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Math Strategies That Work to Prepare All Students for College and Career

John Squires
Director of High School to College Readiness

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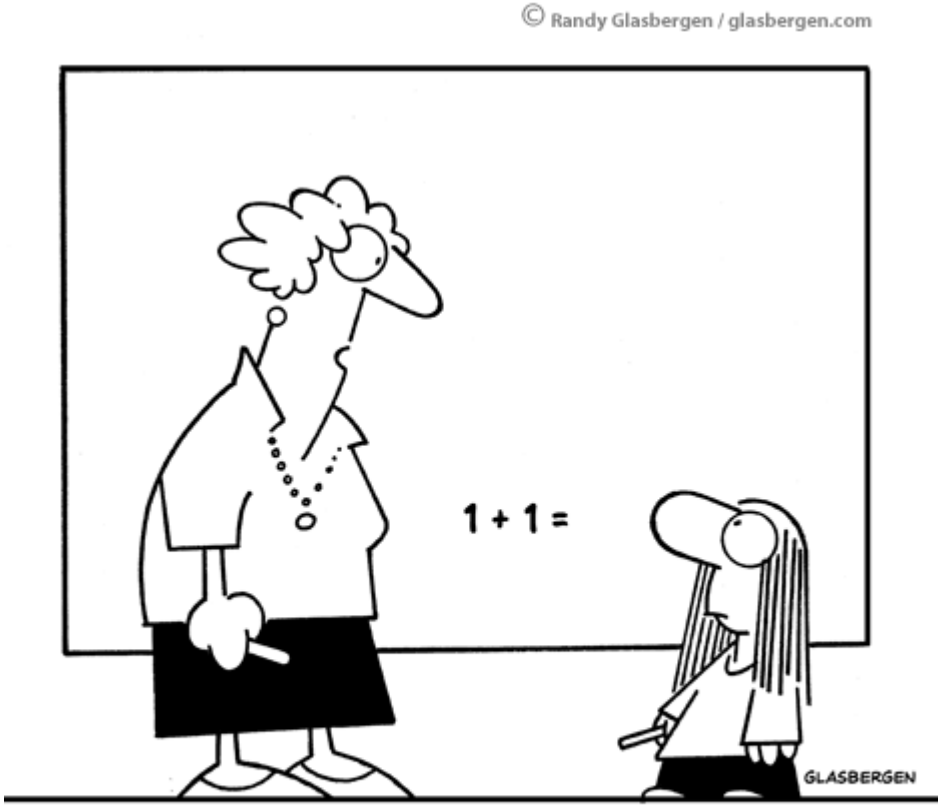
SREB Mathematics Consultant

Two Mathematics Initiatives

- Mathematics Design Collaborative
- Mathematics Readiness Course



"Yes, this will be useful to you later in life."

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Mathematics Design Collaborative

