

Mathematics College and Career Readiness Standards for Adult Education: Exploring the Instructional Shift *Rigor*

February 25, 2014

NELRC Math Team

Donna Curry

Patricia Helmuth

Ronnie Kell

Pam Meader

Connie Rivera

Contact People



*New England Literacy
Resource Center*



Webinar Facilitator

Donna Curry
PD Specialist
donnac@ghi.net



Webinar Host

Andy Nash
NELRC Director
anash@worlded.org



Tech Support

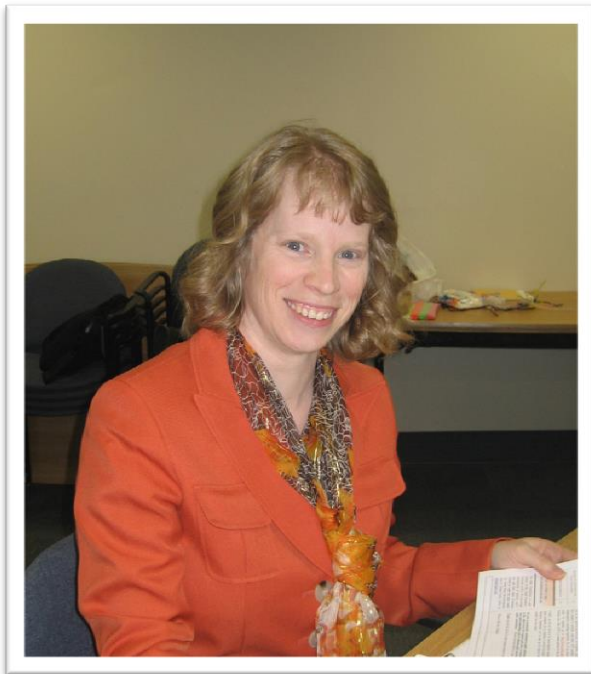
Ben Bruno, Media Specialist
bbruno@worlded.org
617.482.9485 x3629



Today's Co-Presenters

Connie Rivera

Math educator and consultant, CT



Patricia Helmuth

Math educator and consultant, NY



Objectives:

- Introduce participants to the CCR Standards Shift - Rigor
- Explore how this shift influences the structure of the CCR Standards
- Consider how this shift might play out in the adult education math classroom

The Mathematics Instructional Shifts



- **Focus**
- **Coherence**
- **Rigor**



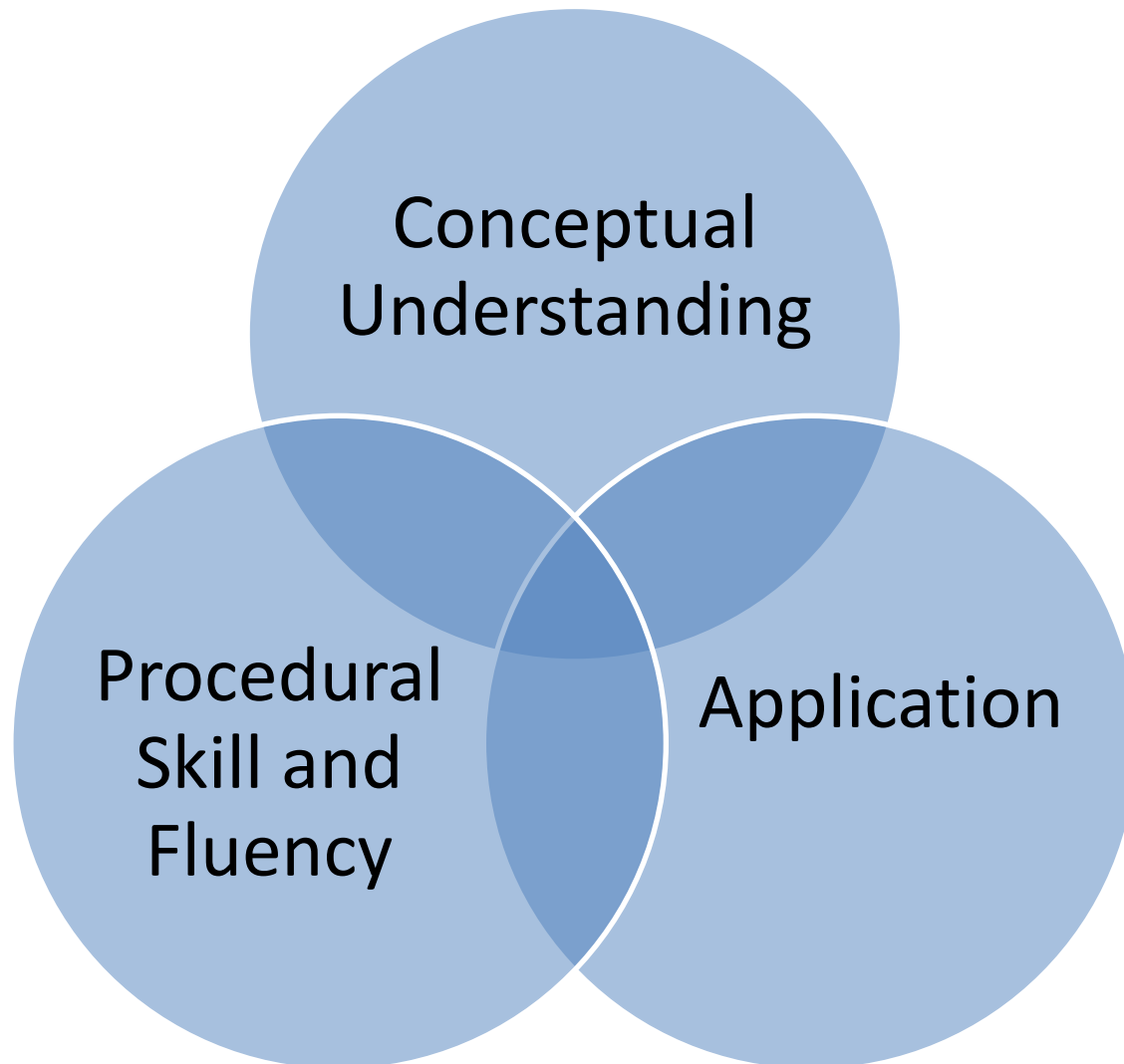
*What comes to mind when
the term rigor is applied to
mathematics?*

