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Building Blocks of Mathematics: Remember to see it from their perspective.

Georgia Department of Education
Divisions for Special Education Services and Supports
1870 Twin Towers East
Atlanta, Georgia 30334

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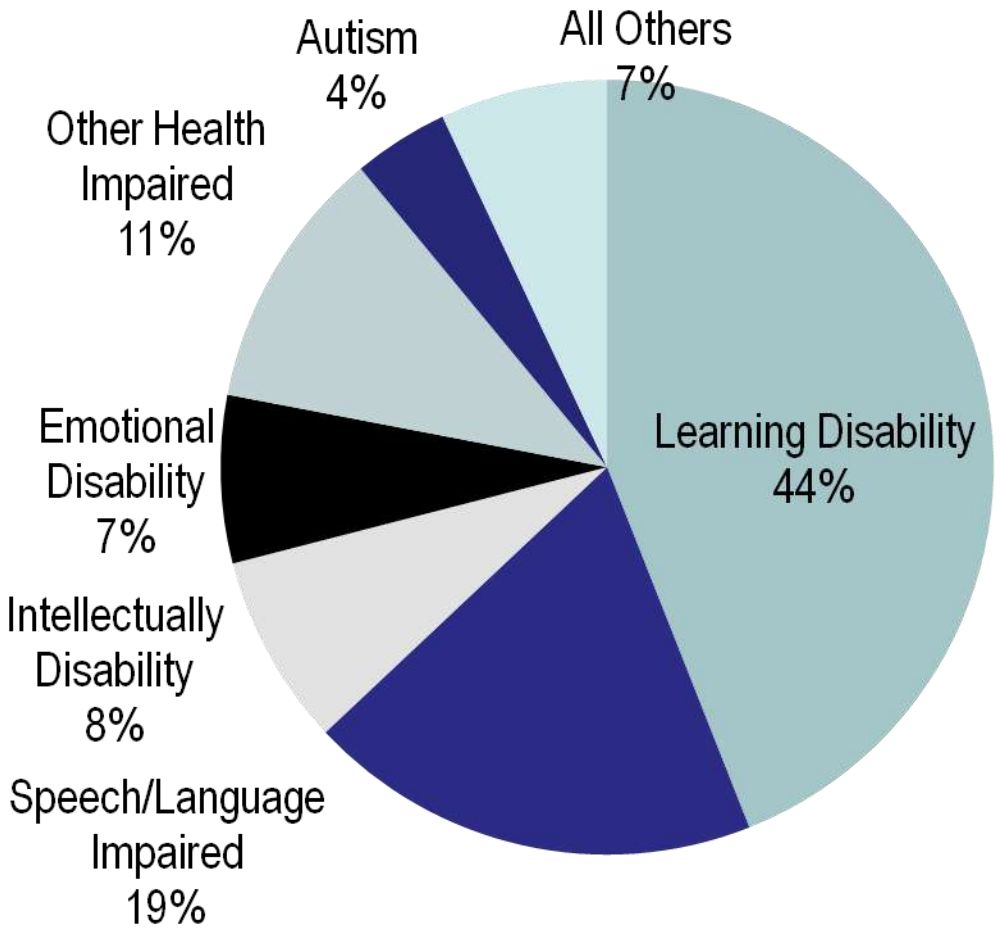
Georgia Special Education Students by Disability Category



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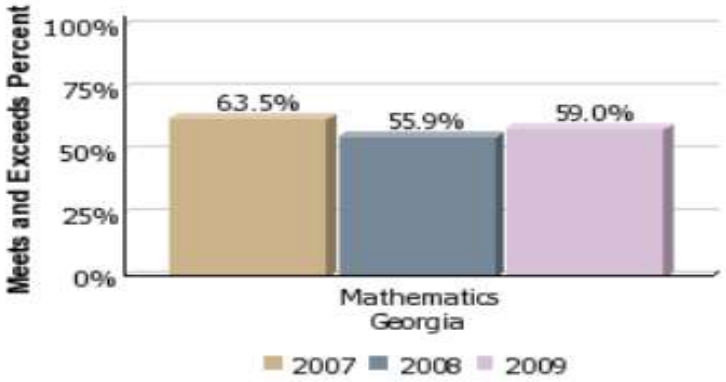
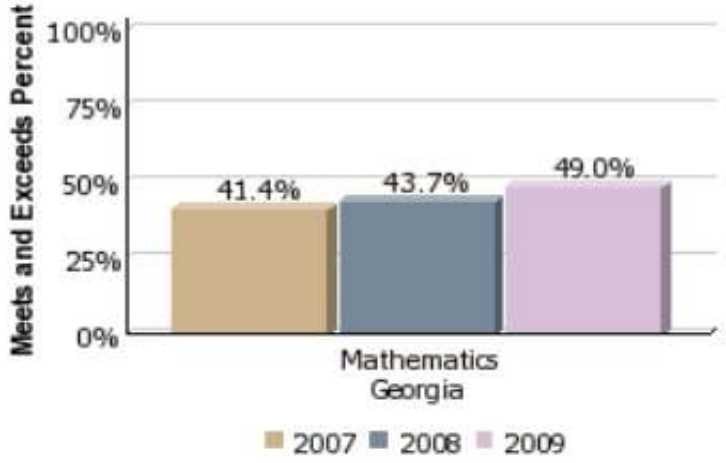
CRCT - Mathematics

Grades 1-5



Grades 6-8



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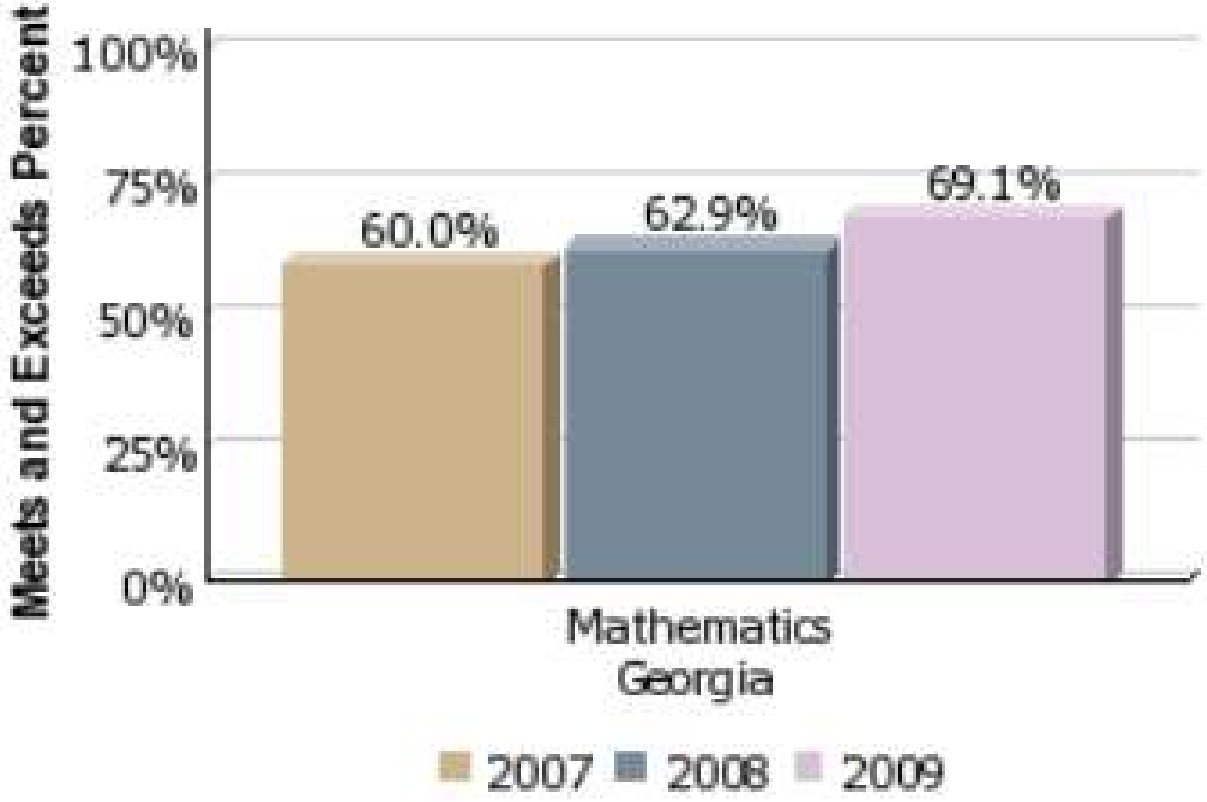
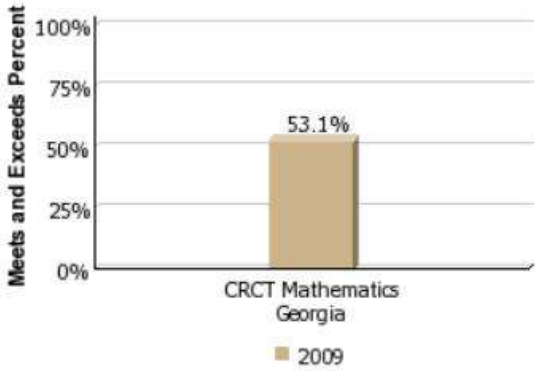
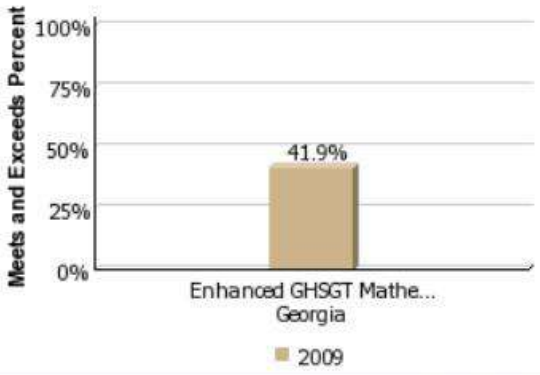
GHSGT - Mathematics



APR - CRCT and Enhanced GHSGT

Percentage of Students Meeting or Exceeding Standards	Georgia 2009
CRCT Mathematics	53.1%
Enhanced GHSGT Mathematics	41.9%





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Students with Disabilities?