Amanda Merritt
SREB Mathematics Consultant

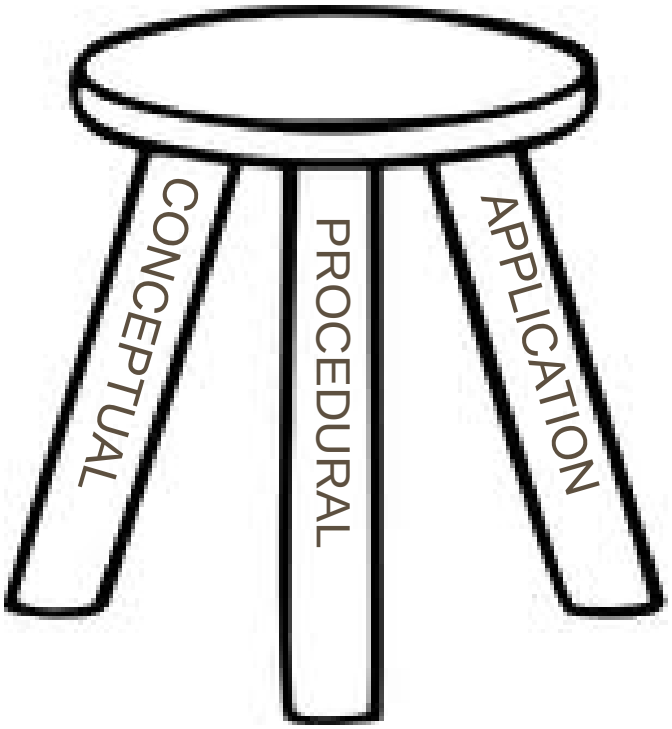
Mathematics Design Collaborative

- Began in 2010
- Purpose: To assist schools in effectively teaching college- and career-readiness standards (CCRS)
- Schools involved from more than 30 states
- State-Wide Roll-Outs: Arkansas (2011), West Virginia (2013), Alabama (2014), Mississippi (2015), North Carolina (2015), Texas (2015)
- 2016: Georgia, Louisiana, Oklahoma, South Carolina, Virginia

Necessary Shifts

Rigor in CCRS

- Skills and concepts are clearly defined.
- An ability to apply concepts and skills to new situations is expected.



The Big Idea of Assessment for Learning

Students and teachers

Using evidence of learning

To adapt teaching and learning

To meet immediate learning needs

Minute-to-minute and day-by-day

(Thompson & Wiliam, 2007)

The Five Strategies of Assessment for Learning

1. Clarifying and sharing learning intentions and criteria for success
2. Engineering effective discussions, questions and tasks that elicit evidence of learning
3. Providing feedback that moves learners forward
4. Activating students as the owners of their own learning
5. Activating students as instructional resources for one another

(Thompson & Wiliam, 2007)

"The five key ingredients are designed to ensure that students are engaged in a productive struggle with mathematics rather than on the receiving end of a lecture."

(Shannon, 2011)

VS.

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(Shannon, 2011)

Structure of Formative Assessment Lessons (Concept Development)

- Pre-Lesson Assessment
- Write feedback questions based on student work
- Collaborative activity based on skills and concepts
- Students answer teacher-developed feedback questions and improve original solutions to pre-lesson assessment task

Pre-Lesson Assessment

Interpreting Expressions

1. Write algebraic expressions for each of the following:

   a. Multiply n by 5 then add 4. .....

   b. Add 4 to n then multiply by 5. .....

   c. Add 4 to n then divide by 5. .....

   d. Multiply n by n then multiply by 3. .....

   e. Multiply n by 3 then square the result. .....

2. The equations below were created by students who were asked to write equivalent expressions on either side of the equals sign.

   Imagine you are a teacher. Your job is to decide whether their work is right or wrong. If you see an equation that is false, then:

   a. Cross out the expression on the right and replace it with an expression that is equivalent to the one on the left.

   b. Explain what is wrong, using words or diagrams.

$$2(n + 3) = 2n + 3$$

$$\frac{10n - 5}{5} = 2n - 1$$

$$(5n)^2 = 5n^2$$

$$(n + 3)^2 = n^2 + 3^2 = n^2 + 9$$

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Whole-Class Introduction

$4(n+2)$	Multiply n by two, then add four.
$2(n+4)$	Add four to n, then multiply by two.
$4n+2$	Add two to n, then multiply by four.

Collaborative Activity

Sample of Finished Activity

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Whole-Class Discussion

Draw an area that shows this expression:

$$3(x + 4)$$

Write a different expression that gives the same area.

Feedback Questions

1. In the following example, how will the parentheses change the answer?

$$6x^2 \text{ and } (6x)^2$$

---

2. Explain why this equation is not true.

$$4(x + 2) = 4x + 2$$

Post-Lesson Assessment

Interpreting Expressions

1. Write algebraic expressions for each of the following:

   a. Multiply n by 5 then add 4. .....

   b. Add 4 to n then multiply by 5. .....

   c. Add 4 to n then divide by 5. .....

   d. Multiply n by n then multiply by 3. .....

   e. Multiply n by 3 then square the result. .....

