

Math Specialists: The Assessments Are Here -

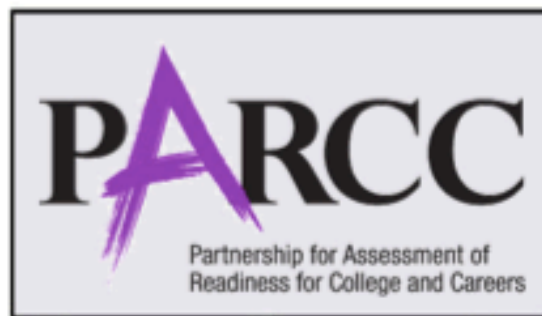
Now What?



Francis (Skip) Fennell
McDaniel College

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Stevenson University

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Howard County
Public Schools



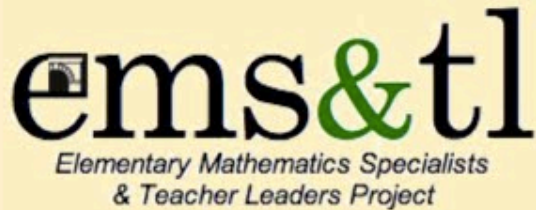
NCTM Annual Meeting and Exposition
New Orleans, LA
April 10, 2014

Special thanks to Sara Delano Moore and **ETA hand2mind** for providing today's hands-on tools

Who are you?

- Where are you from?
- What do you do?
 - Mathematics Specialist/Instructional Leader?
 - Teacher?
 - Level?
 - PreK-2
 - 3-5
 - 6-8
 - High school
 - Other? (e.g. special education, etc.)
 - Principal or Assistant Principal?
 - Supervisor/Curriculum Director?
 - Other?

www.mathspecialists.org

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- Home
- About
- EMS Models
- State Certifications
- Grad Programs
- Presentations
- Doing What Works Project
- Blog
- Resources
- ems&t Staff

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- State Certifications
- Grad Programs
- Presentations
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- Blog
- Resources
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51

days until

the 2014 ems&t Summer Institute
@ McDaniel College



[Read More](#)

"We need elementary school mathematics specialists, elementary classroom teachers who know and understand mathematics and can effectively mentor their colleagues. Given the need for students with a mathematics and science background and interest, this project is a first step in that direction, with multiple national implications."

- Dr. Francis (Skip) Fennell, ems&t Project Director

The [Elementary Mathematics Specialists & Teacher Leaders \(ems&t\) Project](#), sponsored by The Brookhill Foundation, addresses issues related to and in support of Elementary Mathematics Specialists (EMS). As the ems&t Project engages mathematics specialists nationally, work with a cadre of specialists and supervisors from [Howard](#), [Frederick](#), [Carroll](#), and [Baltimore](#) Counties in Maryland continues to provide that up close and personal view of the everyday challenges in the work of elementary mathematics coaches/specialists.

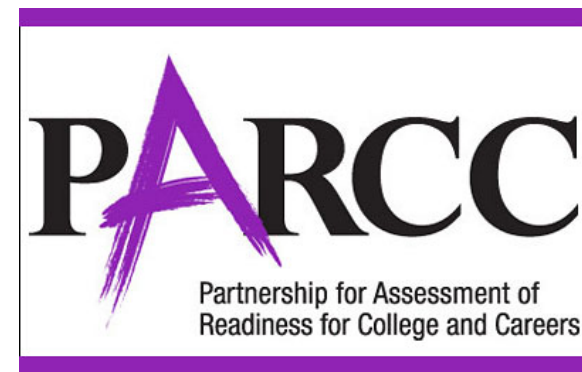
The Brookhill
FOUNDATION





Almost 4 years ago (but who's counting?)...

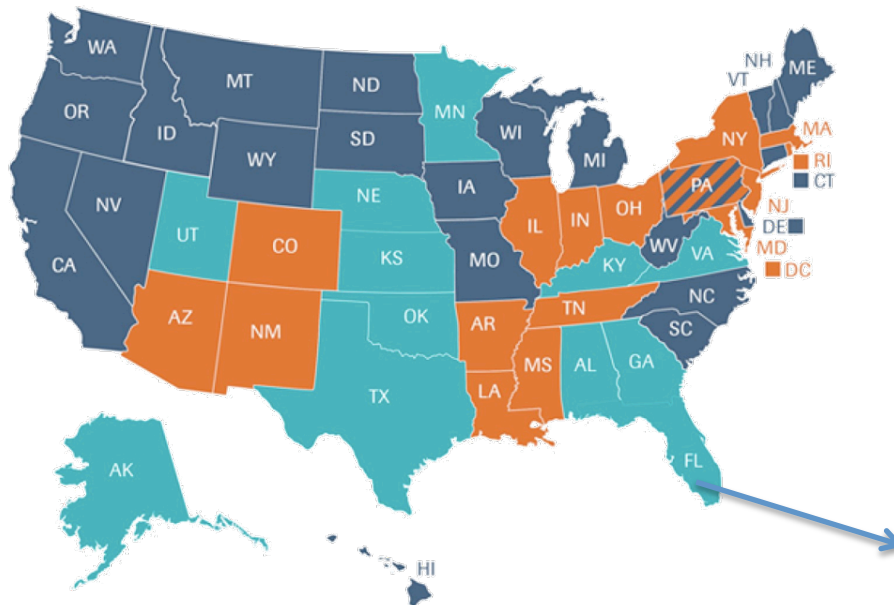
***And now... The assessments must be in our planning and thinking –
EVERYDAY!***



ASSESSMENT CONSORTIA MEMBERSHIP

(As of 4.1.14)

\$360 million in federal grants has gone to groups of states developing common assessments.