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The Essential Questions

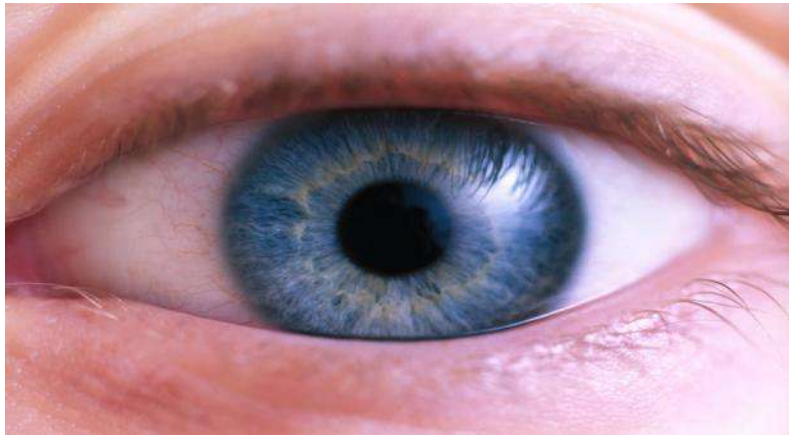
A. What's behind the struggle?
B. Why does acceleration work?
C. How can we best transform SWD into capable math students?
D. What resources are available?

Processing

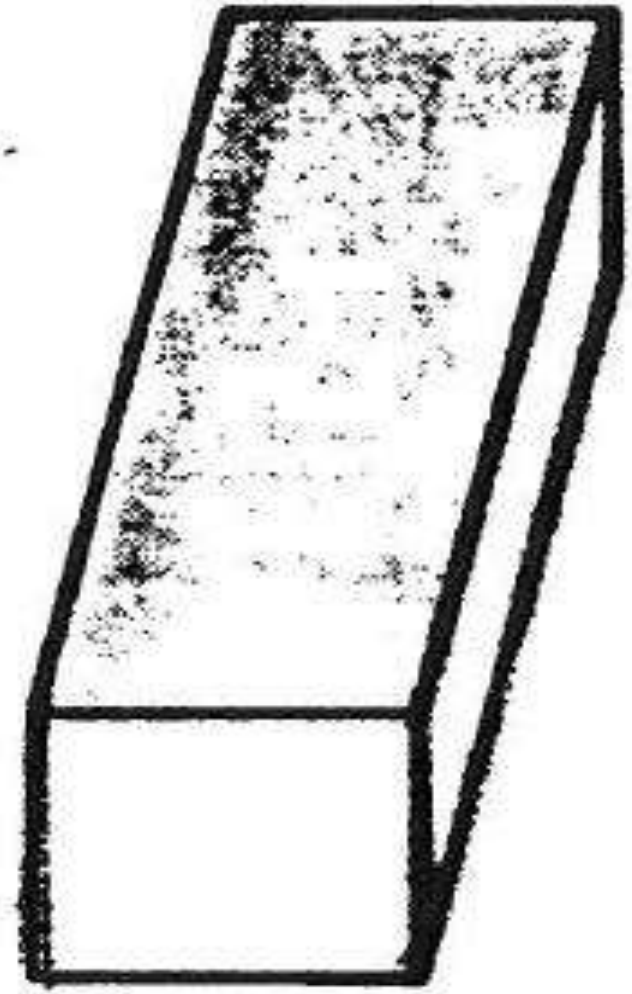
- Processing Deficits are problems with the processes of recognizing and interpreting information taken in through the senses.
- The two most common areas of processing difficulty associated with learning disabilities are visual and auditory perception.
- Other processing difficulties are memory (working, factual, and procedural), distractibility, attention.

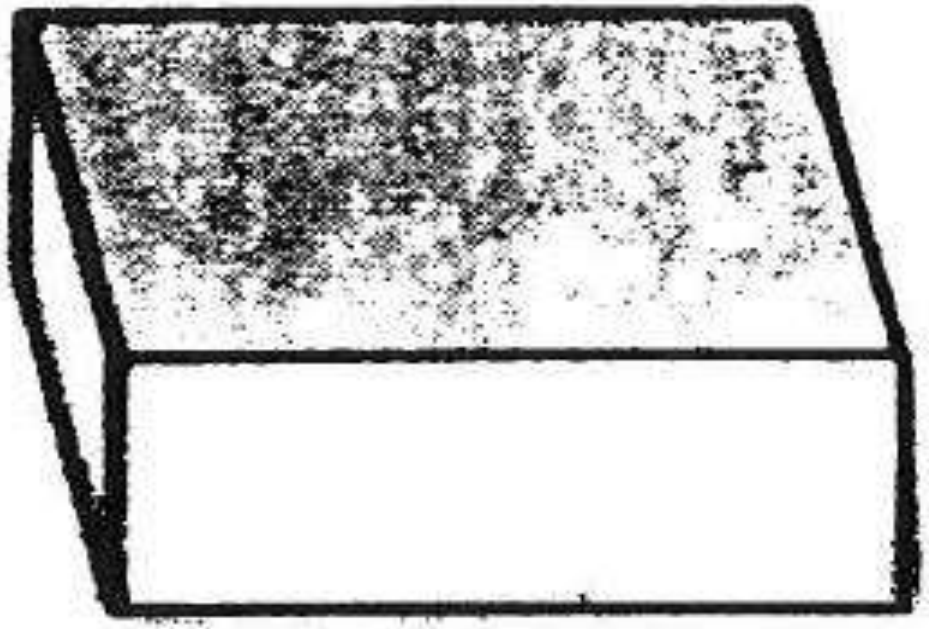
Visual Processing Disorder

- Spatial relation
- Visual discrimination
- Visual closure
- Visual agnosia
  - (object recognition)
- Whole/part relationships
- Visual motor integration



Which block has the larger dimension?





Which letter is it? Which number is it?

b d p q

14 1 4 41

4 + 1

Activity

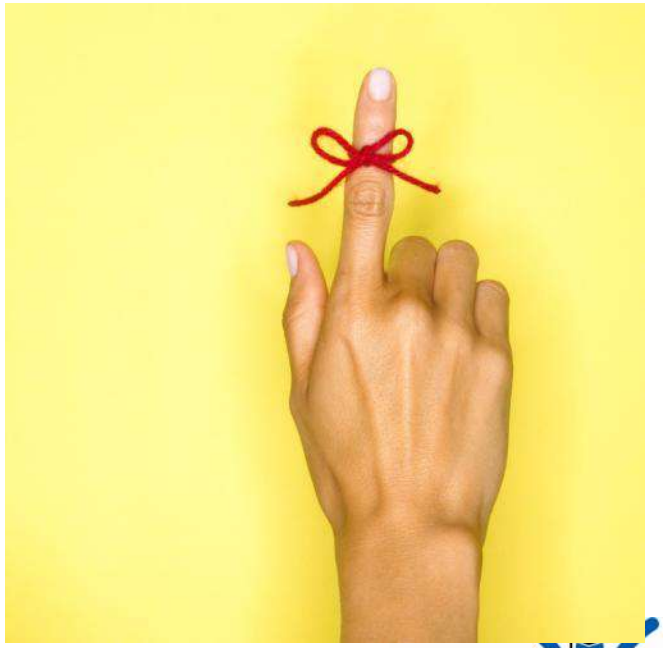
- Misunderstood Minds
  - Spatial activity
  - http://www.pbs.org/wgbh/misunderstoodminds

Auditory Processing Disorder

- Phonological awareness
- Auditory discrimination
- Auditory memory
- Auditory sequencing
- Auditory blending

Got Memory?

- Working Memory
- Factual Memory
- Procedural Memory



Try This

- 6 5 8 7 4 5 6 8 4
- 3 2 1 9 5 6 4 2 1
- 6 5 1 5 1 3 2 3 5

A. Multiply the third number in the first row by the seventh number in the third row.

B. Add this result to the fifth number in the second row.

C. Add to this total ten times the fourth number in the third row.

D. Subtract the eighth number in the first row from the result.

www.pbs.org/wgbh/misunderstoodminds

Distractibility vs Attention

- Distractibility
  - Visual distractibility
  - Auditory distractibility
  - Tactile distractibility
- Attention

Activity

- Misunderstood Minds
  visual
  auditory

http://www.pbs.org/wgbh/misunderstoodminds

Got the Vocabulary?

93%

of teachers assume if you read the word in the passage you will understand the paragraph.

COMPREHENSION

Foundations for Success

National Mathematics Advisory Panel
Final Report, March 2008

- Children's goals and beliefs about learning are related to their mathematics performance.
  - Children's beliefs about the relative importance of effort and ability can be changed.
  - Experimental studies have demonstrated that changing children's beliefs from a *focus on ability* to a *focus on effort* increases their engagement in mathematics learning, which in turn improves mathematics outcomes.

Motivational Research Indicates

- "…the beliefs that individuals create and develop and hold to be true about themselves…are vital forces in their success or failure at school."

Frank Pajares, *Self-efficacy Beliefs in Academic Contexts*, 2002

Self-efficacy & Tasks

- "…those who feel self-efficacious about learning or performing a task competently are apt to participate more readily, work harder, persist longer when they encounter difficulties, and achieve at higher levels."

Schunk & Meece, Self-Efficacy Beliefs of Adolescents, 2005

Foundations for Success

National Mathematics Advisory Panel
Final Report, March 2008

- Scientific Knowledge on Learning and Cognition Needs to be Applied to the classroom to Improve Student Achievement:
  - To prepare students for Algebra, the curriculum must simultaneously develop conceptual understanding, computational fluency, factual knowledge and problem solving skills.
  - Limitations in the ability to keep many things in mind (working memory) can hinder mathematics performance.

