

# Promoting Positive Math Outcomes

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# Thanks

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- Ronni Ephraim, Deputy Superintendent, LA Unified
- Western Regional Reading First Technical Assistance Center
- Education Trust



# Presentation Objectives

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Participants will describe each of the key components of an effective instructional coaching model.

Participants will identify options for using data based decision making in math.

Participants will apply evidence based criteria in evaluating examples of math curricula.

Participants will identify critical features of effective mathematics interventions.



# Topics

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- Brief review of recent research
- The 3 C's
  - Collaboration
  - Curriculum
  - Coaching
- Putting it all together for RtI



# Math Research: 4 areas

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- Student Performance: International, national, and state achievement
- Mathematics Programs
- Teacher Knowledge
- National Math Advisory Panel Report



# Math Research (1)

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- Student Performance: International, national, and state achievement



# Student Performance on International Measures

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Trends in International Mathematics and Science Study (**TIMSS**), a cross national comparative achievement test for students (approximately) 4th and 8th grade students.

# TIMSS Average Mathematics Scale Scores of Eighth-grade Students by Country: 2003

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□	– International average <sup>1</sup>	466
□	+ Singapore	
□	605+ Korea, Republic of	
□	589+ Hong Kong SAR <sup>2,3</sup>	
□	586+ Chinese Taipei	
□	585+ Japan	
□	570+ Belgium-Flemish	
□	537+ Netherlands <sup>2</sup>	
□	536+ Estonia	
□	531+ Hungary	
□	529• Malaysia	
□	508• Latvia	
□	508• Russian Federation	
□	508• Slovak Republic	
□	508• Australia	
□	<b>505• (United States)</b>	
□	<b>504• Lithuania<sup>4</sup></b>	
□	502• Sweden	
□	499• Scotland <sup>2</sup>	
□	498• (Israel)	
□	496• New Zealand	

□ SOURCE: International Association for the Evaluation of Educational Achievement (IEA), Trends in International Mathematics and Science Study (TIMSS), 2003.



# Student Performance

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## PISA

Organization for Economic Co-operation and  
Development (OECD)

30 developed countries

11 non OECD countries

15 year olds

# 2003: U.S. Ranked 24<sup>th</sup> out of 29 OECD Countries in Mathematics

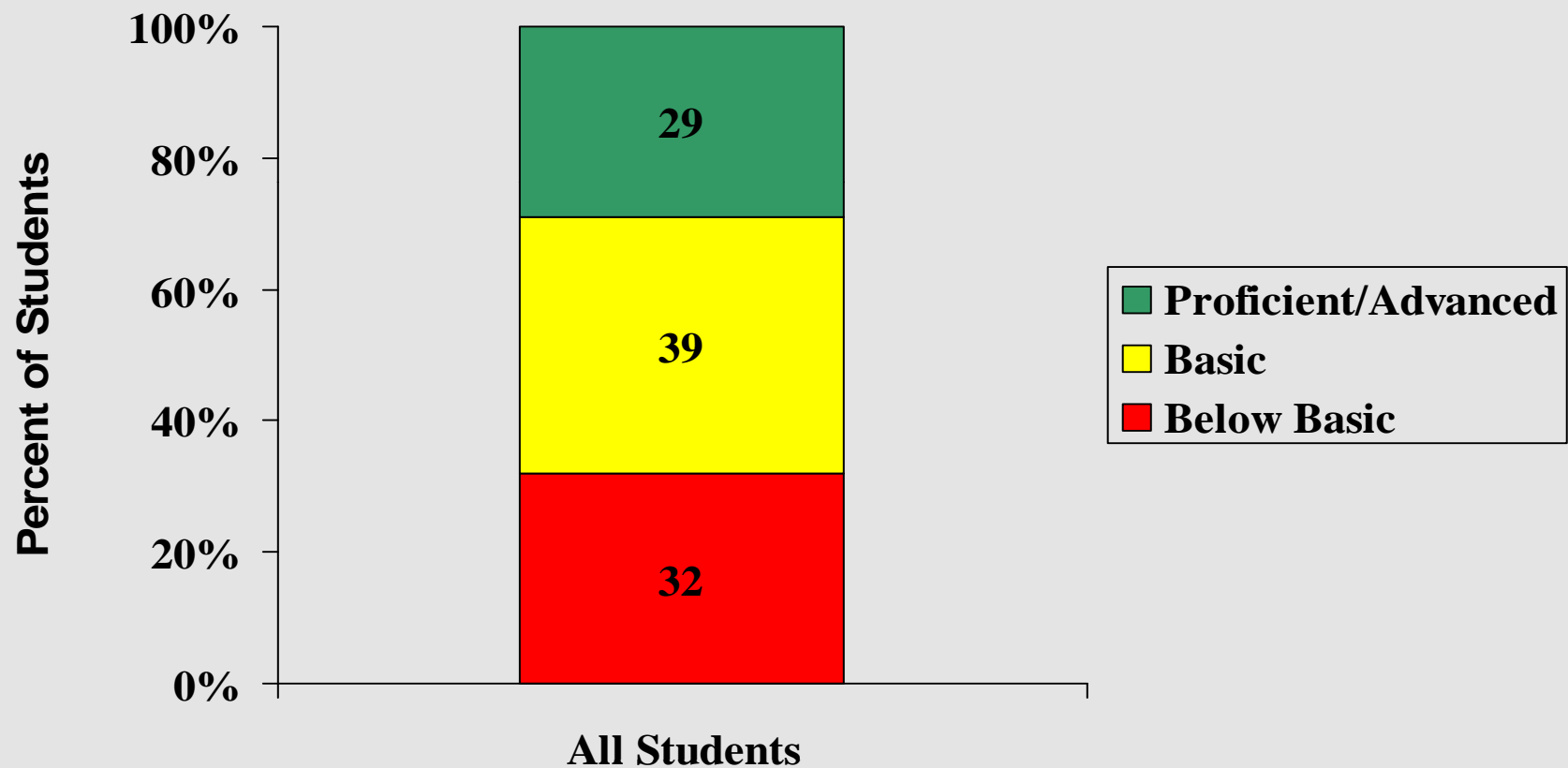


Source: Organization for Economic Cooperation and Development (OECD), PISA 2003 Results, data available at <http://www.oecd.org/>