2. The equations below were created by students who were asked to write equivalent expressions on either side of the equals sign.

   Imagine you are a teacher. Your job is to decide whether their work is right or wrong. If you see an equation that is false, then:

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$$2(n + 3) = 2n + 3$$

$$\frac{10n - 5}{5} = 2n - 1$$

$$(5n)^2 = 5n^2$$

$$(n + 3)^2 = n^2 + 3^2 = n^2 + 9$$

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Analyzing Student Progress

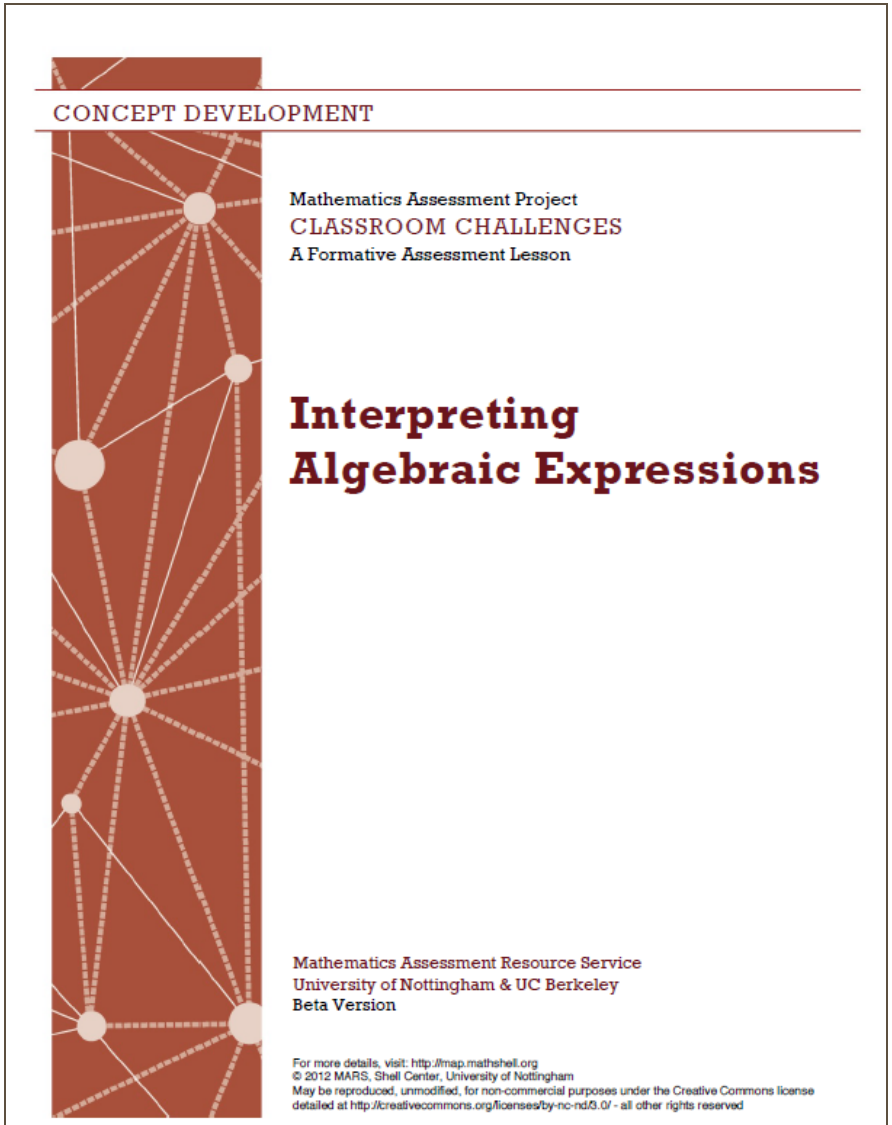
Analyzing Student Data

FAL Title: _____ **Teacher Name:** _____

Date of Pre-Lesson Assessment: _____ **Date of Post-Lesson Assessment:** _____

Analyzing Pre-Lesson Assessment Data				
Pre-Lesson Assessment Data	Demonstrates understanding (3)	Demonstrates some understanding (2)	Demonstrates little to no understanding (1)	No responses provided (0)
Number of Students				
What does the work reveal about the students' current level of understanding? What are the common issues? Summarize the difficulties by writing a series of questions.				
Analyzing Post-Lesson Assessment Data				
Post-Lesson Assessment Data	Demonstrates understanding (3)	Demonstrates some understanding (2)	Demonstrates little to no understanding (1)	No responses provided (0)
Number of Students				

FAL Script



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Structure of Formative Assessment Lessons (Problem Solving)

- Assessment Task
- Feedback questions based on student work
- Introduction: Return Assessment Task with feedback questions for individual improvement of initial attempts
- Collaborative Activity: produce a joint solution
- Whole Class Discussion: sharing different approaches

SREB's Four-Element Training Approach

- Element 1: Build Capacity of Teacher Leaders
- Element 2: Develop District and Regional Level Trainers
- Element 3: Conduct Classroom Observations and Provide Teachers Feedback
- Element 4: Work with Principals

SREB's Three-Year Training Plan

- Year 1: MDC teacher leaders implement 6-8 Formative Assessment Lessons
- Year 2: SREB works with MDC teacher leaders to build collaborative teams to begin the spread of MDC
- Year 3: MDC becomes part of the culture of the entire math department and spreads through the school district

Instructional Shifts in the Mathematics Classroom

"The MDC model has given me a way to see not only if my students understand, but how and what they understand. It has been exciting to see my students learning, and exiting to teach."

Danielle S.

Teacher
Georgia

Instructional Shifts in the Mathematics Classroom

"Students were reasoning in ways that I had never imagined, and I turned into more of a facilitator in the classroom. Students were taking ownership of their own learning. I realized that I had been robbing them of that opportunity."