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The challenge is…

- To create an environment that fosters math self-efficacy, support processing deficits while utilizing instructional strategies that maximize math potential.

So? Where do we start?

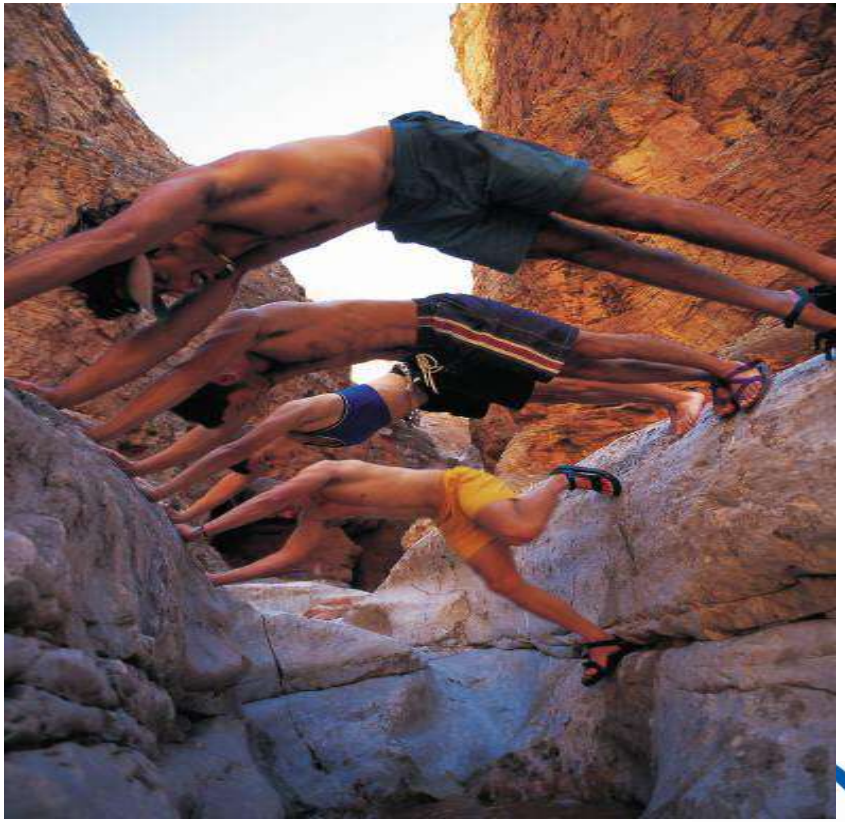
- “You see, in life, lots of people know what to do, but few people actually do what they know. Knowing is not enough! You must take action.”
  Anthony Robbins

- “Too often we give our children answers to remember rather than problems to solve."
  Roger Lewis

Critically Important

These gaps have to be closed in tandem:

1. Self-efficacy
2. Processing deficits
3. Math knowledge
4. Strategies



Acceleration can close both gaps

- Students move forward, not backward
- Gaps in math education filled in context while moving forward
- The largest indicator of student success is self-efficacy, not I.Q. Acceleration builds success!
- Scaffolding, vocabulary, & remediation "Just in time," not "Out of Context"
- Two days ahead, not years behind
- Remediation in context when they need the skill, rather than in isolation.

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Characteristics of an Environment that Builds Self-Efficacy

- Choices (Provides a sense of autonomy & control)
- Non-competitive (evaluated on task, not compared to other students.)
- Accommodate processing deficits (Stimulate all the senses , but not necessarily all at once)
- Descriptive, quick feedback
- Builds success early
- Promote an active participant rather than a passive observer.

Co-Teaching

- General Educators have knowledge of the curriculum
- Special Educators have knowledge of instructional processes for students who learn atypically

Blending Co-Teaching structures with Research based Instruction

What makes Co-Teaching SPECIAL?

- Collect student data, monitor and support student behavior
- Jigsaw instruction
- Think-out-louds
- Explicit instruction – Solve It! Program.
- CRA
- Cover, Copy, Compare technique
- Visual Mnemonic technique

Research shows the biggest gains with the following strategies:

1. Systematic and explicit instruction (large effect)
2. Student think-alouds (large effect)
3. Visual and graphic depiction of problems (moderate effect)

Effect size of .80 = Large
Effect size of .50 = Moderate
Effect size of .25 = Small

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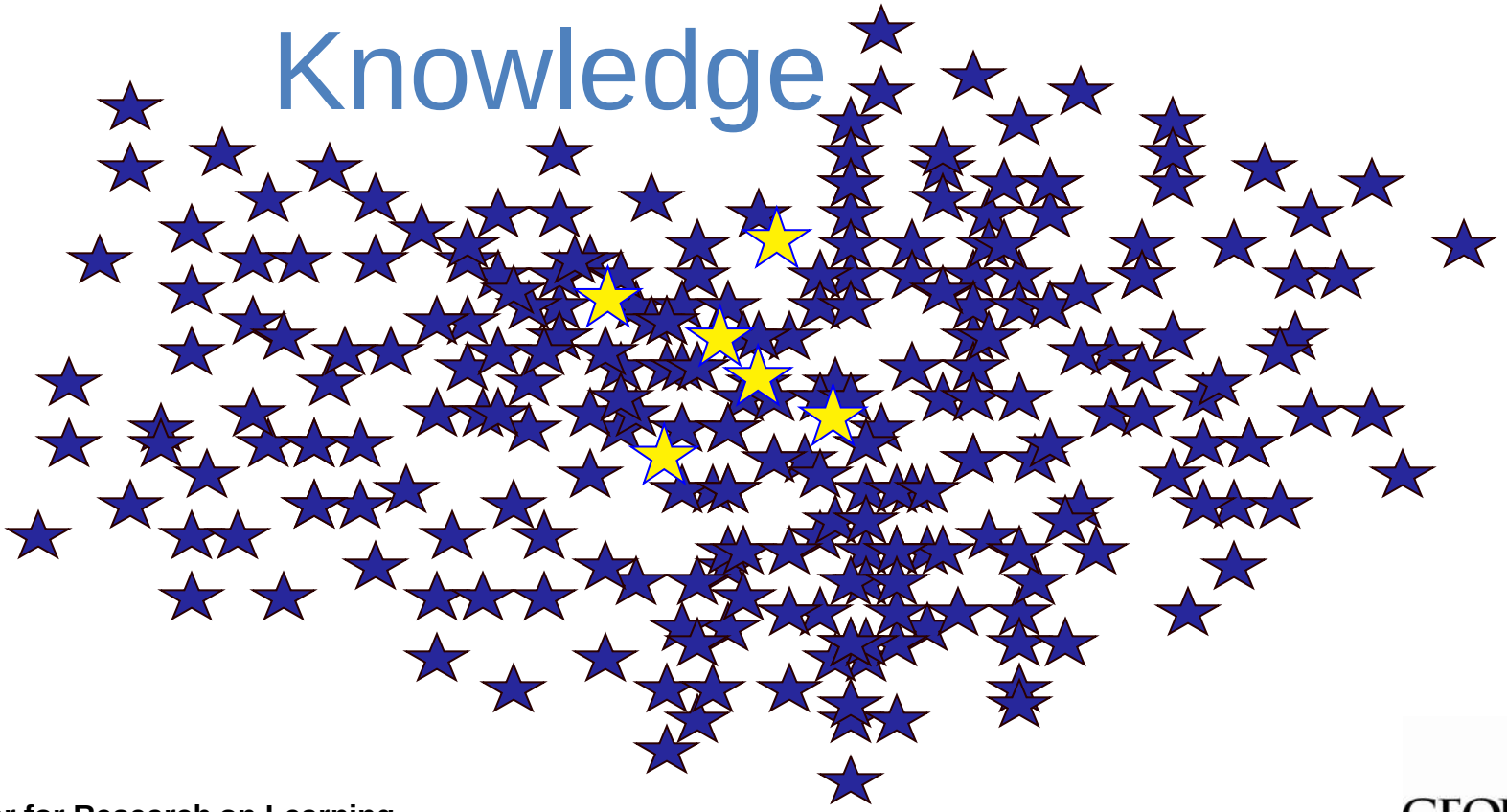
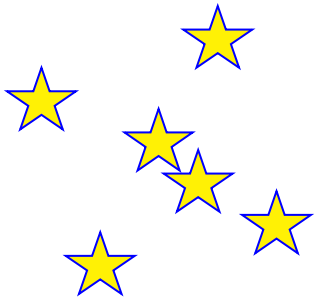
Thinking about the curriculum:



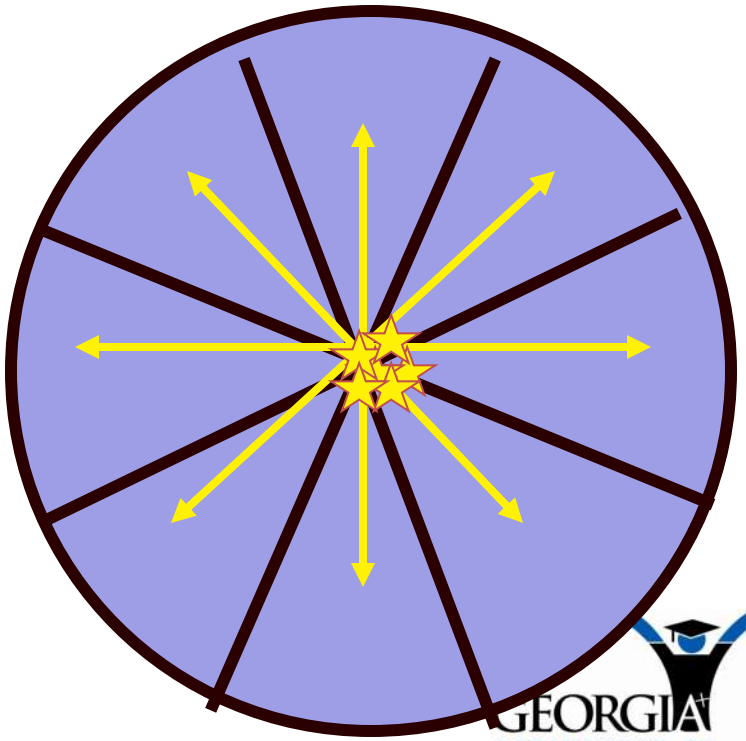
Thinking About the Curriculum...