Rigor



Pursuing conceptual understanding, procedural skill and fluency, and application—all with equal intensity

Rigor



Rigor



Students with a solid conceptual understanding see mathematics as more than just a set of procedures. They know more than “how to get the answer” and can employ concepts from several perspectives.

Rigor in Different Standards **Level B**

Understand that the three digits of a three-digits number represent amounts of hundreds, tens, and ones.

Use place value understanding to round whole numbers to the nearest 10 or 100.

Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.

POLL

What element of RIGOR does each of these illustrate?

1. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain reasoning used.
2. Organize, represent, and interpret data with up to three categories ...
3. Measure angles in whole-number degrees using a protractor.
4. Recognize and generate simple equivalent fractions, e.g., $\frac{1}{2} = \frac{2}{4}$, $\frac{4}{6} = \frac{2}{3}$.
5. Identify arithmetic patterns and explain them using properties of operations.

**Please respond to the following question
in the poll:**

**What element of RIGOR does each
of these illustrate?[check one element
for each]?**

Procedural Skill and Fluency

*Procedural Skill
and Fluency*



*Knowing your
math facts*

Procedural Skill and Fluency

*Procedural fluency refers to knowledge of procedures, knowledge of **when** and **how** to use them appropriately, and skill in performing them flexibly, accurately, and efficiently.*

Procedural Skill and Fluency

$$\frac{7}{11} = \frac{x}{121}$$

How would you solve for x?