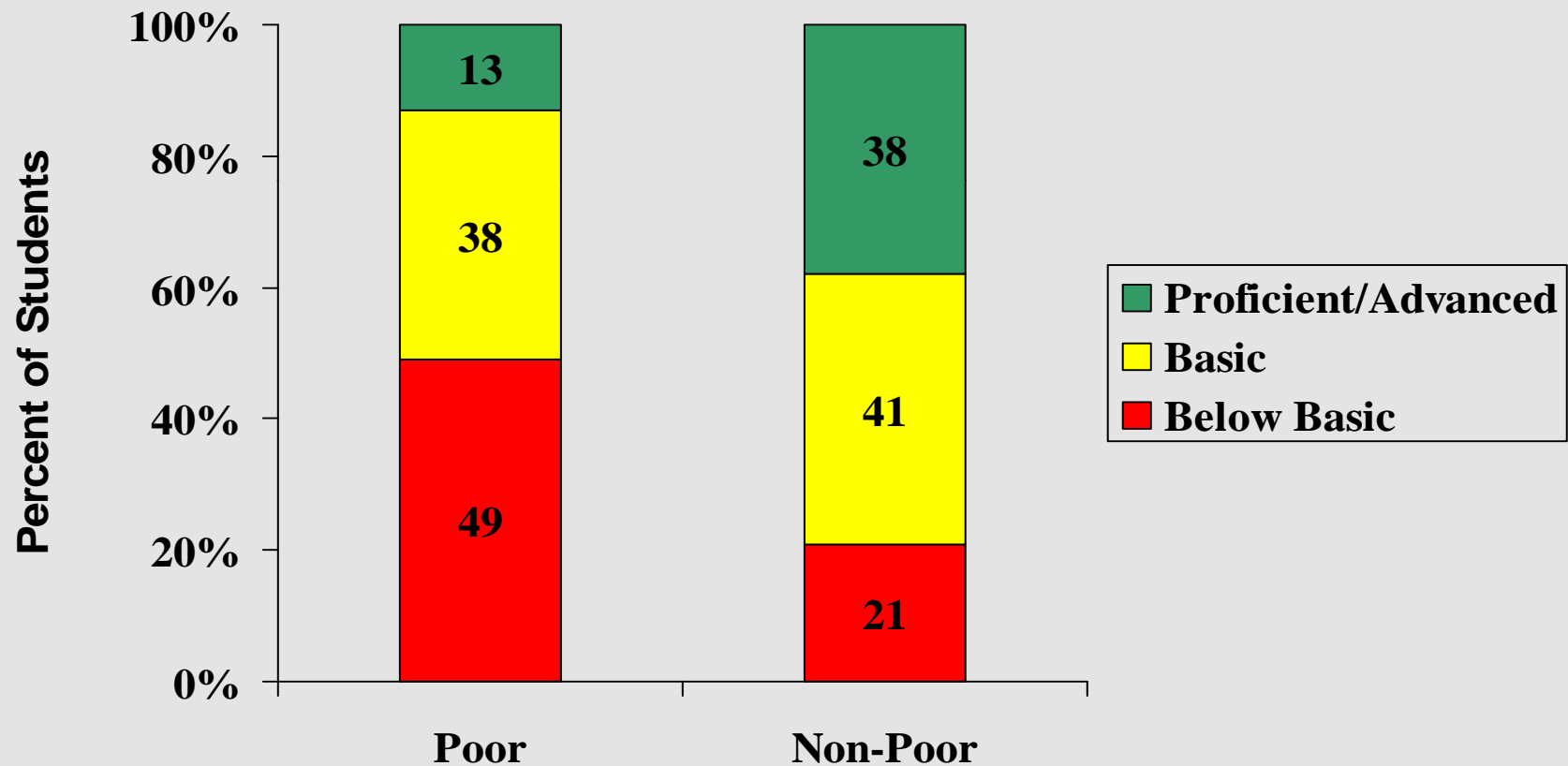
# 2005 NAEP Grade 8 Math

## All Students, Nation

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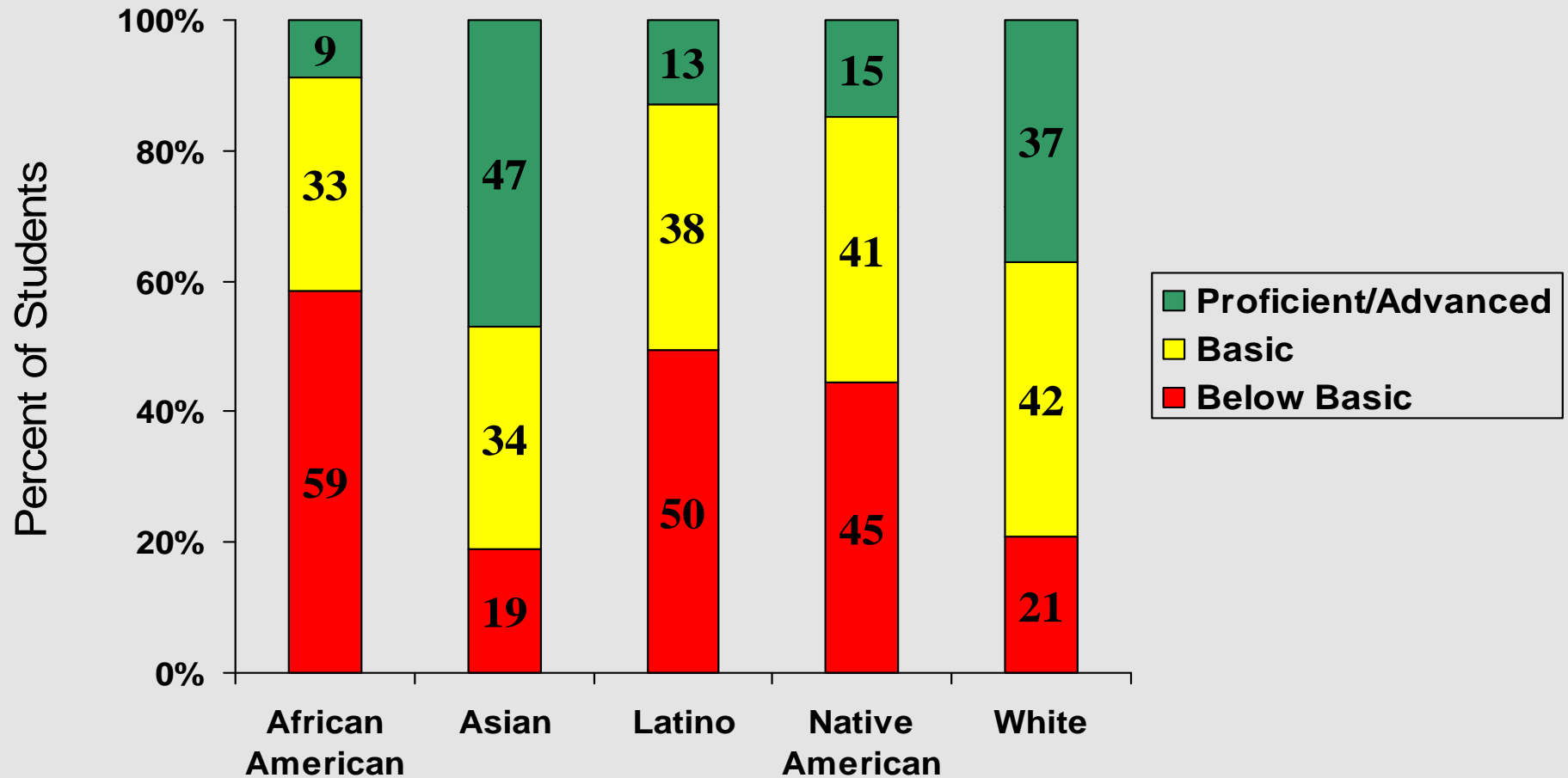


# 2005 NAEP Grade 8 Math by Family Income, Nation



Source: National Center for Education Statistics, NAEP Data Explorer, <http://nces.ed.gov/nationsreportcard/ndep/>