Knowledge

Critical Content



Course



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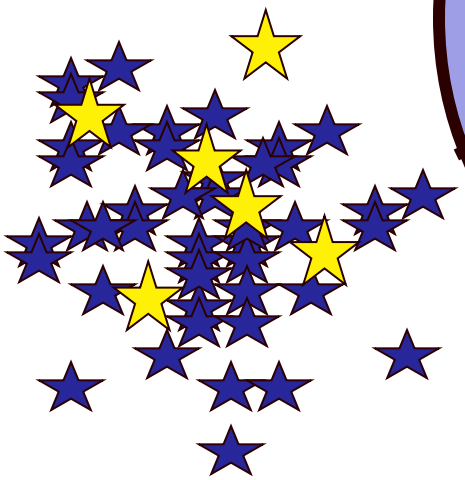
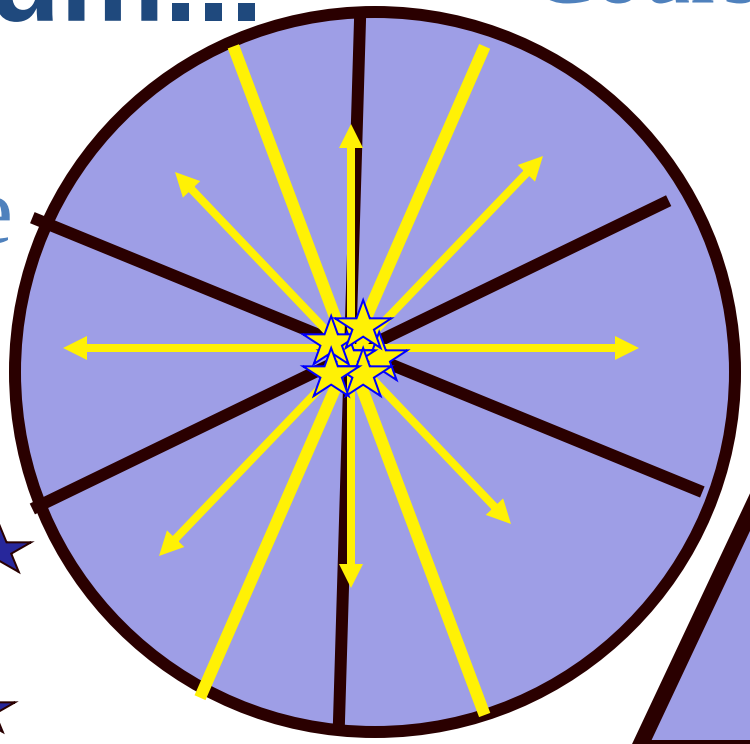
Thinking About the Curriculum...

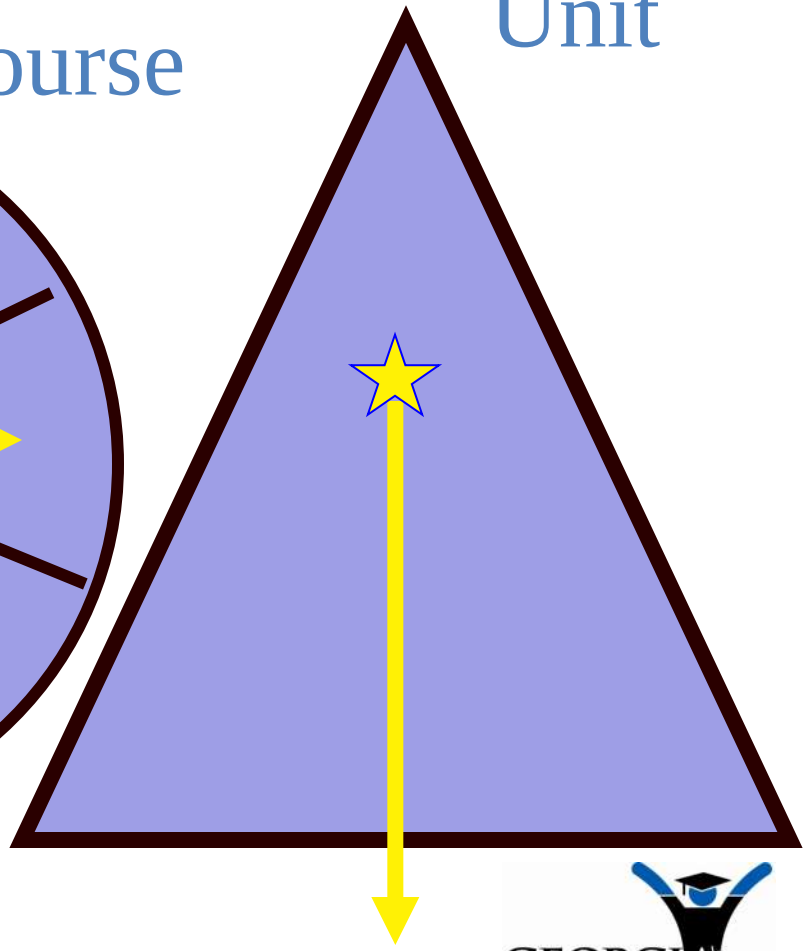
Knowledge



Course



Unit



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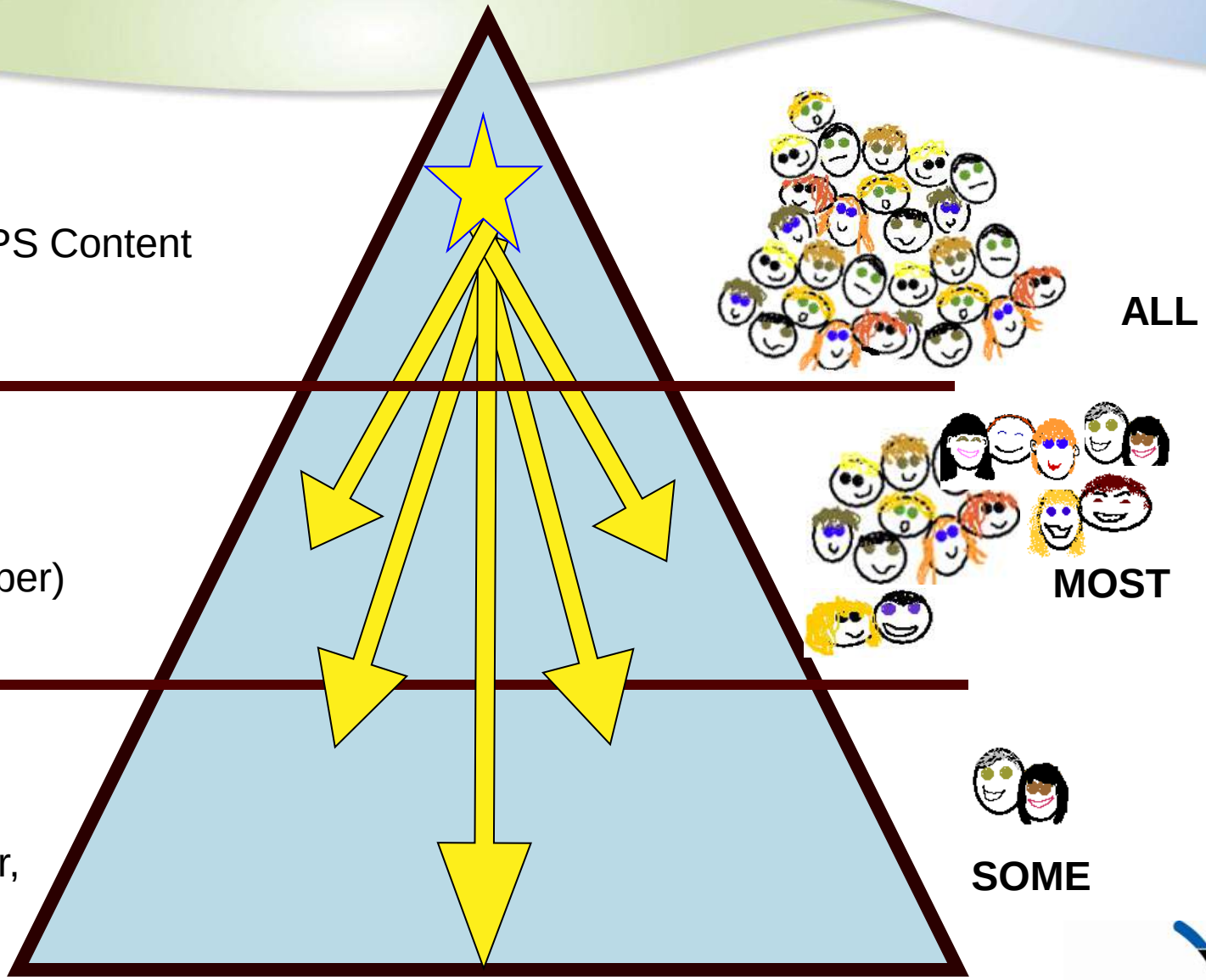