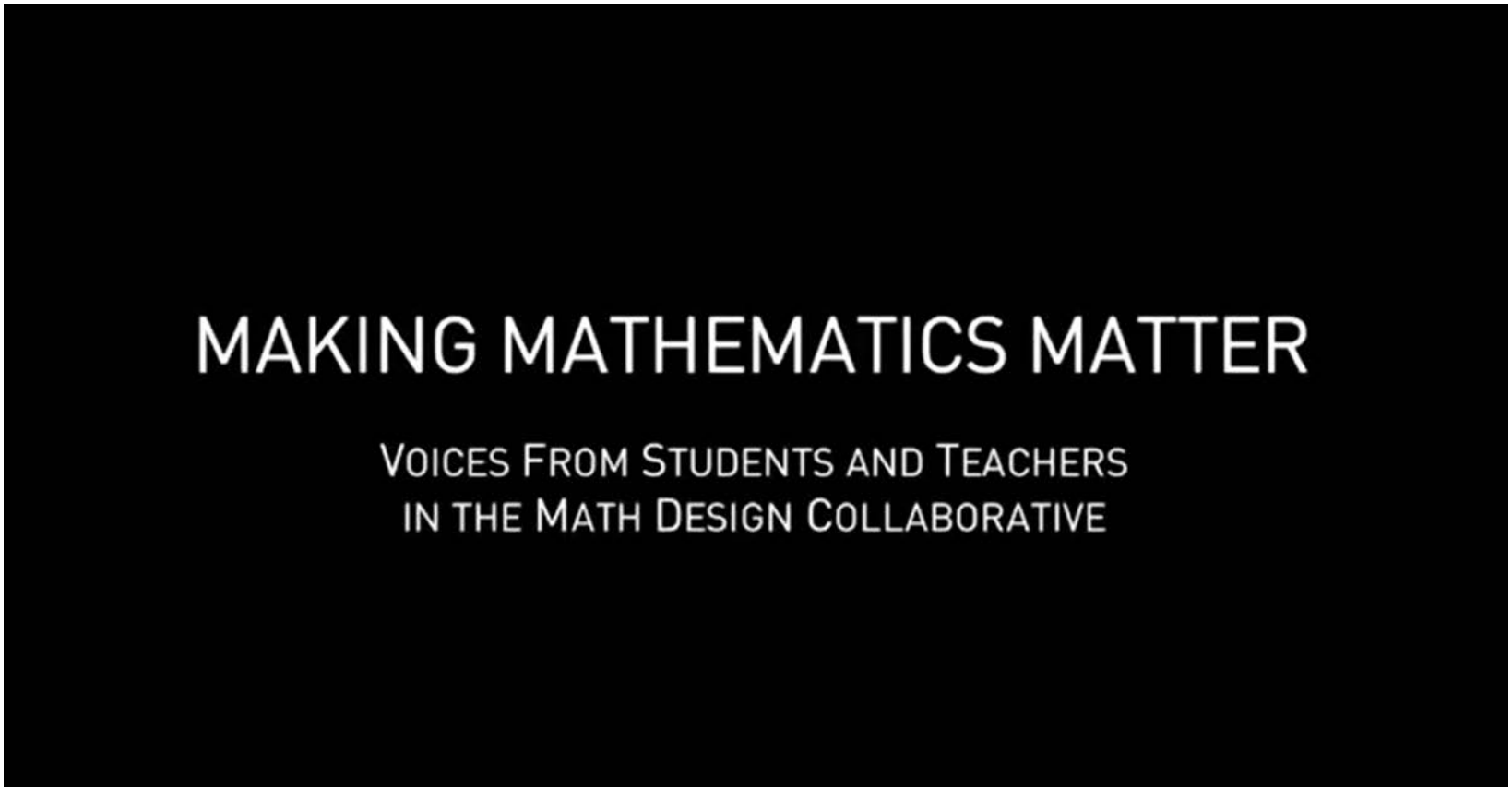
Amanda C.
Teacher
Arkansas

Instructional Shifts in the Mathematics Classroom

"Our classrooms have moved from traditional math instruction to a collaborative environment where students are completely engaged in the learning. MDC has changed the way our teachers think about instruction."

Rodney W.
Principal
Arkansas

Making Mathematics Matter



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Readiness Courses

John Squires
Director of High School to College Readiness

SREB's College and Career Readiness Action Agenda

1. **Adopt statewide readiness standards.** Establish statewide postsecondary readiness standards for literacy and mathematics skills; ensure that those skills are emphasized in course work; and have both K-12 and postsecondary education agree on the specific standards.

2. **Assess high school juniors.** Assess students in 11th grade to determine their progress in achieving the readiness standards.

3. **Offer transitional readiness courses.** Offer supplemental transitional postsecondary-readiness courses, and require juniors assessed as underprepared to take the classes in 11th or 12th grade.

4. **Apply the standards in college.** Ensure that public postsecondary institutions apply the readiness standards agreed to with K-12 in deciding whether students need additional learning support after admission and, if so, the form of such support.

5. **Hold schools accountable.** Include increasing postsecondary readiness as an important criterion in school accountability systems.

From High School to College: A Model for Readiness

HS Junior

Students test at end of junior year to determine College Readiness.

HS Senior

Students not College Ready take courses in senior year such as Literacy Ready and Math Ready.

