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

“We will lead the nation in improving student achievement.”
Georgia Special Education Students by Disability Category

- Learning Disability: 44%
- Speech/Language Impaired: 19%
- Intellectually Disability: 8%
- Emotionally Disability: 7%
- Other Health Impaired: 11%
- Autism: 4%
- All Others: 7%

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“We will lead the nation in improving student achievement.”
“We will lead the nation in improving student achievement.”
APR - CRCT and Enhanced GHSGT

<table>
<thead>
<tr>
<th>Percentage of Students Meeting or Exceeding Standards</th>
<th>Georgia 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRCT Mathematics</td>
<td>53.1%</td>
</tr>
<tr>
<td>Enhanced GHSGT Mathematics</td>
<td>41.9%</td>
</tr>
</tbody>
</table>

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“We will lead the nation in improving student achievement.”

Students with Disabilities?
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?

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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.

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Visual Processing Disorder

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

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Which block has the larger dimension?
Which letter is it? Which number is it?

b  d  p  q

14  1  4  41

4 + 1

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Activity

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

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Auditory Processing Disorder

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

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Got Memory?

• Working Memory
• Factual Memory
• Procedural Memory
Try This

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.

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Distractibility vs Attention

• Distractibility
  – Visual distractibility
  – Auditory distractibility
  – Tactile distractibility
• Attention

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Activity

• Misunderstood Minds
  visual
  auditory

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

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Got the Vocabulary?

93% of teachers assume if you read the word in the passage you will understand the paragraph.

COMPREHENSION

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• 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.

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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

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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.

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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

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Critically Important

These gaps have to be closed in tandem:

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

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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.
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.

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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

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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

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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:

Knowledge

“We will lead the nation in improving student achievement.”
Thinking About the Curriculum...

Knowledge

Critical Content

Course

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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 from 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 hallway as they left your class after taking the unit test and asked, “What was that unit about?” What would you want them to say?”
RESOURCES

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Graphic Organizers
### Comparison Table

#### Overall Concept

<table>
<thead>
<tr>
<th>Concept</th>
<th>Triangles</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Concept</strong></td>
<td><strong>1. Concept</strong></td>
</tr>
<tr>
<td>Congruent Triangles</td>
<td>Similar Triangles</td>
</tr>
<tr>
<td><strong>3. Characteristics</strong></td>
<td><strong>3. Characteristics</strong></td>
</tr>
<tr>
<td>Corresponding angles are congruent</td>
<td>Corresponding angles are congruent</td>
</tr>
<tr>
<td>Corresponding sides are congruent</td>
<td>Corresponding sides are proportional</td>
</tr>
<tr>
<td>Logic</td>
<td>Scale Factor</td>
</tr>
<tr>
<td>CPCTC</td>
<td>Three ways to show the triangles are similar: SSS, AA, SAS (Similarity Theorems)</td>
</tr>
<tr>
<td>Four ways of proving the triangles are congruent: SSS, SAS, ASA, AAS, HL</td>
<td>Applications</td>
</tr>
<tr>
<td>Theory</td>
<td>Find the measure of the missing side</td>
</tr>
<tr>
<td></td>
<td>Proportions</td>
</tr>
</tbody>
</table>

#### Extensions

- **FRAME:** One proof and one measurement problem

#### Likely Characteristics

- **Likely Characteristics:**
  - Corresponding angles are congruent

#### Unlike Characteristics

- **Unlike Characteristics:**
  - Corresponding sides are congruent
  - Four ways to prove the triangles are congruent: CPCTC

- **Unlike Characteristics:**
  - Corresponding sides are proportional
  - 3 ways to prove similar triangles |
  - Similarity Theorem

#### Summary

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

### Steps

1. Communicate targeted concepts
2. Obtain Overall Concept
3. Make lists of known characteristics
4. Pin down like characteristics
5. Assemble like categories
6. Record unlike characteristics
7. Identify unlike categories
8. Nail down a summary
9. Go beyond the basics

---

Adapted from The Concept Comparison Routine. Copyrights for the template are held by the authors of The Concept Comparison Routine.
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**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
  - Logical argument
  - Law of Detachment
  - Law of Syllogism

- **Essential details**
  - Conditional statements
    - \( p \rightarrow q \)
    - Converse: \( q \rightarrow p \)
  - Negation: \( \sim p \)
  - Biconditional statements
    - \( p \iff q \)
  - \( p \) is hypothesis
  - \( q \) is conclusion

- **Using if-then statements**
  - If \( p \rightarrow q \) is a true statement and \( p \) is a true statement, then we can conclude that \( q \) is true.
  - Example: If Jon gets 2 weeks of vacation, he will go to Europe.

- **Using given statements**
  - Example: If Susan earns her course credits, she will graduate.

- **Using algebra concepts and properties**
  - He gets 2 weeks of vacation.

- **Using postulates and theorems**
  - Therefore, we can conclude that Mark is going to Europe.

- **If she graduates, she will go to college.**

- **Therefore, if Susan earns her course credits, she will go to college.**

**So What? (What’s 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

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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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Accessing Learning Village

If you do not have a GaDOE portal login, please click on the “sign up for an account” link to gain access to Learning Village.
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Revised Elementary Frameworks

Revised frameworks include:
Updated Standards
Differentiation
Essential Questions
Updated Tasks
Background Knowledge

“We will lead the nation in improving student achievement.”
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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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

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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.

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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

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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)

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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

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**State Board Rule 160-4-2-.20**

<table>
<thead>
<tr>
<th>Course Numbers</th>
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</tr>
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<tbody>
<tr>
<td><strong>Mathematics Support III</strong></td>
<td>27.04600</td>
</tr>
<tr>
<td><strong>Advanced Mathematical</strong></td>
<td>27.08500</td>
</tr>
<tr>
<td><strong>Decision Making</strong></td>
<td></td>
</tr>
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<td><strong>Decision Making in Finance</strong></td>
<td></td>
</tr>
</tbody>
</table>

“We will lead the nation in improving student achievement.”
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.pbs.org/wgbh/misunderstoodminds)


Center for Research on Learning
Kansas Content Enhancements


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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

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