Adapted from Center for Research on Learning

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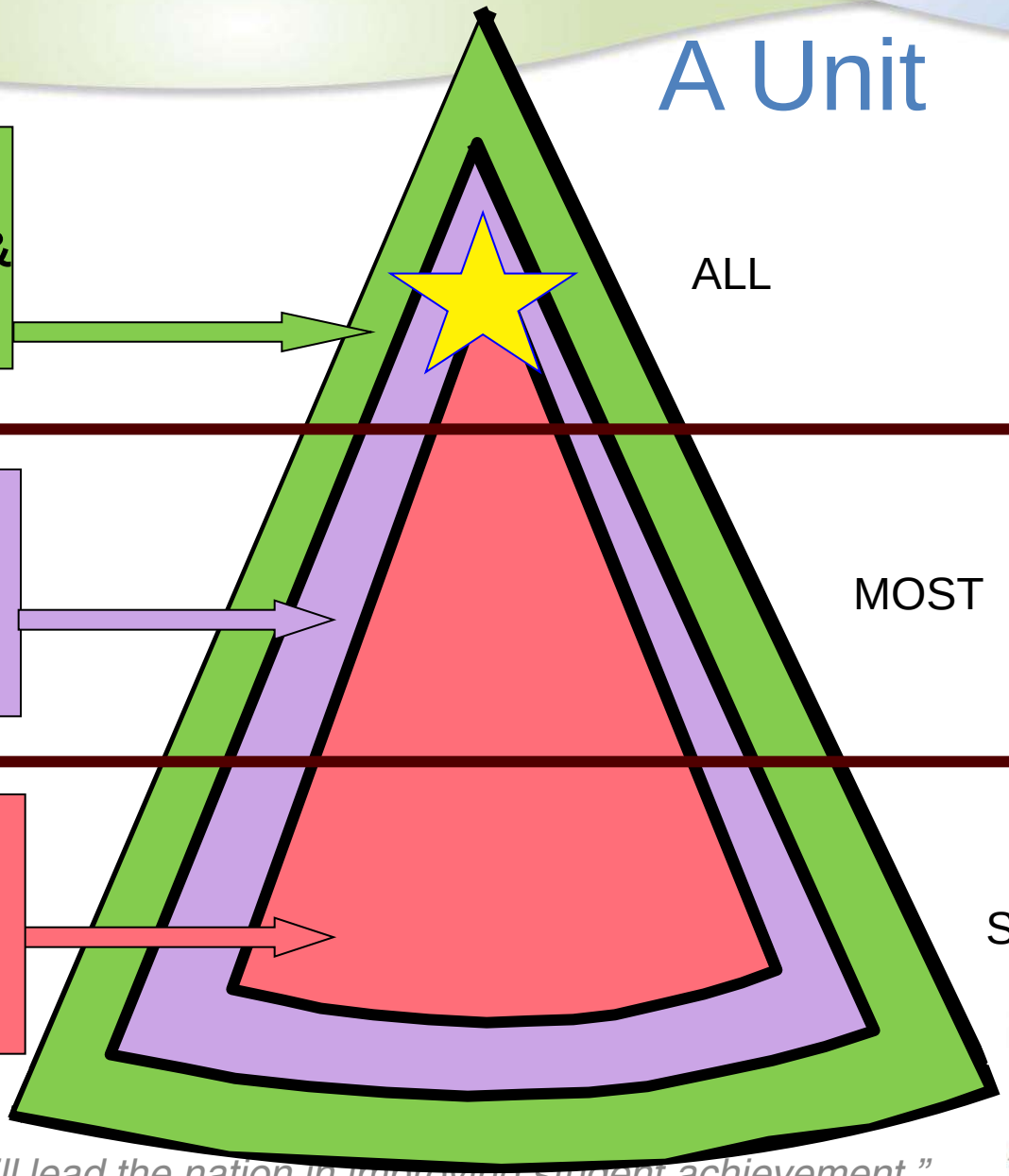
A Unit



Thinking for Problem Solving & Generalization

Thinking for Manipulating Content

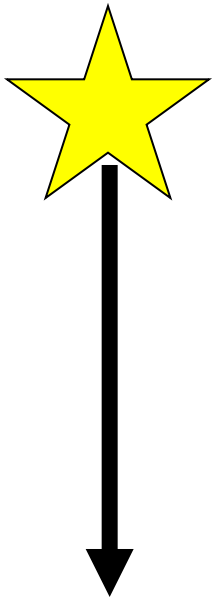
Acquisition of Concepts, Facts, Principles, & Propositions

Center for Research on Learning

Backward Design

What is sufficient evidence for demonstrating understanding of the critical content?

Start with the end in mind



- **Start with unit/lesson questions that are derived form standards and benchmarks.**
- **Design assessment procedures.**
- **Select/construct teaching devices, activities, and routines that ensure students meet assessment criteria.**

Map the critical content

"If I stopped one of your students in the hall way as they left your class after taking the unit test and asked, "What was that unit about?" What would you want them to say?"

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RESOURCES

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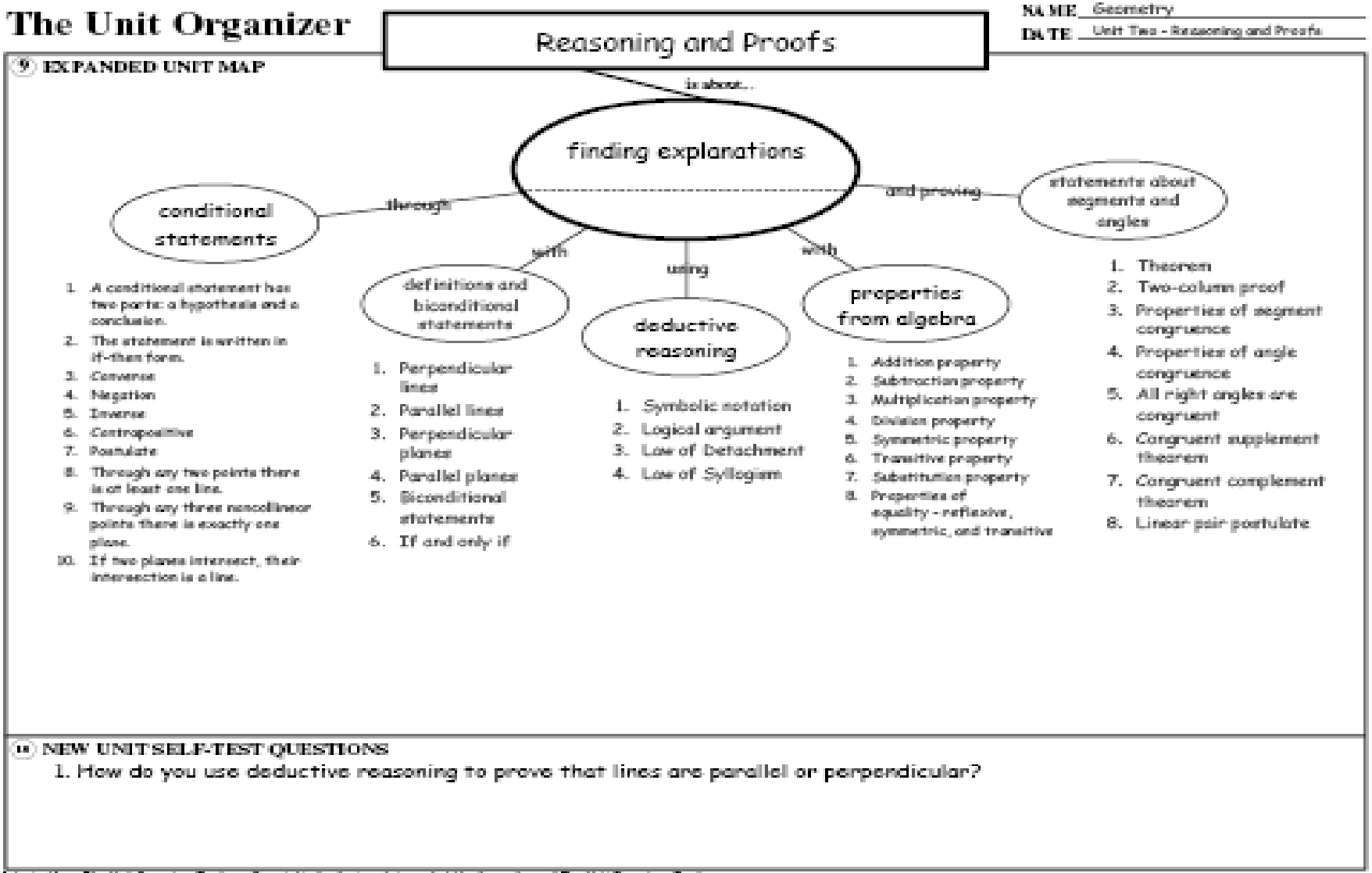
Graphic Organizers



The Unit Organizer

NAME Geometry

DATE Unit Two - Reasoning and Proofs

Reasoning and Proofs

is about...

finding explanations

through: conditional statements

1. A conditional statement has two parts: a hypothesis and a conclusion.
2. The statement is written in if-then form.
3. Converse
4. Negation
5. Inverse
6. Contrapositive
7. Postulate
8. Through any two points there is at least one line.
9. Through any three noncollinear points there is exactly one plane.
10. If two planes intersect, their intersection is a line.

with: definitions and biconditional statements

1. Perpendicular lines
2. Parallel lines
3. Perpendicular planes
4. Parallel planes
5. Biconditional statements
6. If and only if

using: deductive reasoning

1. Symbolic notation
2. Logical argument
3. Law of Detachment
4. Law of Syllogism

with: properties from algebra

1. Addition property
2. Subtraction property
3. Multiplication property
4. Division property
5. Symmetric property
6. Transitive property
7. Substitution property
8. Properties of equality - reflexive, symmetric, and transitive

and proving: statements about segments and angles

1. Theorem
2. Two-column proof
3. Properties of segment congruence
4. Properties of angle congruence
5. All right angles are congruent
6. Congruent supplement theorem
7. Congruent complement theorem
8. Linear pair postulate

9 EXPANDED UNIT MAP

10 NEW UNIT SELF-TEST QUESTIONS

1. How do you use deductive reasoning to prove that lines are parallel or perpendicular?

COMPARISON TABLE

② OVERALL CONCEPT

Triangles

① CONCEPT

Congruent Triangles

① CONCEPT

Similar Triangles

③ CHARACTERISTICS

Corresponding angles are congruent
Corresponding sides are congruent
Logic
CPCTC
Four ways of proving the triangles are congruent: SSS, SAS, ASA, AAS, HL
Theory

③ CHARACTERISTICS

Corresponding angles are congruent
Corresponding sides are proportianal
Scale Factor
Three ways to show the triangles are similar: SSS, AA, SAS (Similarity Theorems)
Applications
Find the measure of the missing side
Proportions

⑨ EXTENSIONS

FRAME : One proof and one measurement problem

④ LIKE CHARACTERISTICS

Corresponding angles are congruent

⑤ LIKE CATEGORIES

Corresponding angles

⑥ UNLIKE CHARACTERISTICS

Corresponding sides are congruent
Four ways to prove the triangles are congruent
CPCTC

Corresponding sides are proportional
3 ways to prove similar
Similarity Theorem

⑦ UNLIKE CATEGORIES

Sides
Ways to prove
Theorems

⑧ SUMMARY

Congruent and similar triangles both have congruent corresponding angles, but they differ in their sides (congruent vs. porportional), ways to prove, and theorems.