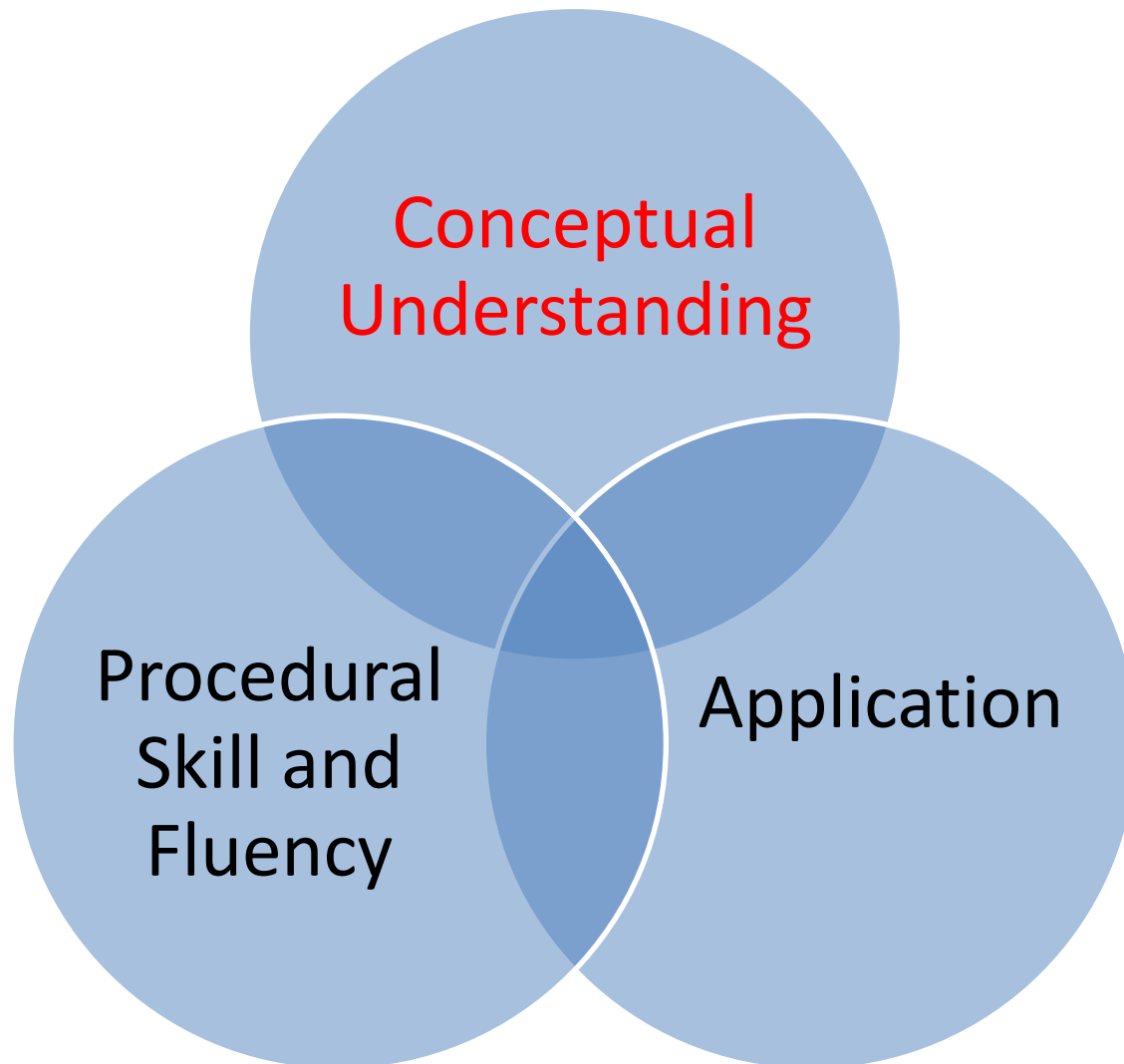
How would you teach your students to solve for x?

Procedural Skill and Fluency

It includes, but is not limited to, algorithms. Although the word procedural may imply an arithmetic procedure to some, it also refers to being fluent with procedures from other branches of mathematics, such as measuring the size of an angle using a protractor.

<http://www.p12.nysed.gov/ciai/mst/math/standards/revisedlintro.html>

Rigor



Broken Calculator Issue: no 7



$$7 \times 4$$

$$4 + 4 + 4 + 4 + 4 + 4 + 4$$

$$(6 \times 4) + 4$$

$$2 \times 14$$

<http://schools.nyc.gov>

Conceptual understanding

Teachers teach more than “how to get the answer” and support students’ ability to access concepts from a number of perspectives so that students are able to see math as more than a set of mnemonics or discrete procedures.

Students demonstrate deep conceptual understanding of core math concepts by solving short conceptual problems, applying math in new situations, and speaking about their understanding.

Conceptual understanding...

...is an integrated and functional grasp of mathematical ideas.

...is an understanding of why a mathematical idea is important and the kinds of contexts in which it is useful.

.... organizes knowledge into a coherent whole, which enables students to learn new ideas by connecting those ideas to what they already know.

National Research Council. *Adding It Up: Helping Children Learn Mathematics*

What do students understand?