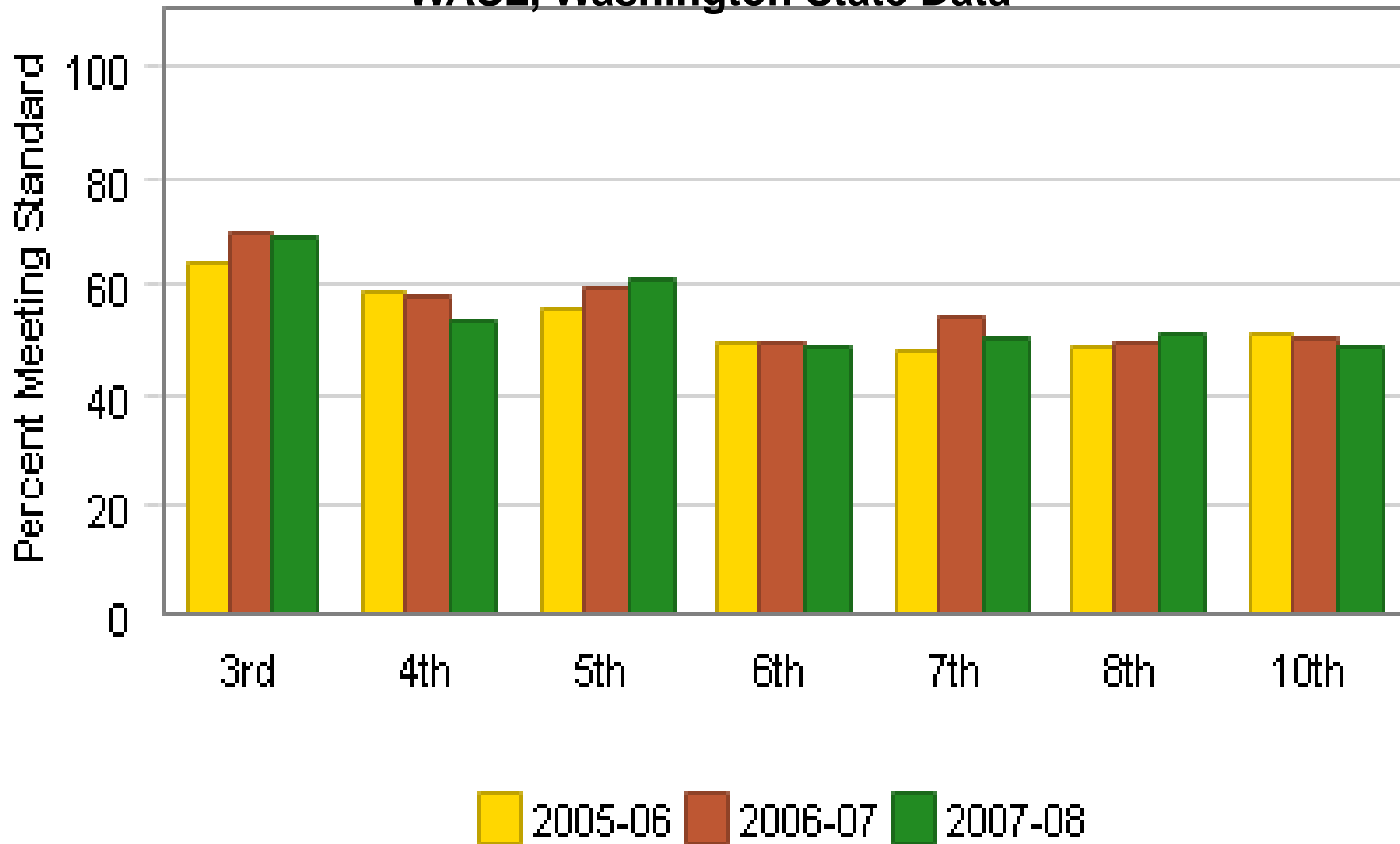
# 2005 NAEP Grade 8 Math by Race/Ethnicity, Nation



Source: National Center for Education Statistics, NAEP Data Explorer, <http://nces.ed.gov/nationsreportcard/nde/>

# Math

## WASL, Washington State Data





# Math Research (2)

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- Student Performance: International, national, and state achievement
- Mathematics Programs



# Mathematics Programs (TIMSS)

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U.S. textbooks compared to those of other countries:

- much larger and heavier
- cover more topics with less depth
- fail to develop linkages between topics
- are repetitive and spiral



# Mathematics Programs (TIMSS)

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U.S. textbooks compared to those of other countries:

- focus more on “eye catching,” irrelevant illustrations,
- dedicate equal time to simple tasks and difficult tasks,
- provide little information for teachers on content and methodology.



# Changes in the NCTM

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- <http://www.nctm.org/focalpoints/>
- Curriculum focal points are important mathematical topics for each grade level, pre-K–8. These areas of instructional emphasis can serve as organizing structures for curriculum design and instruction at and across grade levels.
- Response to “inch deep and mile wide”



# Changes in the Washington State K–8 Mathematics Standards

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## ***Kindergarten***, July 2008

- K.1. Core Content: Whole numbers
- K.2. Core Content: Patterns and operations
- K.3. Core Content: Objects and their locations
- K.4. Additional Key Content
- K.5. Core Processes: Reasoning, problem solving, and communication

## ***Grade 1***

- 1.1. Core Content: Whole number relationships
- 1.2. Core Content: Addition and subtraction
- 1.3. Core Content: Geometric attributes
- 1.4. Core Content: Concepts of measurement
- 1.5. Additional Key Content
- 1.6. Core Processes: Reasoning, problem solving, and communication

## ***Grade 2***

- 2.1. Core Content: Place value and the base ten system
- 2.2. Core Content: Addition and subtraction
- 2.3. Core Content: Measurement
- 2.4. Additional Key Content



# Math Research (3)

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- Student Performance: International, national, and state achievement
- Mathematics Programs
- Teacher Knowledge



# Teacher Knowledge

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Factors that support the development of Chinese teachers' **Profound Understanding of Fundamental Mathematics (PUFM)**:

- their own elementary education
- their teacher preparation
- their work as math specialists



# Teacher Knowledge

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Ma's recommendations:

- refocusing teacher preparation
- enhancing teacher study of mathematics “on the job”
- using well-constructed textbooks



# Math Research 4

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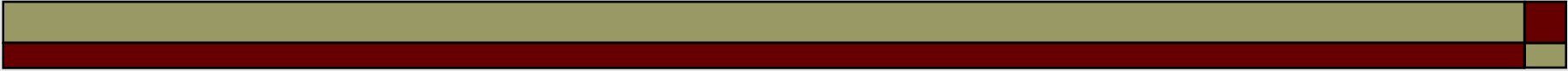
- Student Performance: International, national, and state achievement
- Mathematics Programs
- Teacher Knowledge
- National Math Advisory Panel Report



# National Math Panel Report

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“The panel was charged with providing recommendations to the President and U.S. Secretary of Education Margaret Spellings on the **best use of scientifically based research to advance the teaching and learning of mathematics**. Expert panelists, including a number of leading mathematicians, cognitive psychologists, and educators, reviewed numerous research studies before preparing a final report containing guidance on how to improve mathematics achievement for all students in the United States. “



# National Math Panel: Six Important Elements

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- The mathematics curriculum in Grades Pre K–8 should be streamlined and should emphasize a **well-defined set of the most critical topics in the early grades.**
- Use should be made of what is clearly known from **rigorous research** about how children learn, especially by recognizing a) the advantages for children in having a strong start; b) the mutually reinforcing benefits of conceptual understanding, procedural fluency, and automatic (i.e., quick and effortless) recall of facts; and c) that effort, not just inherent talent, counts in mathematical achievement.



# Six Important Elements

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- ...mathematically knowledgeable classroom teachers as having a central role in mathematics education and should encourage rigorously evaluated initiatives for attracting and appropriately preparing prospective teachers, and for evaluating and retaining effective teachers.
- Instructional practice should be informed by high-quality research, when available, and by the best professional judgment and experience of accomplished classroom teachers.



## Six Important Elements

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“NAEP and state assessments should be **improved in quality** and should carry increased emphasis on the most critical knowledge and skills leading to Algebra.”

“The nation must continue to build capacity for **more rigorous research in education** so that it can inform policy and practice more effectively.”