Step 1: Communicate targeted concepts	Step 2: Obtain Overall Concept	Step 3: Make lists of known characteristics	Step 4: Pin down Like Characteristics	Step 5: Assemble Like Categories	Step 6: Record Unlike Characteristics	Step 7: Identify Unlike Categories	Step 8: Nail down a summary	Step 9: Go beyond the basics

MATH FRAME

Key Topic

Deductive Reasoning

is about...

process of reasoning in which the argument supports the conclusion based on a rule (making conclusions based on known facts).

Main Idea: Symbolic notation	Main Idea: Logical argument	Main Idea: Law of Detachment	Main Idea: Law of Syllogism
Essential details	**Essential details**	**Essential details**	**Essential details**
conditional statements p ---> q converse q ---> q	using if-then statements	if p --> q is a true statement and p is a true statement, then we can conclude that q is true.	if p --> q and q --> r are both true, then we can conclude that p--> r.
~ negation ~p	using givens	Example: If Jon gets 2 weeks of vacation, he will go to Europe.	Example: If Susan earns her course credits, she will graduate.
biconditional statements p <-----> q	using algebra concepts and properties	He gets 2 weeks of vacation.	If she graduates, she will go to college.
p is hypothesis q is conclusion	using postulates and theorems	Therefore, we can conclude that Mark is going to Europe.	Therefore, if Susan earns her course credits, she will go to college.

So What? (Whats important to understand about this?)

When we use deductive reasoning, we can make logical arguments in geometry.

Paul Riccomini

- Workshops
  - Building Strategies to Help Students with Disabilities Graduate: Improving Academic Success in Math (SPDG)
  - Strategies for Making AYP for Math (SPDG)
- Elluminates
  - Error Analysis Procedures
- Video

Elluminates

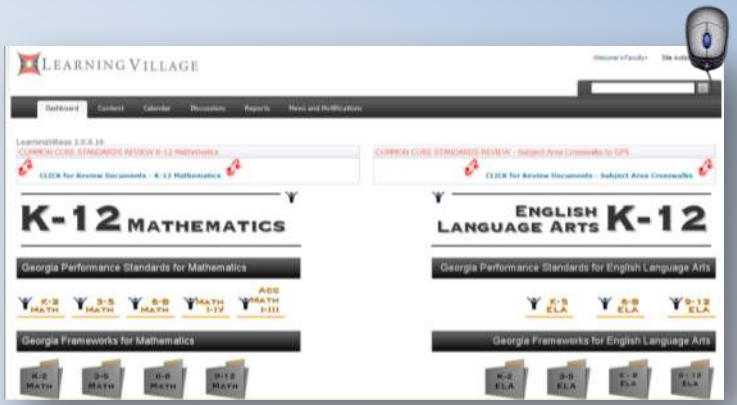
- **Teacher Talk** (Talking about Learning and Kids)
  - Grade level
  - Math Support I bi-monthly talks
- **Special Education with General Education**
  - 10-15-08 Improving Academic Performance of SWD's for Elementary Mathematics
  - 11-12-08 Improving Academic Performance of SWD's for Secondary Mathematics
  - 01-14-09 SIA Mathematics Vocabulary & Interleave Strategies
  - 02-11-09 SIA Mathematics 1 and Mathematics Support, Space Learning
  - 03-18-09 SIA Mathematics: Graphic representation & Flexible groups (PAL)

Learning Village

Learning Village, a resource in alignment to the Georgia Performance Standards, has been designed to achieve a balance among concepts, problem solving, and skill development in Georgia's Mathematics classrooms. This resource stresses rigorous concept development, presents realistic and relevant tasks, and keeps a strong emphasis on computational skills.

This website includes:

- standards
- REVISED framework units
- classroom and training videos
- mathematics parent letters
- vertical alignment charts
- webinars
- middle school mathematics webcasts
- PowerPoint unit overviews (coming soon)



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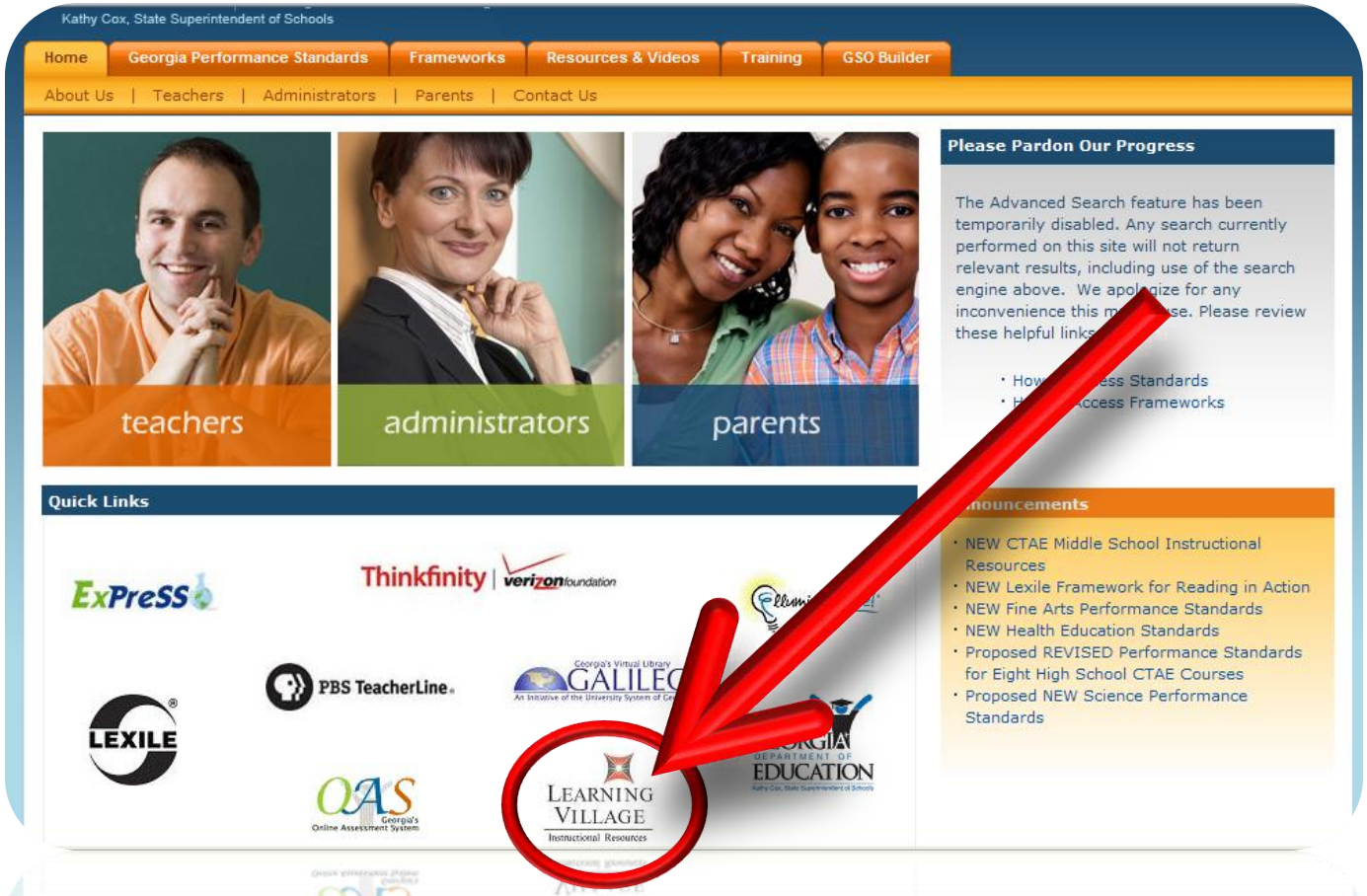
GeorgiaStandards.org…