- $10 \times 3 =$
- $10 \times 13 =$
- $20 \times 13 =$
- $30 \times 13 =$
- $31 \times 13 =$
- $29 \times 13 =$
- $22 \times 13 =$

Givvin, K., Stigler, J, Thompson, B. (2011) What Community College Developmental Mathematics Students Understand about Mathematics:, Part II The Interviews

What do students understand?

$$10 \times 3 = 30$$

$$10 \times 13 = \cancel{113} 130$$

$$20 \times 13 = 86$$

$$30 \times 13 = 120$$

$$31 \times 13 = 123$$

$$29 \times 13 = 116$$

$$22 \times 13 = 92$$

$$10 \times 3 = 30$$

$$10 \times 13 = 130$$

$$20 \times 13 = 260$$

$$22 \times 13 = 52$$

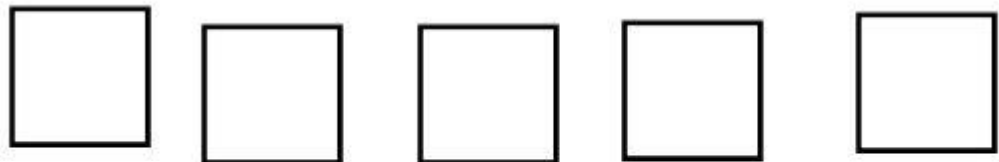
$$30 \times 13 = 120$$

$$31 \times 13 = 124$$

$$29 \times 13 = 126$$

Givvin, K., Stigler, J, Thompson, B. (2011) What Community College Developmental Mathematics Students Understand about Mathematics:, Part II The Interviews

What are students thinking?



$= 20\%$

$? = 100\%$

What are students thinking?

$$\square \square \square \square \square = 20\%$$

$$\begin{aligned} 20\% &= 5 \\ 40\% &= 10 \\ 60\% &= 15 \\ 80\% &= 20 \\ 100\% &= 25 \end{aligned}$$

$$\begin{array}{r} .20\% \\ \underline{5} \\ 100 \end{array}$$

$$? = 100\%$$

$$\begin{array}{r} 20\% \quad 5 \\ \hline 100 \quad 100 \\ 100 \overline{) 10000} \end{array}$$

$$\begin{array}{r} 2000 \\ \times \quad 5 \\ \hline 10000 \end{array}$$

What is π ?



