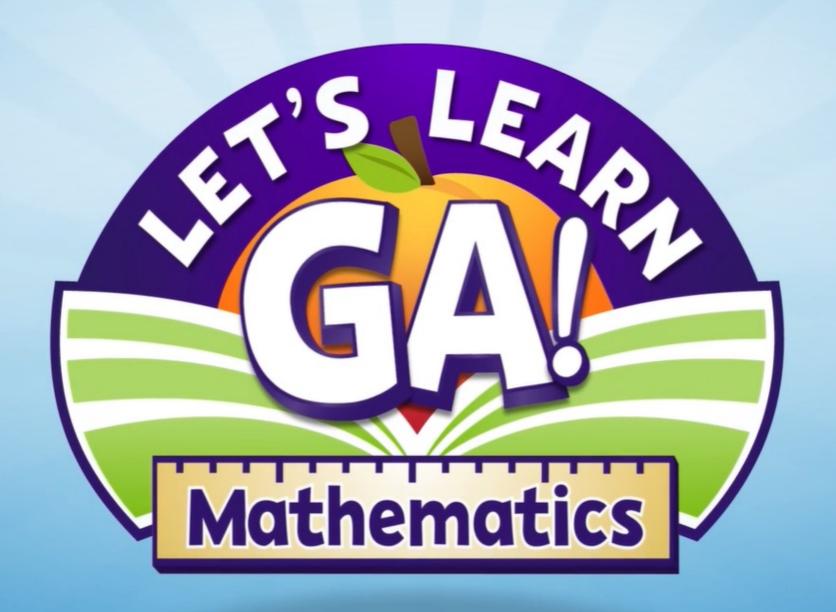


Videos, Learning Plans, Games, and Activities are available on Georgia Home Classroom



Make निस्तिवलिंदिडि Count



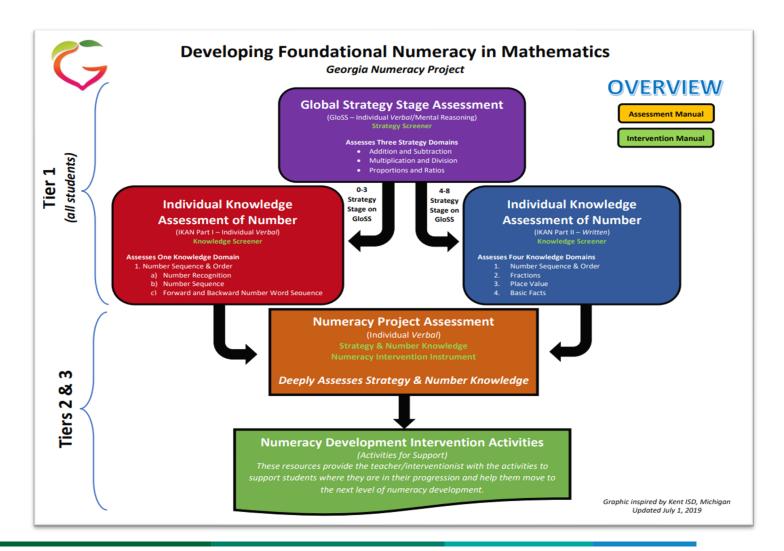




www.gpb.org/education/learn



Georgia Numeracy Project







Let's Make **Mathematics** Learning Relevant and Fun for Students!!



Mathematizing Georgia!

Thank you for joining me on this journey to MATHEMATIZE GEORGIA!

It is exciting to partner with you to educate Georgia's future!







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YOUR GADOE **MATHEMATICS TEAM IS** HERE TO SERVE YOU!



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Important Websites

Georgia Mathematics **Program Updates:** www.gadoe.org/mathematics

Professional Learning Communities:

https://community.gadoe.org

Curriculum Resources: www.georgiastandards.org

Professional Learning Conferences: www.gadoe.org/mathcon



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Preparing students

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