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Accessing Learning Village

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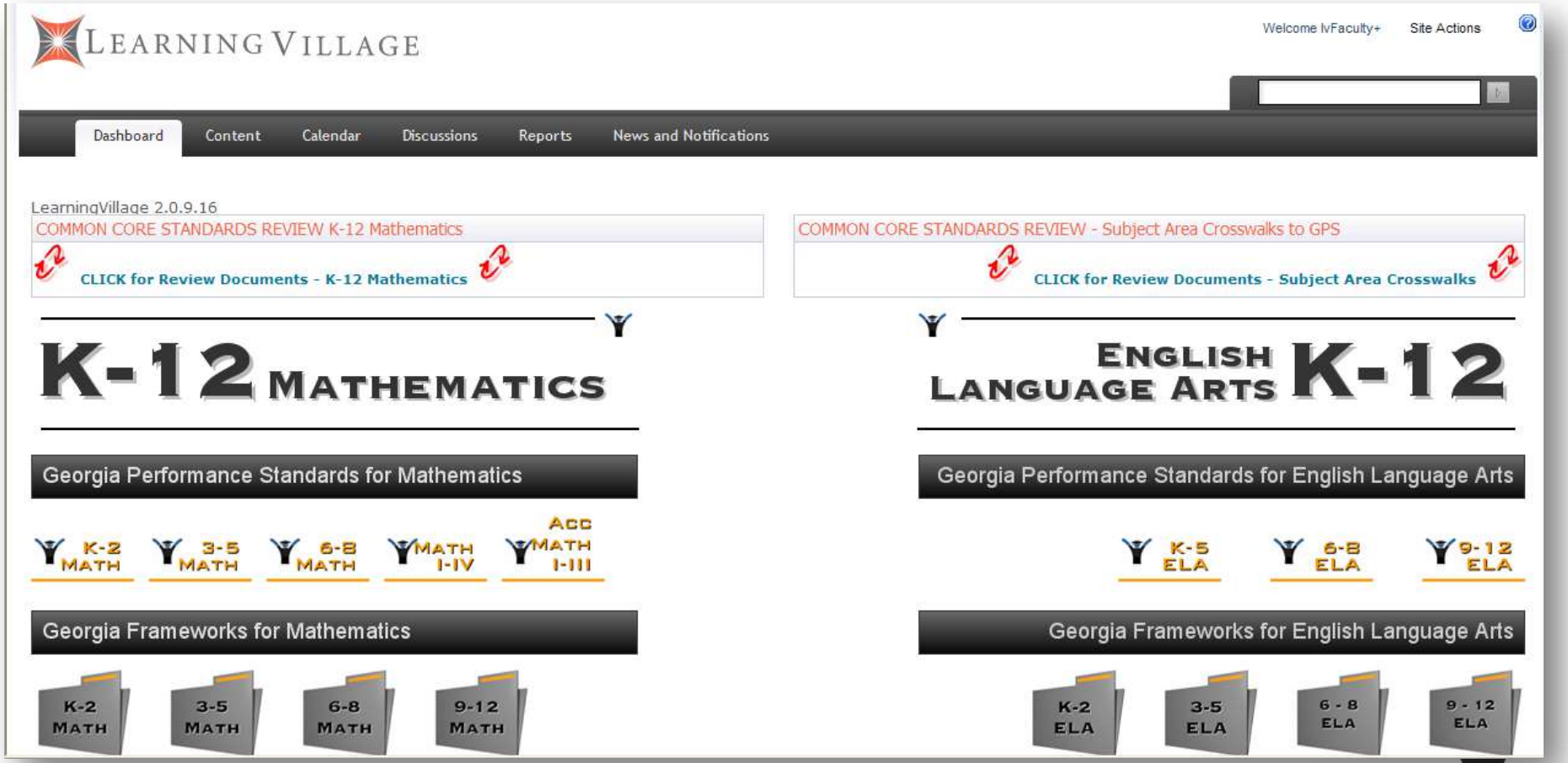
Dashboard of Instructional sources …



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Revised Elementary Frameworks

Revised frameworks include:

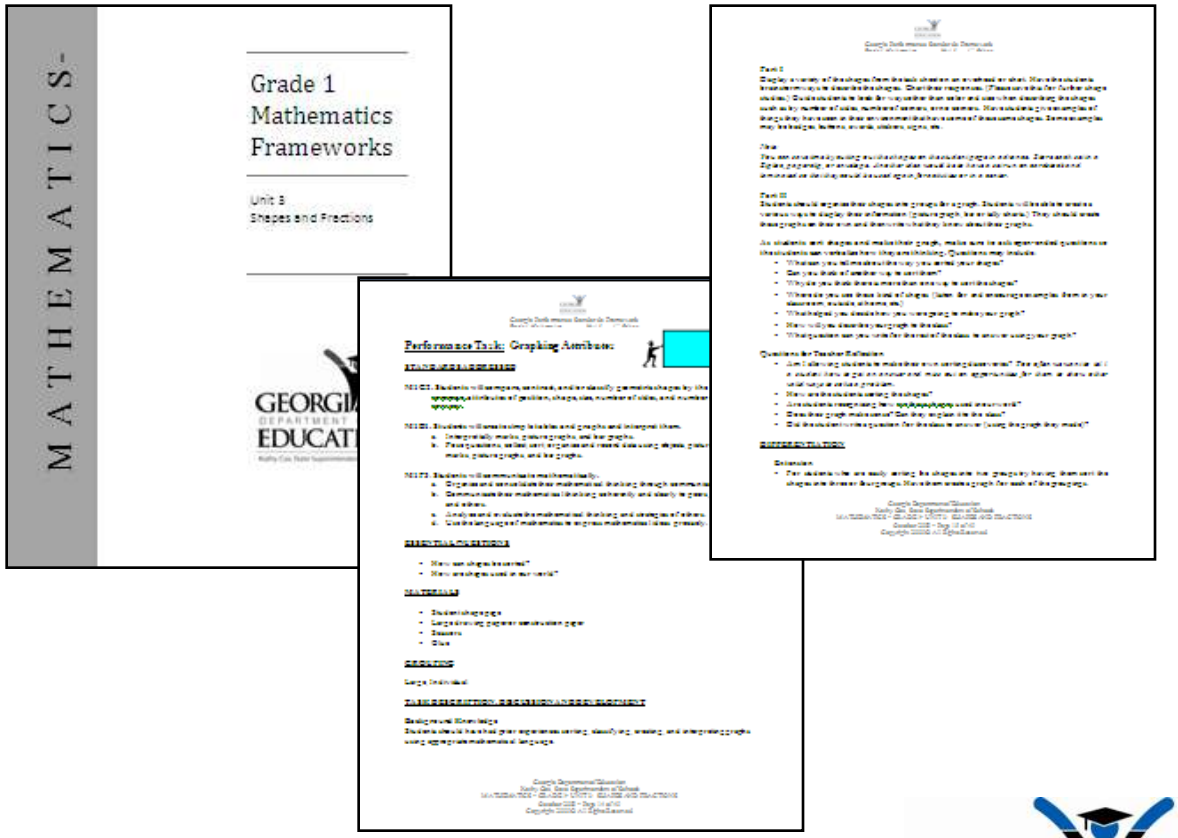
Updated Standards

Differentiation

Essential Questions

Updated Tasks

Background Knowledge



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Revised Middle School Frameworks

Revised frameworks include:

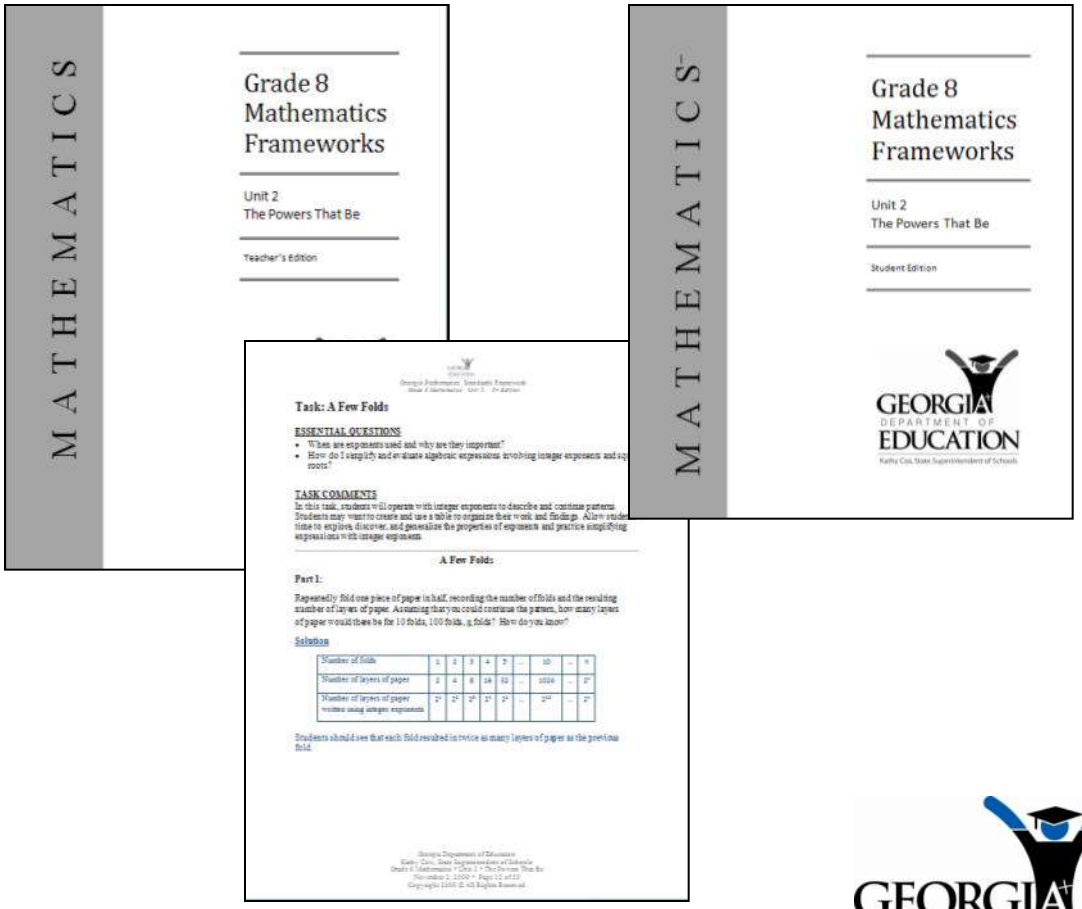
Teacher's Edition

Student Edition

Essential Questions

Updated Tasks

Background Knowledge



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PBS TeacherLine

PBS TeacherLine is an online tool that offers low-cost, high-quality professional development classes to teachers so they can improve their abilities and earn the Professional Learning Units -- or PLUs -- they need to maintain their certification.