# The Three C's

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Collaboration  
(who)

C \_\_\_\_\_

C \_\_\_\_\_

# Three-Tiered Model Implies Collaboration

## Academic Systems

### Intensive, Individual Interventions

- Individual Students
- Assessment-based
- High Intensity

### Targeted Group Interventions

- Some students (at-risk)
- High efficiency
- Rapid response

### Universal Interventions

- All students
- Preventive, proactive

## Behavioral Systems

### Intensive, Individual Interventions

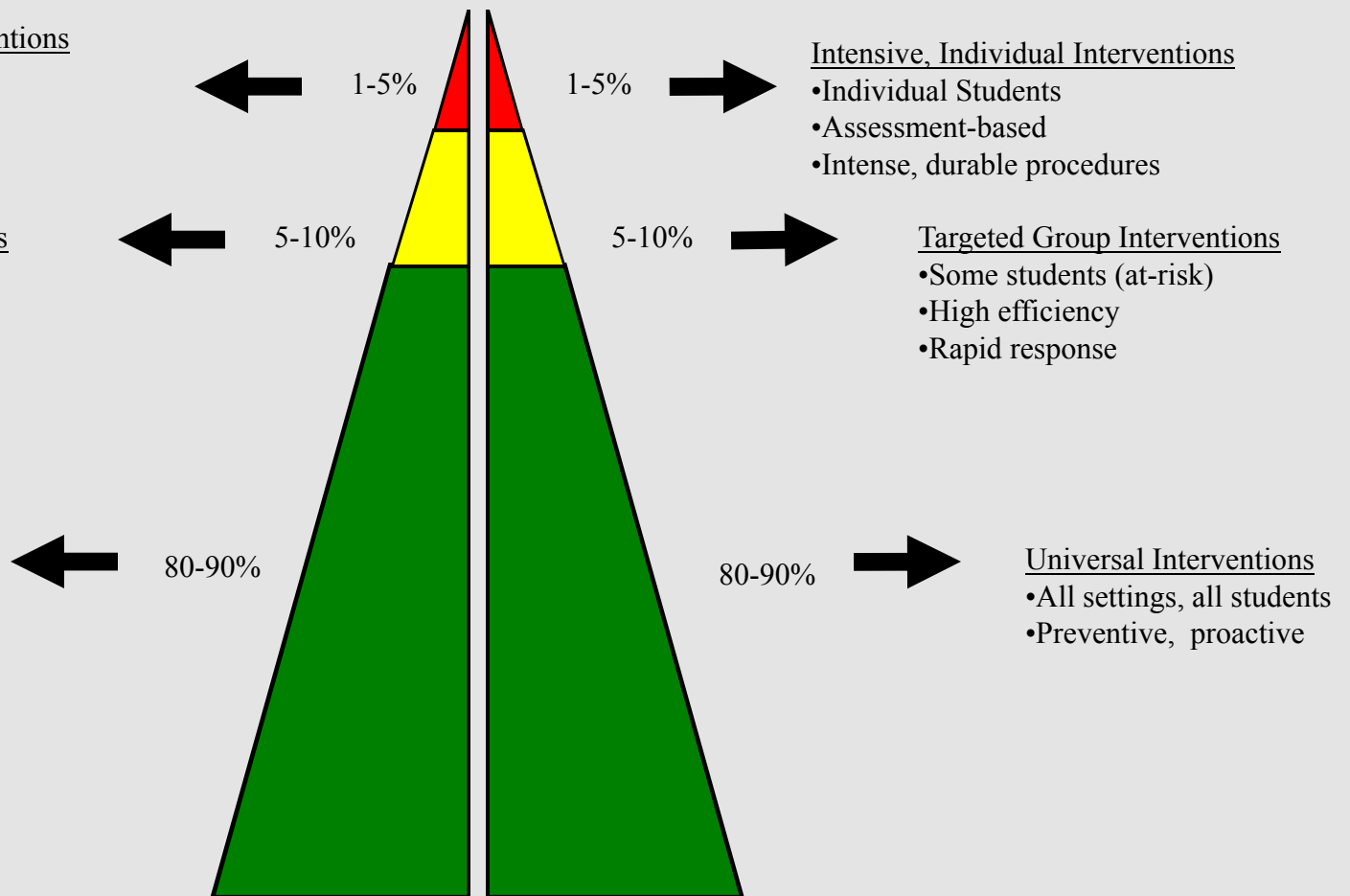
- Individual Students
- Assessment-based
- Intense, durable procedures

### Targeted Group Interventions

- Some students (at-risk)
- High efficiency
- Rapid response

### Universal Interventions

- All settings, all students
- Preventive, proactive





# Guiding Assumptions

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- What we do *at every level* has significant impact on students.
- Developing the leadership and learning capacity of **teachers, school-based administrators, and district leadership** is the best strategy for sustained instructional improvement.



# The Power of Collaborative Leadership

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The most promising strategy for sustained, school improvement is building the capacity of the school personnel to function collaboratively.

(Note: collaboration alone will not guarantee school improvement.)



# Establishing Collaborative Teams

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- ❑ Embed collaboration in routine practices
- ❑ Build time for collaboration into the school day
- ❑ Focus teams on key questions
- ❑ Make products of collaboration explicit
- ❑ Generate team norms to guide collaboration
- ❑ Pursue specific and measurable performance goals
- ❑ Ensure that teams have access to relevant information



# Grade Level Meetings

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## In Successful Schools:

- Meetings have a clear focus with detailed agendas.
- The coach and principal are active participants.
- Release time is used for regularly scheduled meetings.



# Grade Level Meetings

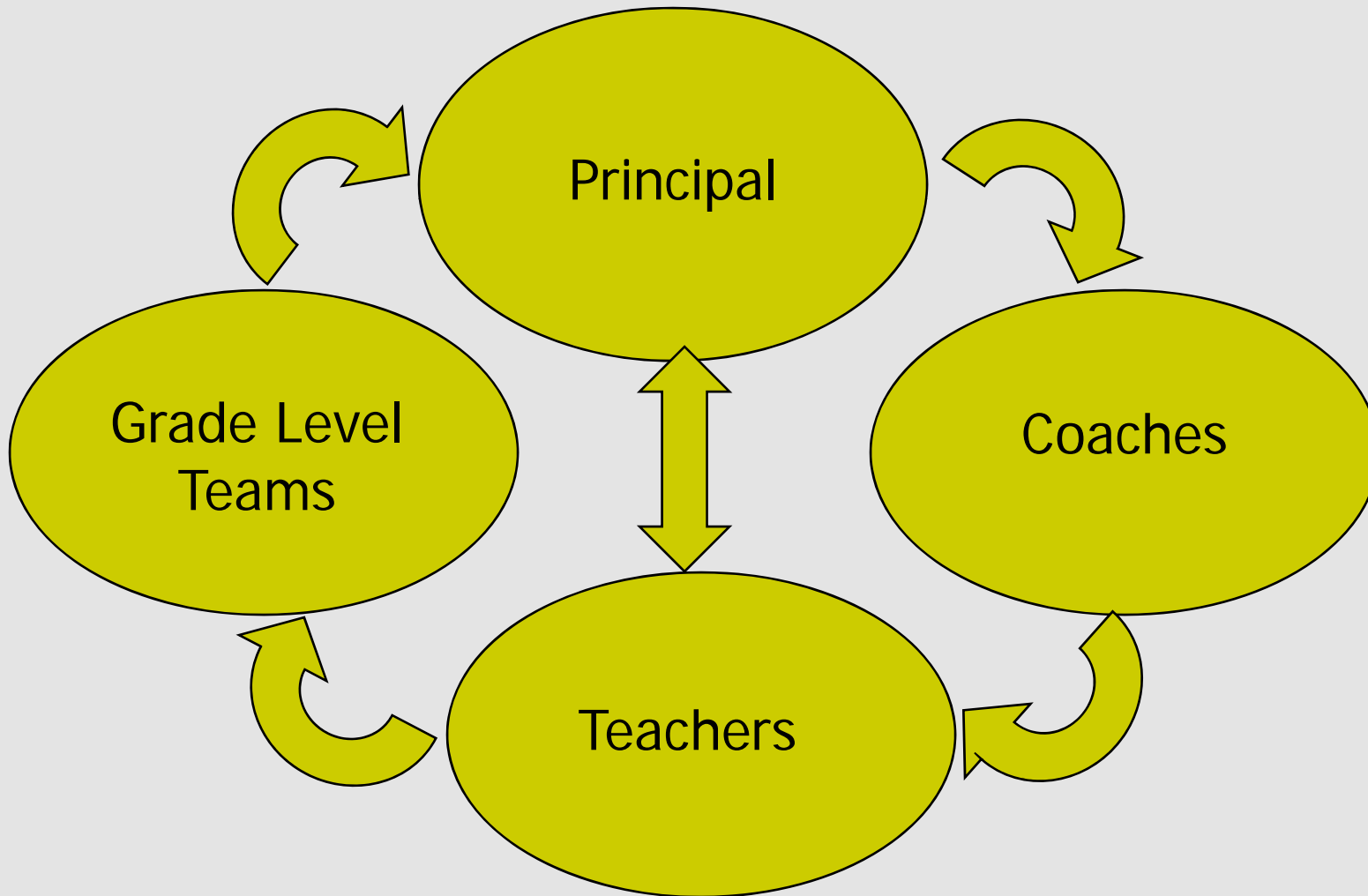
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## In Successful Schools:

- Student assessment results are public and are regularly used to identify professional development needs.
- Meetings focus on program content, instructional strategies, and effective teaching practices.