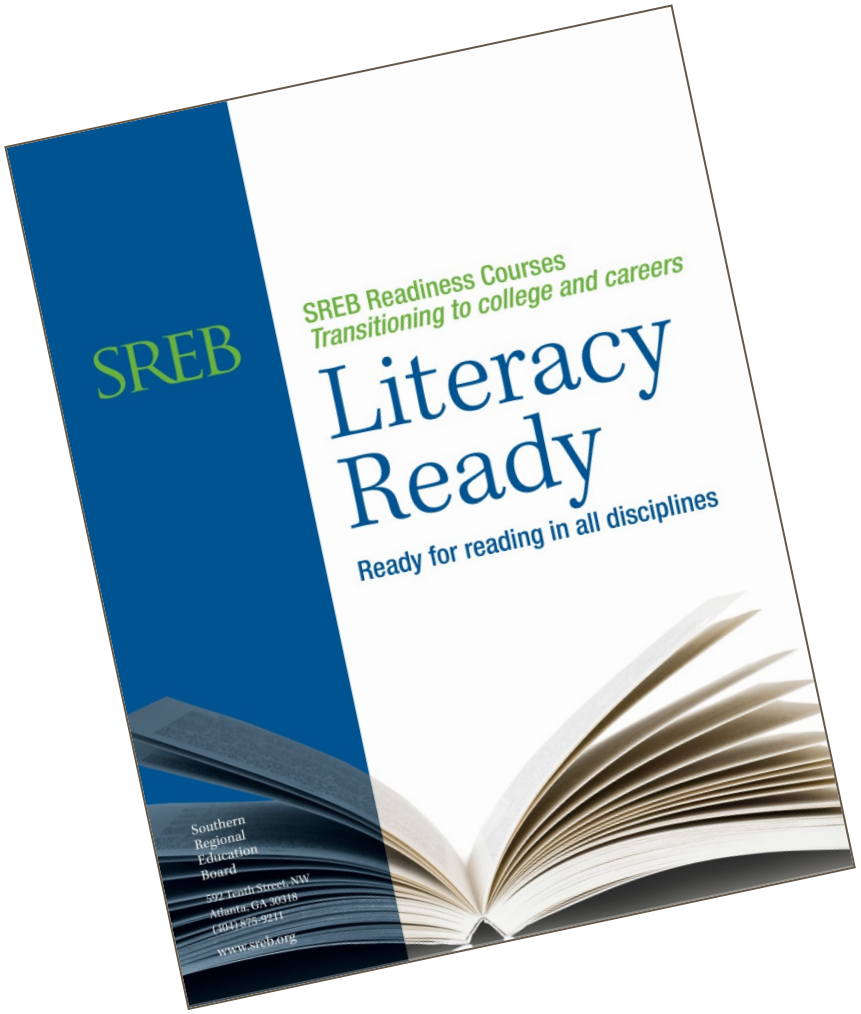
College Freshman

Students completing the Readiness Courses enter college and take college level Math and English courses, not needing remediation.

Colleges and High Schools Working Together

- Kentucky (Senate Bill 1)
  - Senate Bill 1 mandates alignment of academic standards from elementary through postsecondary and colleges to work with high school to address readiness
  - Requires students to take ACT college admissions and placement exam in 11th grade and schools to provide a transitional course or monitored intervention to every student not meeting readiness benchmarks in ELA or math
- North Carolina (Essentials for College Math)
  - Uses Math Ready as 4th Year Math Course
  - Students taking Math Ready and meeting Multiple Measures Criteria don't need math remediation when enrolling in a community college
- Tennessee (SAILS Program)
  - Community Colleges work with local high schools to embed assessments in transition math course, students complete remediation senior year in high school