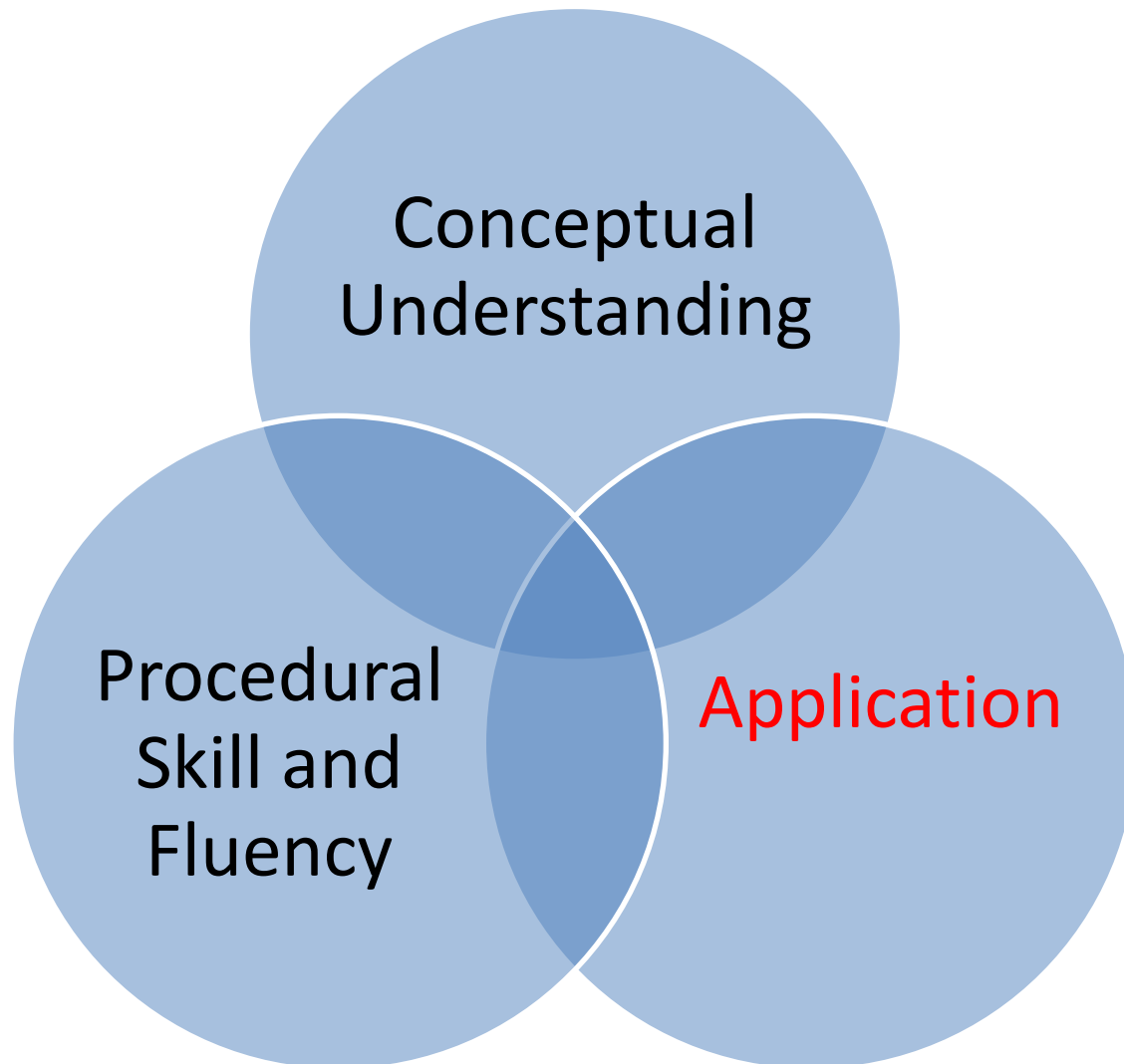


Lady Fingers handed hi
f

Application of π

The tallest tree in the world is believed to be the Mendicino Tree, a redwood near Ukiah, California, that is 112 meters tall! Near the ground, the circumference of this tree is about 9.85 meters. The age of a redwood can be estimated by comparing its diameter to trees with similar diameters. What is the diameter of the Mendicino Tree?

Rigor



Application

When students develop mathematical thinking in core concepts that they can apply across all levels, they are able to problem solve, and redirect themselves when answers don't make sense, even in situations that they haven't been specifically trained in.

POLL A

Look at each problem and decide whether:

- you can solve it
- you can teach it to students
- you cringe when you look at it

1. $\frac{3}{4} \times \frac{4}{5}$

2. $3 \frac{1}{2} \div \frac{2}{3}$

3. $7 \frac{1}{8} - 4 \frac{2}{3}$

POLL B

Look at each problem and decide whether:

- you can solve it
- you can teach it to students
- you cringe when you look at it

1. Sketch a picture to show why $\frac{3}{4} \times \frac{4}{5} = \frac{3}{5}$

2. Use a model to show $3\frac{1}{2} \div \frac{2}{3}$

3. Use a number line to show $7\frac{1}{8} - 4\frac{2}{3}$

POLL C

Look at each problem and decide whether:

- you can solve it
- you can teach it to students
- you cringe when you look at it

1. Jill has $2\frac{1}{2}$ cups of M&M's. A batch of cookies requires $\frac{3}{4}$ cup of M&M's. How many batches of cookies can Jill make?
2. Catherine can shovel out a foot-deep layer of snow from her driveway in four hours. Her brother can shovel out a foot-deep layer of snow from the same driveway in two hours. How long will it take them to shovel a foot-deep layer from the driveway if they work together?

Different elements of Rigor

- $\frac{2}{3}$ of the adult education class are going on the field trip. If 9 students are going, how many adult learners are in the class?
- If $\frac{2}{3}$ of x is 9, what is x ?
- Visually show that $\frac{2}{3}$ of an amount can equal 9.

Different elements of Rigor

- What is the mean for the following test scores: 88, 76, 57, 88, 69?
- If Jake is trying to justify that his average is pretty good, would he use the mean, median, or mode for his test scores of 88, 76, 57, 88, 69?
- If Jill wants to maintain a mean of 90, and so far has test scores of 78, 99, 89, and 95, what will be the minimum score she will need to make on the last test?

We're good at one aspect of Rigor

Choose one of the following problems and consider how to adapt it to assess for application and conceptual understanding:

- a) What is 75% of 150?
- b) $\frac{2}{3} \div \frac{1}{4} = ?$
- c) What is $\frac{1}{5}$ of 200?