# Collaboration with Accountability

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# The Three C's

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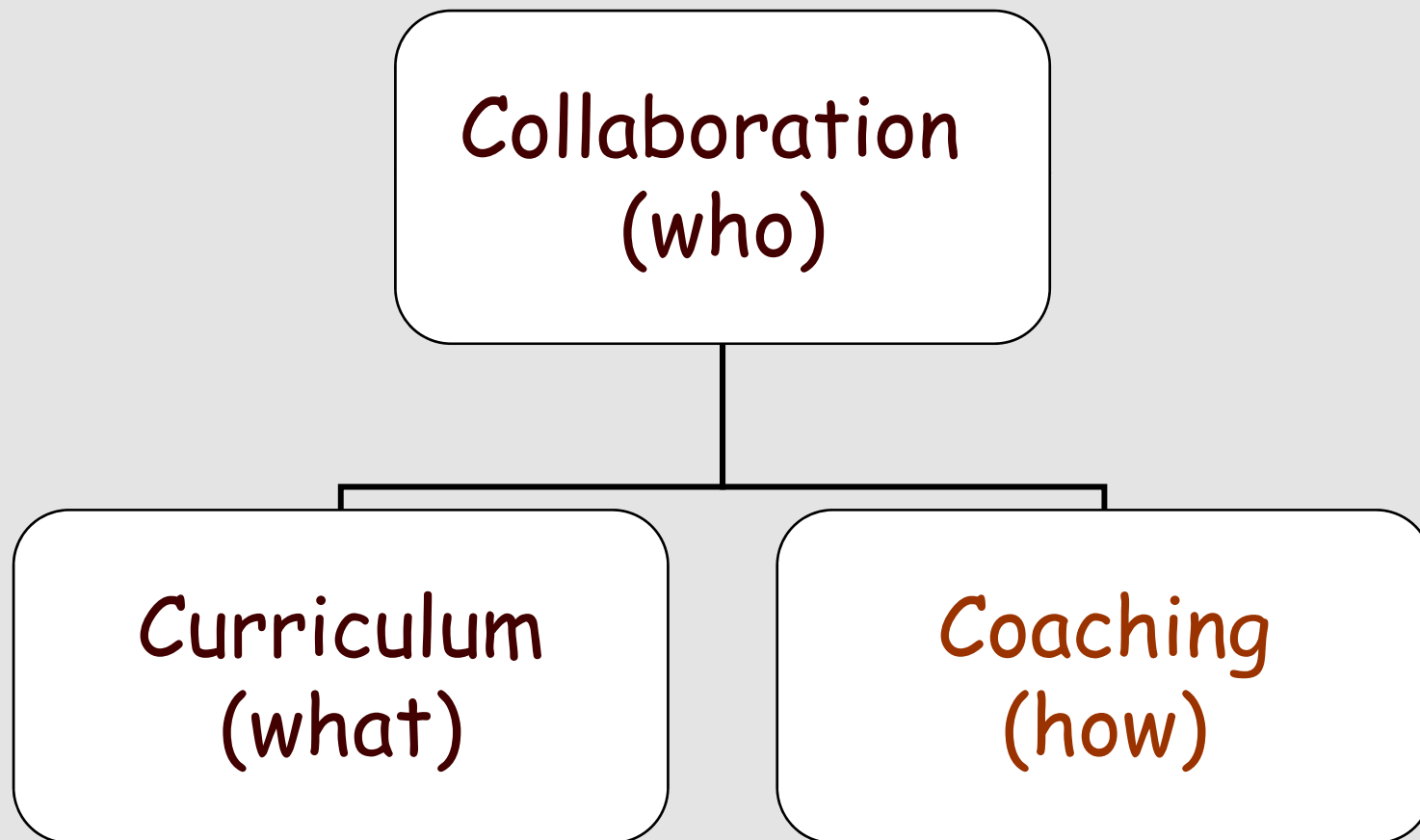
Collaboration  
(who)

Curriculum  
(what)

C\_\_

# Three C's of School Improvement

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# Instructional Coaching

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What is an instructional coach?

“an on-site professional development educator who **collaborates** with educators to identify and assist with implementation of proven teaching methods.”

Knight, 2006



# Instructional Coaching

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Evidence suggests that coaching is an effective means of professional development.

No more drive-by workshops...

The goal of all coaching is *increased student achievement.*



# Math Coaching Framework

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Math coaching provides a structure for problem solving. The math coach *helps*:

- I. Gather information
- II. Design action plans (*collaboratively*)
- III. Implement plans (*professional development*)
- IV. Evaluate student progress



# I. Gather Information

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## Math Problem Solving Inventory

- A. Assessment
- B. Curriculum & Instruction
- C. Professional Development



# I. Gather Information: Assessment

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## A. Student Performance Measures

- A1. Benchmark Assessment
- A2. Progress Monitoring
- A3. Program Specific Assessment
- A4. Assessment of Content Coverage



# I. Gather Information: Assessment

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## A1. Benchmark Assessment

Are beginning-of-year assessments administered within the first days of the school year to identify students performing below grade level and to determine their starting points in the curriculum materials?



# I. Gather Information: Assessment

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## A2. Progress Monitoring

What general progress monitoring assessments are administered during the school year?

Are these assessments administered frequently enough to discover when students are not making satisfactory progress?



# Progress Monitoring

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“The goal of CBM is to provide a measurement system that (a) **teachers could use efficiently**; (b) would produce **accurate, meaningful information** with which to index standing and growth; (c) could **answer questions about the effectiveness of programs** in producing academic growth; and (d) would provide information that **helped teachers plan better instructional programs.**” (Deno, Fuchs, Marston, & **Shinn**, 2001, p. 508)



# Student Outcomes

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Teachers who use CBM data to monitor performance and adjust instructions achieve **significant positive effects on student achievement!**

(Fuchs, Deno, & Mirkin, 1984; Fuchs, Fuchs, Hamlett, & Stecker, 1991; Jones & Krouse, 1988; Stecker & Fuchs, 2000)