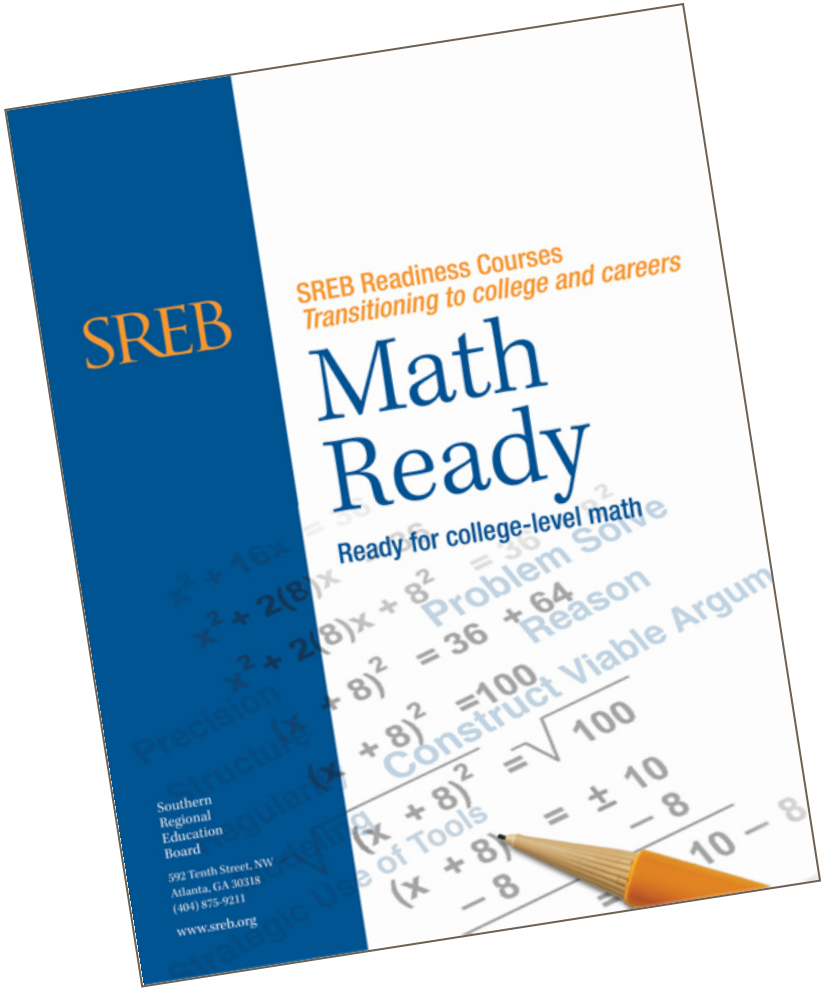
Literacy Ready: Ready for reading in all disciplines



- Outside of the box course!
- Utilizes disciplinary literacy
- Multi-disciplined approach
- 2 units each in English, Science and Social Studies
- Content-rich instruction with specific reading and writing strategies
- Interesting topics like how the internet affects the brain

- Download for free at www.sreb.org/ready

Math Ready:
Ready for college-level math



- Not your typical math course!
- Contextual real world assignments
- Utilizes the best instructional strategies in the country designed to produce student conceptual understanding
- 8 units covering topics in numeracy, algebra and statistics

- Download for free at www.sreb.org/ready

Readiness Courses 2014-15

150+ teachers using Math Ready

15+ teachers using Literacy Ready

3600+ downloads from iTunes U

Survey Results

Teachers surveyed regarding existing courses

- 84% satisfaction with courses
- 89% satisfaction with student learning and progress
- Training program being strengthened – both face to face and online - due to teacher feedback

Readiness Courses Revisions

Literacy Ready

- George Johnson working on updating to put Disciplinary Literacy within an LDC framework
- Upfront prompt of writing assignment so students can make connections between reading and writing
- Streamline academic notebooks and improve consistency between teacher and student notebooks

Math Ready

- Kenna Barger working on updating Math Ready based on feedback from teachers
- Time allotments adjusted based on field testing
- Procedural fluency problem set samples included at conclusion of each unit

Readiness Courses Training 2015-16 Goals

Statewide Training – 4 States

- Arkansas – 100 Teachers
- Mississippi – 100 Teachers
- North Carolina 100 Teachers
- West Virginia – 100 Teachers

Readiness Institute – 50 Teachers

HSTW Summer Conference, July 13-17

Goal: At least 20% of teachers trained implement Literacy Ready in 2015-16

High School Readiness Courses

Designed for Middle School to High School Transition for Underprepared Students

- Could be taught in 8th or 9th grade
- Provide earlier intervention for struggling students before they enter high school

Draft Courses to be Piloted in 2015-16

Final Courses to be published in summer 2016 for 2016-17 Implementation

- High School Ready Math Course
- High School Ready Literacy Course