Post your idea in the chat box.

Rigor: Instructional Implications

Conceptual Understanding: Students need a conceptual understanding of key concepts. Teachers support students' ability to access concepts from a number of perspectives.

Procedural Skill and Fluency: Students need to have speed and accuracy when performing calculations.

Application: Students need to be able to use math flexibly for applications. Teachers should provide opportunities for students to apply math in context.

What should **Rigor** look like in Adult Education Classrooms?

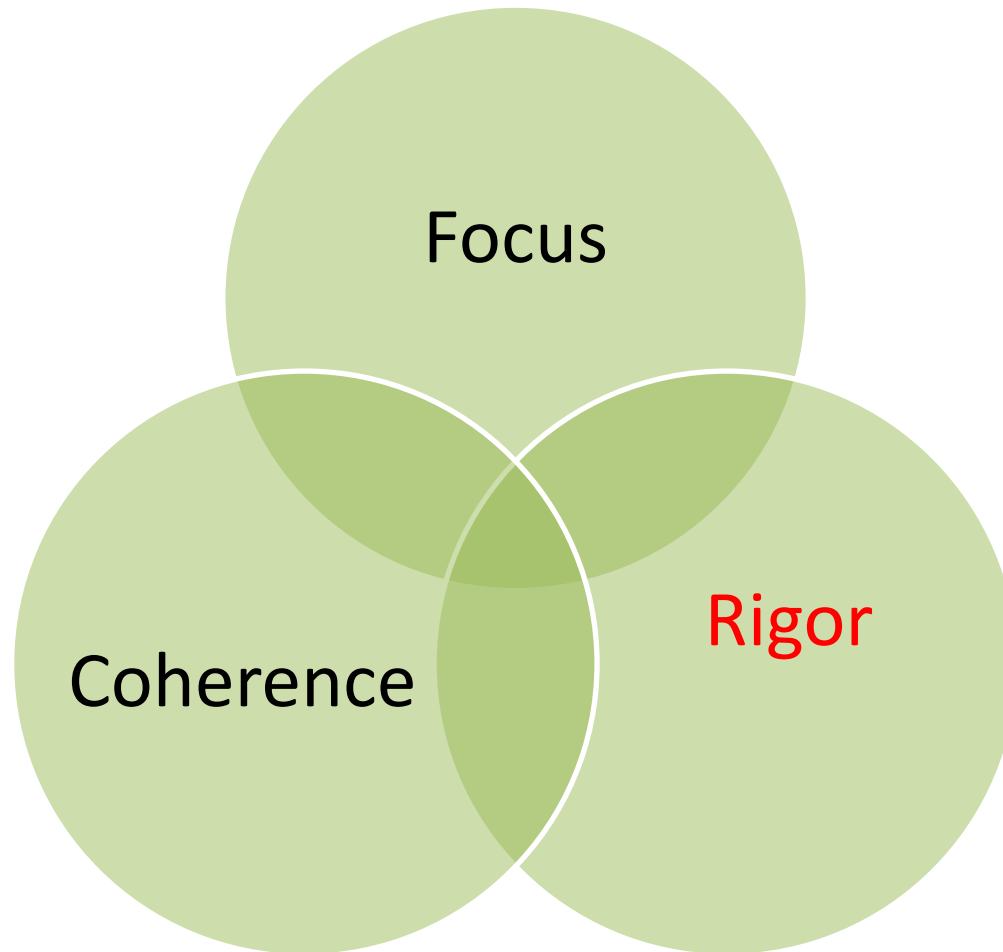


Instructors see their students as problems solvers and convey this message to their students.

Instructors provide plenty of wait time during lessons to give students opportunity to think through and talk through problem solving, rather than quickly demonstrate how to solve the problem.

Instructors provide students with plenty of opportunity to demonstrate learning through group/pair work, projects based on real-life contexts, and performance assessments.

CCR Standards Key Shifts





Reminders

- The webinars will be recorded and archived at www.nelrc.org
- Please respond to the short evaluation survey to follow
- Email me (anash@worlded.org) if you need a certificate of completion
- The ELA Instructional Shifts webinars are March 12 and April 1. Register at

<https://www.eventbrite.com/e/the-ela-instructional-shifts-2-webinars-tickets-10100253129>

Thank you!

- To our presenters: Donna, Connie, and Patricia for building our conceptual understanding of the math shifts.
- To you for being in this conversation!