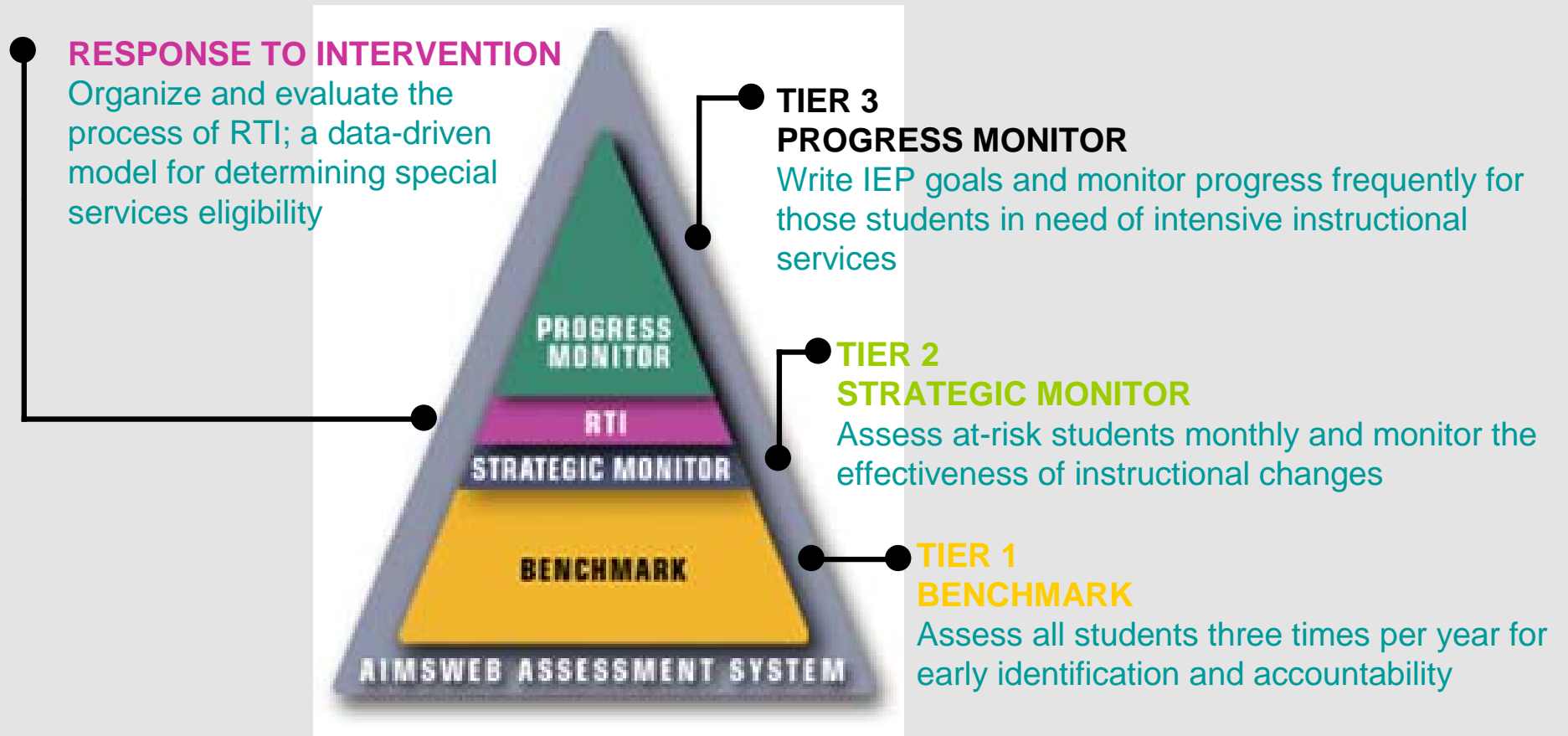
# Teacher Outcomes

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Enhances teacher planning & instruction

- Teachers plan more **varied, specific, and responsive instruction** (Fuchs, Fuchs, et al., 1993)
- Teachers set more **ambitious goals and adapt their instruction** (Fuchs, Fuchs, & Hamlett, 1989)

# 3-Tier Progress Monitoring and Response to Intervention System



# Tier 3 Progress Monitor: Student Report 3


**AIMSWEB**  
 CHARTING THE PATH TO LITERACY

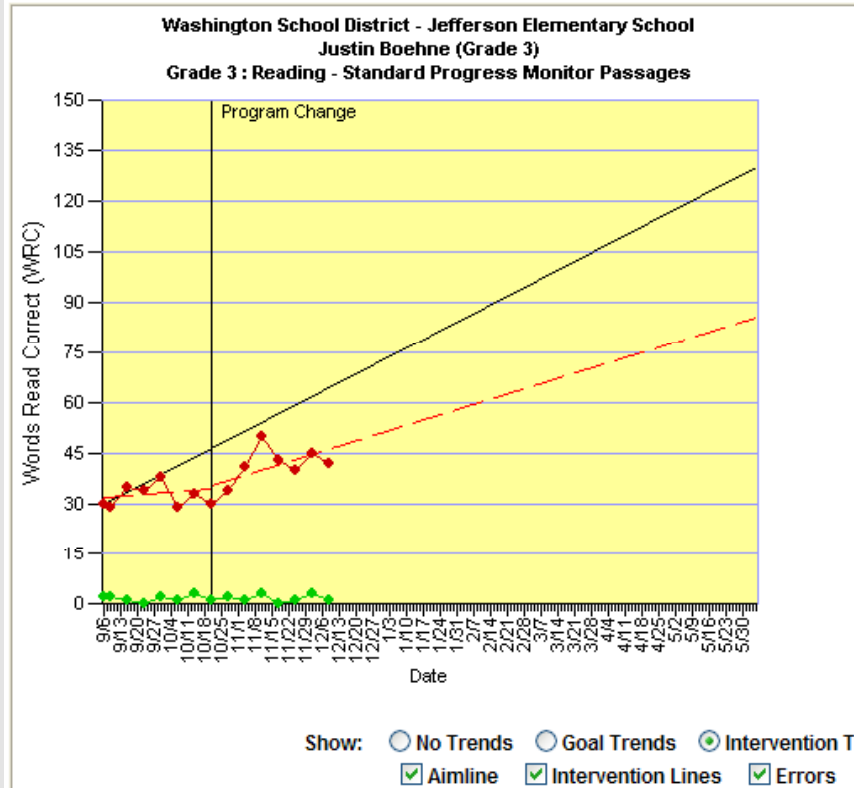
Jefferson Elementary School

HELP | LOGOUT  
 Year: 2004-2005

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Chart, Data, Goal Statement & Intervention Descriptions


## Progress Monitoring Improvement Report from 09/06/2004 thru 06/03/2005



### Goal Statement

In 38.6 weeks, Justin Boehne will achieve 130 Words Read Correct with 2 Errors from grade 3 Reading - Standard Progress Monitor Passages. The rate of improvement should be 2.6 Words Read Correct per week. The current average rate of improvement is 1.6 Words Read Correct per week.

Progress toward IEP goals can be evaluated.


**AIMSWEB**  
 CHARTING THE PATH TO LITERACY

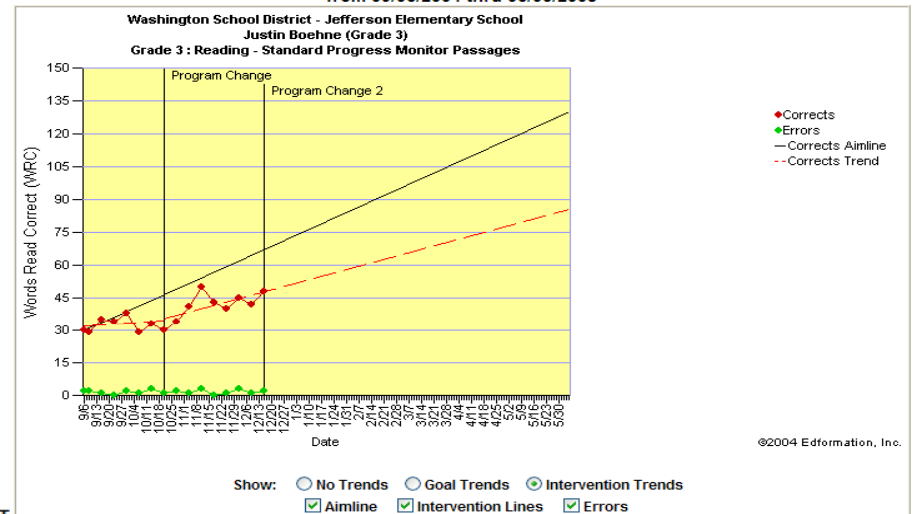
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### Goal Statement

In 38.6 weeks, Justin Boehne will achieve 130 Words Read Correct with 2 Errors from grade 3 Reading - Standard Progress Monitor Passages. The rate of improvement should be 2.6 Words Read Correct per week. The current average rate of improvement is 0.0 Words Read Correct per week.