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GPB npr

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Mathematics Newsletters

Mathematics Newsletters include:

Content Articles

Resources

Elluminate Calendar

Professional Learning Opportunities

Assessment Articles

Instructional Articles

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Mathematics Newsletters

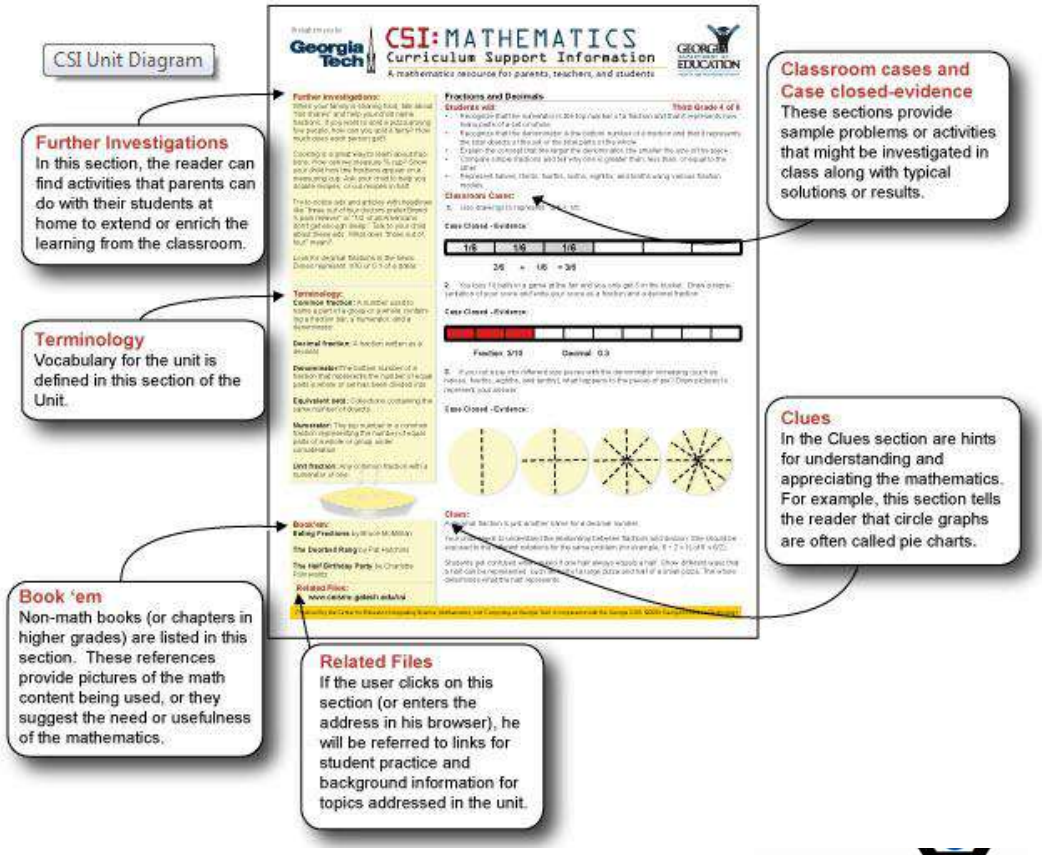
To subscribe to the bi-monthly newsletter, send an email with no message to the appropriate email address listed below:

mailto:join-mathematics-k-5@list.doe.k12.ga.us
mailto:join-mathematics-6-8@list.doe.k12.ga.us
mailto:join-mathematics-9-12@list.doe.k12.ga.us
mailto:join-mathematics-districtsupport@list.doe.k12.ga.us
mailto:join-mathematics-administrators@list.doe.k12.ga.us
mailto:join-mathematics-resa@list.doe.k12.ga.us

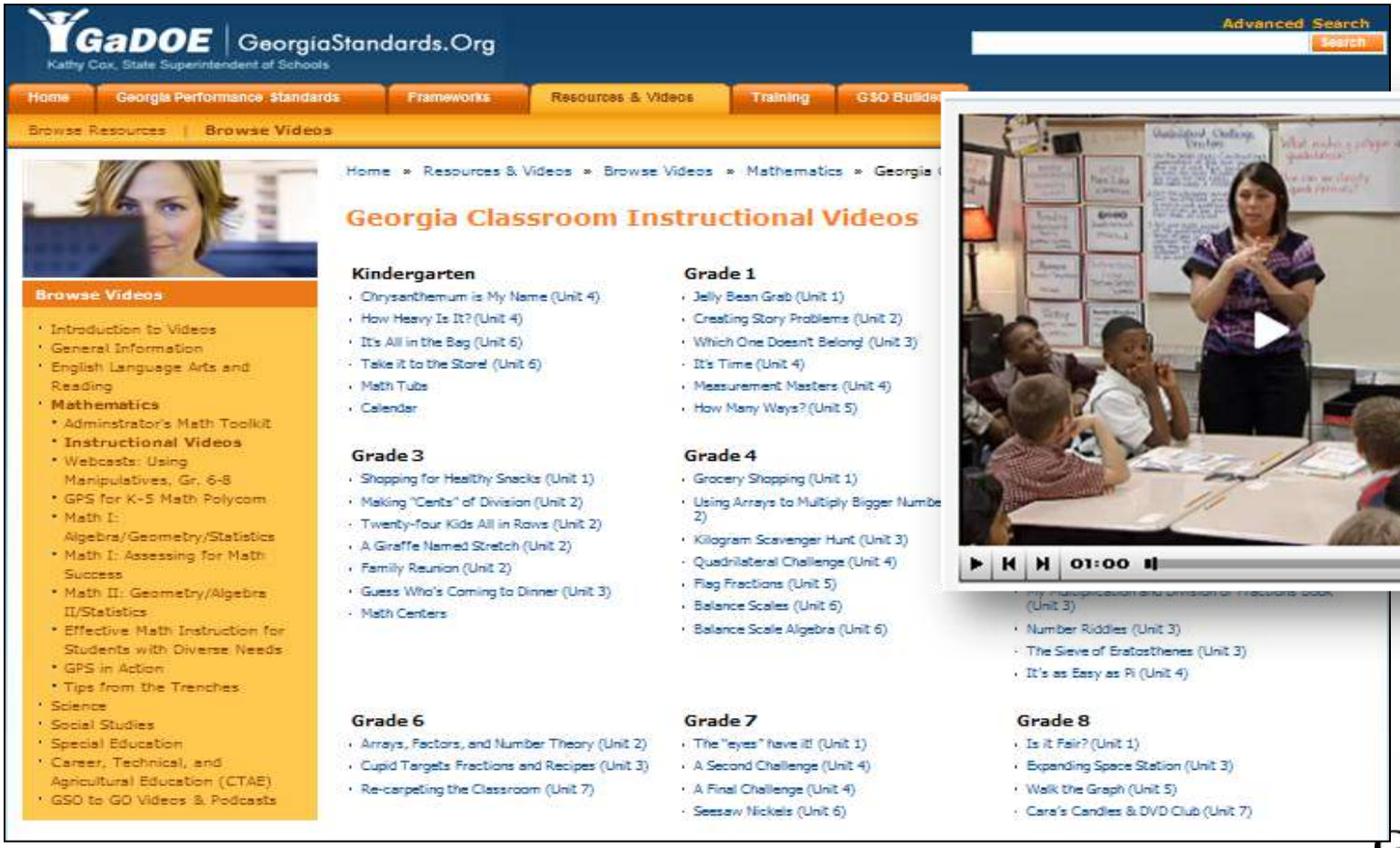
Parent Letters

Mathematics Parent Letters include:

Each letter provides glimpses of the content investigated in class, suggestions for activities to explore at home, vocabulary used in the unit, grade-appropriate readings related to the math content, and links to websites that contain additional background information or practice opportunities for skills development.



GPS Mathematics Classroom Videos



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Mathematics Videos

www.georgiastandards.org

- Administrator's Mathematics Toolkit
- Georgia Classroom Instructional Videos
- Webcasts: Using Manipulatives, Gr. 6-8
- GPS for K-5 Math Polycom, March, 2009
- Mathematics I: Algebra/Geometry/Statistics
- Mathematics I: Assessing for Mathematics Success
- Mathematics II: Geometry/Algebra II/Statistics
- Effective Mathematics Instruction for Students with Diverse Needs
- Georgia Performance Standards In Action
- Tips From the Trenches

What is georgiamath.org?

From
http://www.gadoe.org

Look for the calculator!

Or go directly to:
georgiamath.org

What can you find at the georgiamath.org page?

- Introductory Video by Kathy Cox
- Comparison of QCC and GPS Course Content
- Information about learners requiring acceleration and learner requiring support
- Resources for Parents, Teachers and Educators
- General Information
- Link to GeorgiaStandards.org

Year 3

- Mathematics III
- Mathematics Support III (optional)

Fourth Year Mathematics Courses

- Mathematics IV
- Advanced Mathematical Decision Making
- Advanced Mathematical Decision Making in Industry and Government
- Advanced Mathematical Decision Making in Finance
- AP Statistics
- AP Calculus AB/BC

State Board Rule 160-4-2-.20	Course Numbers
Mathematics Support III	27.04600
Advanced Mathematical Decision Making	27.08500
Advanced Mathematical Decision Making in Industry and Government	27.08600
Advanced Mathematical Decision Making in Finance	27.08700

Thanks to:

Richard D. Lavoie — How Difficult Can This Be? A Learning Disabilities Workshop (1989)

Dr. Mel Levine — http://www.pbs.org/wgbh/misunderstoodminds

http://www.eyetricks.com/illusions.htm

Center for Research on Learning

Kansas Content Enhancements

Sileo, Jane M and van Garderen, Delinda (2010)Creating Optimal Opportunities to Learn Mathematics: Blending Co-Teaching Structures With Research-Based Practices. *Teaching Exceptional Children*, Vol.42, No. 3, pp.14-21.

Presenters

Donna Ann Flaherty
Education Program Specialist for
Divisions for Special Education Services
dflaherty@doe.k12.ga.us

Sharon Hooper
Mathematics Education Program Specialist
shooper@doe.k12.ga.us

Sharquinta Tuggle
Teacher on Special Assignment – Mathematics
stuggle@doe.k12.ga.us

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Final Thought…

- “A man who doubts himself is like a man who would enlist in the ranks of his enemies and bear arms against himself. He makes his failure certain by himself being the first person to be convinced of it.“

- Alexandre Dumas