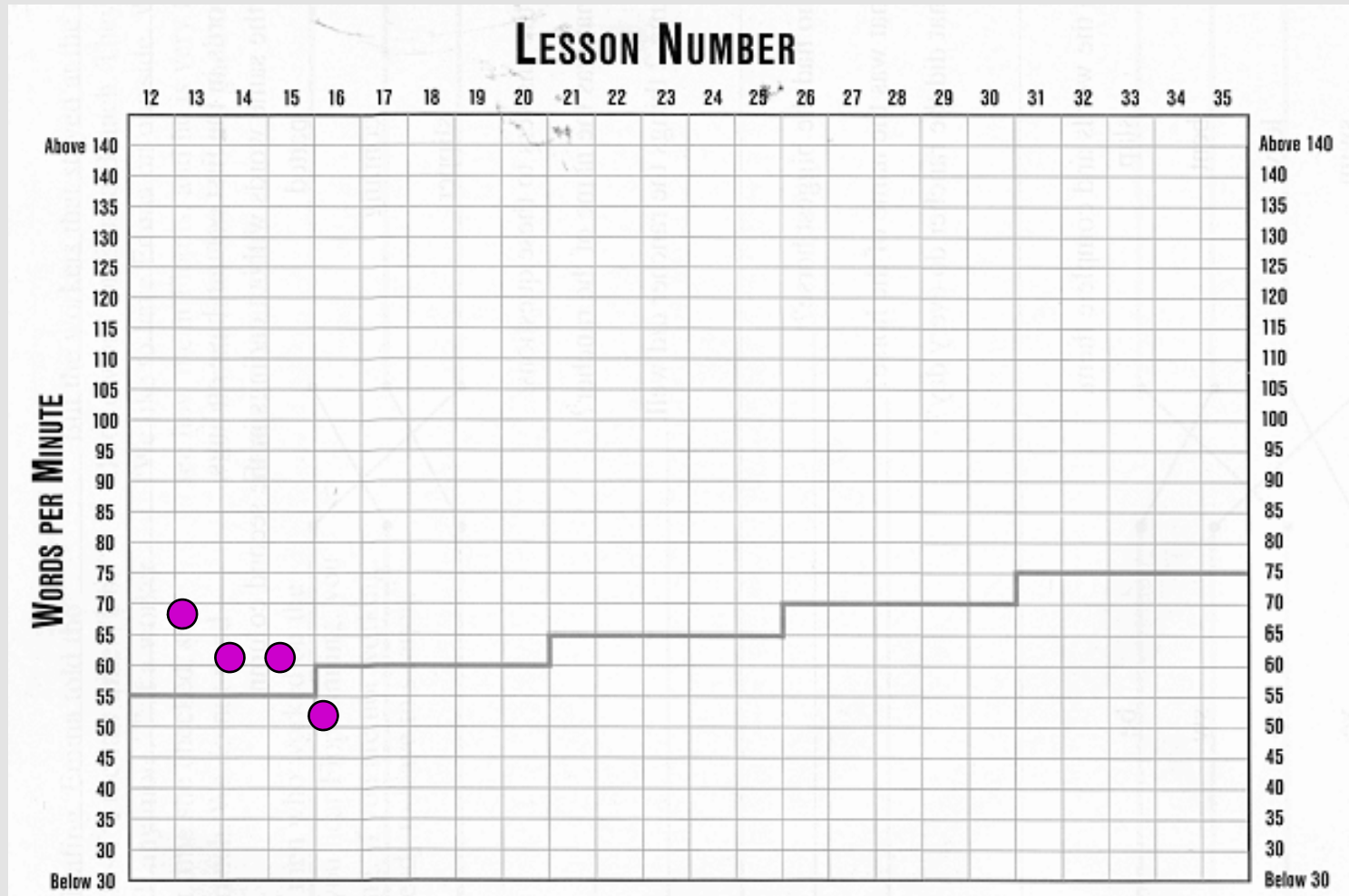
# I. Gather Information: Assessment

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## A3. Program Specific Assessment

What program-specific assessments are used to determine if students are learning content taught in core, supplementary, and intervention programs?

# Corrective Reading Program: Individual Reading Progress Chart





# I. Gather Information: Assessment

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## A4. Content Coverage

Have content coverage goals (pacing guides) been established for the core program?

Have content-coverage goals (e.g., lessons, units, pages to be completed) for groups in supplemental and intervention programs been established?



# I. Gather Information: C & I

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## B. Curriculum and Instruction

- B1. Curriculum materials for each tier
- B2. Procedures for selecting, evaluating and modifying curriculum materials
- B3. Organizational variables: time & grouping



# I. Gather Information: C & I

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## B. Curriculum Materials

(Core, Supplemental, Intervention)

Is the instruction provided to students systematic and explicit?

Do the materials contain sufficient practice opportunities?



# I. Gather Information: C & I

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## B. Instructional Time and Grouping

Is sufficient time being devoted to teacher directed instruction?

Is the number of students in classes appropriate for students' skill level?



# I. Gather Information: Prof Dev

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## C. Inservice Training

- C1 Inservice – Assessment
- C2. Inservice – Curriculum & Instruction
- C3. Inservice – Action planning

## D. Classroom Coaching

- D1. In-class instructional coaching
- D2. In-class behavioral coaching



# I. Gather Information: Prof Dev

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## C. Inservice Training

Are teachers receiving sufficient, high-quality inservice training in using their program materials (core, supplemental, intervention)?



# I. Gather Information: Prof Dev

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## D. In-Class Coaching

Are teachers and assistants receiving sufficient high-quality in-class coaching?

Are there sufficient provisions to support teachers needing extra help (e.g., with positive behavioral management).



## II. Design Action Plans

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### Who and When?

Math coach, teachers, administrators - *collaboratively*

Time in regularly scheduled team meetings should be spent planning for **instructional interventions, setting priorities and determining next steps.**



# Responsibilities of a Math Coach

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Coordinates **professional development** activities related to action planning:

- Assessment (including RTI)
- Content (aligning content with state standards)
- Behavior (discouraged learners)
- Instruction (curriculum evaluation, error analysis)



## III. Implement Action Plans

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### Examples of coaching activities:

- Coordinating the implementation of **progress monitoring**;
- providing **inservice training** on error analysis;
- providing **in-class coaching** on implementing intervention programs;
- presenting **model** lessons;
- guiding teachers in a **curriculum evaluation and modification** progress.



# Curricular Interventions

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## Strategic

Use supplemental  
*programs* – e.g. math  
facts programs

Provide supplemental  
instruction – e.g.,  
institute work checks

## Intensive

Use a replacement core  
program (*intervention  
program*)

Provide a “double dose”

Provide supplemental  
*instruction* – e.g.  
preteach lessons;  
institute work checks



# Non-Curricular Interventions

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## Strategic

Add minutes of peer  
tutoring or peer practice

Implement a homework  
incentive program

## Intensive

Group students  
homogenously

Add minutes of teacher-  
directed instruction

- Preteaching
- Work checks
- Supplemental programs



## IV. Evaluate Student Progress

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Collect and *use data* from student performance measures to analyze progress and design interventions:

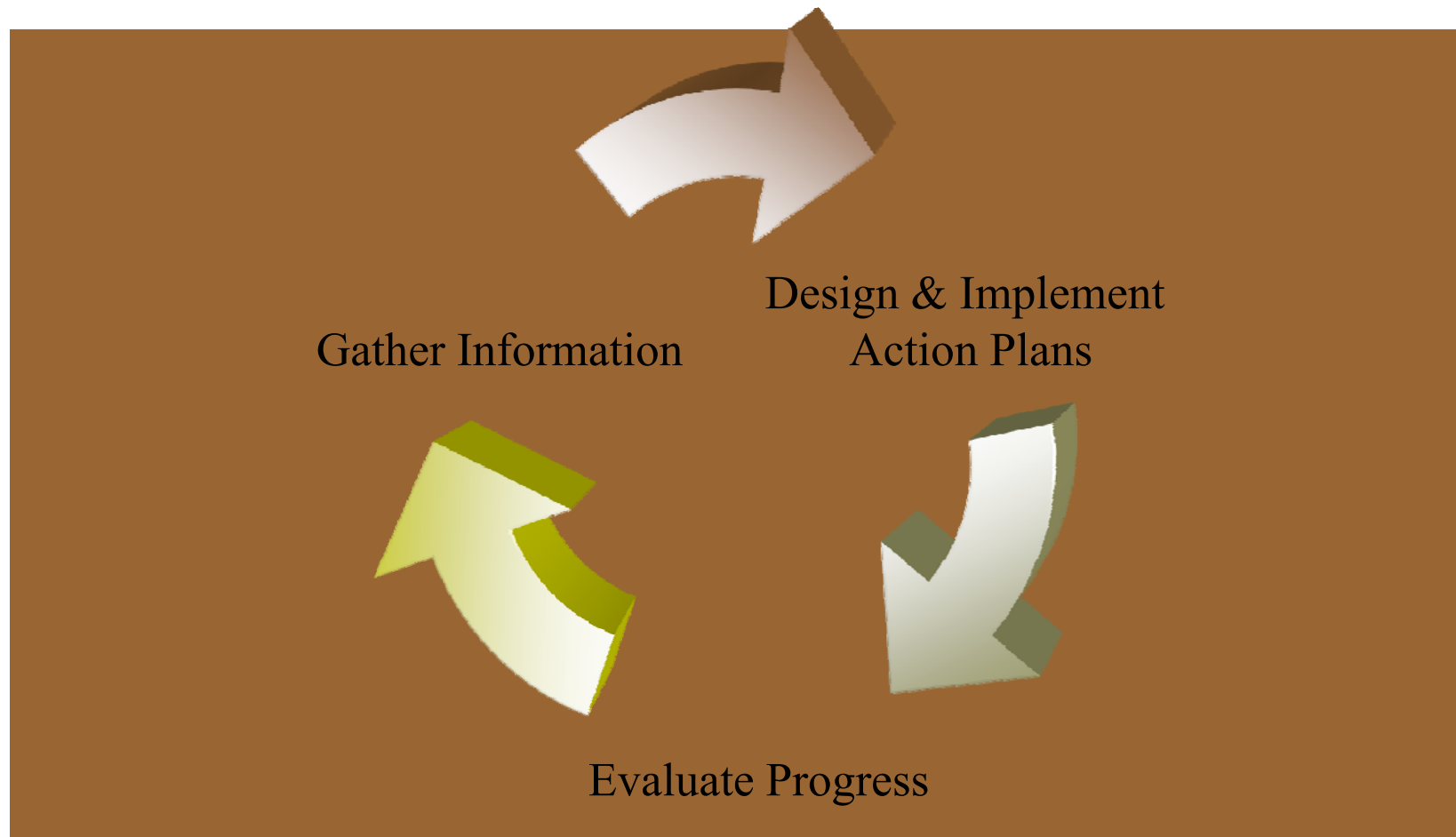
Benchmark testing

Progress Monitoring

Program Specific Assessments

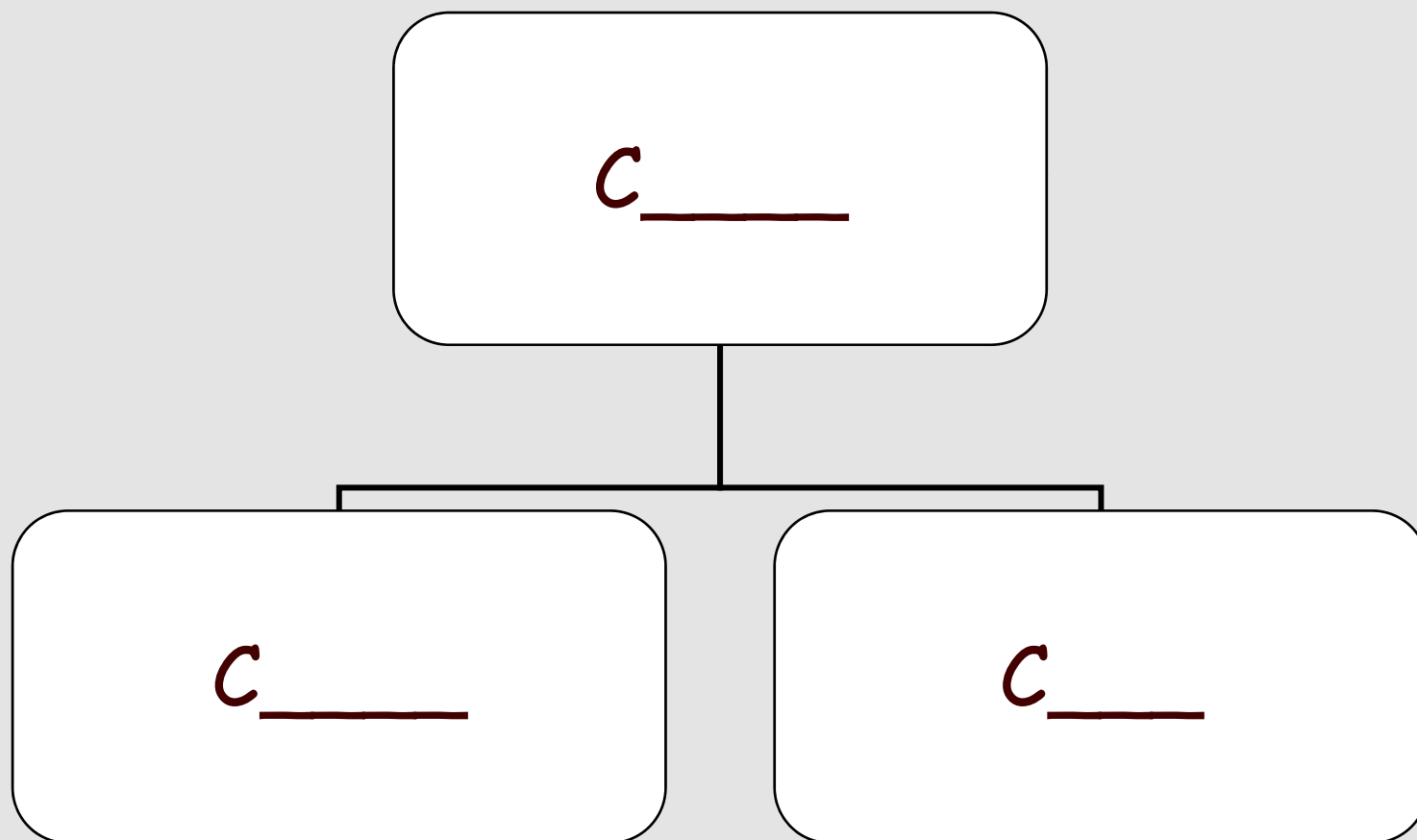
Content Coverage

# *Collaborative Problem Solving*



# The Three C's

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# References & Resources

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American Educator - previous issues - Schmidt

Center on Instruction - <http://www.centeroninstruction.org/>  
Special education:  
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