- Smarter Balanced Assessment Consortium (23)
- Partnership for Assessment of Readiness for College and Careers (16 plus D.C.)
- Both (1)
- None (12)

SOURCES: Smarter Balanced Assessment Consortium; Partnership for Assessment of Readiness for College and Careers



Questions Emerging *Research Needs*

- How is the mathematics education system responding to the introduction of the CCSS?
 - ✓ States, school districts and schools
 - ✓ Preservice teacher education – all types
 - ✓ Professional development
 - ✓ Professional societies
- Distinguishing between alignment and quality
- ***The influence of the CCSS will be strongly mediated by the consortial assessments.***

Heck, Weiss, Pasley, 2011

Here's what we will do today!

Consider paths toward student use of and success with consortial assessment items by considering:

intentional use of particular formative assessment techniques.



Think about this:
*Assessment for Learning is a
foundation for instruction*

Stiggins, 2007

Just Wondering


- Have you made extensive use of the SMARTER Balanced or PARCC sample items? Some use? Where are you?
- Do you have a plan for linking the types of assessments provided by PARCC or SMARTER Balanced (or your own state's assessment) to classroom instruction?



We actually know a lot about
formative assessment...



- The term **formative assessment** has been with us for close to 50 years...
- Regular use of **classroom formative assessment** would raise student achievement by 0.4 to 0.7 standard deviations – enough to raise the U.S. into the top five countries in the international rankings for mathematics (Natriello, 1987; Crooks, 1998; Black and Wiliam, 1998).



BUT, Aside from teacher-made classroom tests, the integration of assessment and learning as an interacting system has been too little explored.

Glaser & Silver, 1994

NCTM Research Brief: Formative Assessment

1. Clarifying, sharing, and understanding goals for learning and criteria for success with learners; - pathfinder
2. Engineering effective classroom discussions, questions, activities, and tasks that elicit evidence of students' learning;
3. Providing feedback that moves learning forward;
4. Activating students as owners of their own learning;
5. Activating students as learning resources for one another.

NCTM “Key Strategies” for Effective Formative Assessment. [See handout, pp119-122](#)



NATIONAL COUNCIL OF
TEACHERS OF MATHEMATICS

Formative Assessment

A position of the National Council of Teachers of Mathematics

Question

What is the role of formative assessment in mathematics education?

NCTM Position

Through formative assessment, students develop a clear understanding of learning targets and receive feedback that helps them to improve. In addition, by applying formative strategies such as asking strategic questions, providing students with immediate feedback, and engaging students in self-reflection, teachers receive evidence of students' reasoning and misconceptions to use in adjusting instruction. By receiving formative feedback, students learn how to assess themselves and how to improve their own learning. At the core of formative assessment is an understanding of the influence that assessment has on student motivation and the need for students to actively monitor and engage in their learning. The use of formative assessment has been shown to result in higher achievement. The National Council of Teachers of Mathematics strongly endorses the integration of formative assessment strategies into daily instruction.

Formative assessment is an essential process that supports students in developing the reasoning and sense-making skills that they need to reach specific learning targets and move toward mastery of mathematical practices, such as those set out in the Common Core State Standards. It

Formative Assessment

We know it is **more** informative to observe a student during a mathematical activity than to grade his papers.

Freudenthal, 1973

Assessment Recommendations

- **Observation, discussion, and interviews** serve better than paper-pencil tests in evaluating a pupil's ability to understand the principles he/she uses (Suelz, Boynton, & Sauble, **1946**, p. 145).
- Information is best collected through informal **observation** as students participate in class discussions, attempt to solve problems, and work on various assignments individually or in groups (NCTM, **1989**, p. 233).
- **Observation** of the pupil's oral and written work is a very important assessment procedure and should be encouraged. Closely associated with the use of **observations** is the **interview** with the pupil regarding his/her daily work or his solution or attempted solutions of items of a test (Spitzer, **1951**, p. 191).

Formative Assessment - Research

- Regular Assessment (two-five times per week) with follow-up action produced a substantial increase in student learning.
- When teachers set rules about how they would review the data and the actions that were to follow before they assessed their students, the gains in achievement were twice as great as those cases in which the follow up action was left to the judgment of the individual teacher.

Fuchs & Fuchs, 1986

Formative Assessment - Research

In an experimental design in which teachers regularly used formative assessment to drive instruction, their students made *almost twice as much progress over the year* as measured by externally scored standardized tests than their counterparts in other classrooms.

Wiliam, Lee, Harrison & Black, 2004

Formative assessment is:

- 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 and Wiliam, 2007

Love this...

Formative Assessment *Strategies*

1. **Clarifying** learning intentions and sharing criteria for success.
2. **Engineering** effective classroom discussions, questions, and learning 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.

William and Leahy, 2007; William and Thompson, 2007.

What we have done...

- SMARTER Balanced and PARCC examples as summative assessment ‘carrots’ (a new form of “test-prep”)
- Back-mapped from summative assessments to daily classroom assessment opportunities.
- Distilled formative assessment techniques – Pathways.



Fennell, Kobett, & Wray, 2013



Observations

- What would you hope to observe?
- How would you *know it* if you saw it?
- How might you record/note the observation?
- What misconceptions might you observe?



Interviews



- What would make you decide to work 1:1 with a student or small group?
- What questions might you ask? How might the questions be different?
- What are you anticipating from students? (Consider understandings AND possible misconceptions.)
- What follow-up questions might you ask?



Show Me



1. Provide a “show me” prompt that you might use for a concept/skill appropriate for the assessment sample you have reviewed.
2. What might you want a student or students to say as they describe their “show me” example?
3. How is this (the show me activity) different from an interview or observation?



Hinge Questions

- **Hinge questions** provide a check for understanding/proficiency at a ‘hinge-point’ in a lesson, or stated differently, success of the lesson hinges on responses to such questions as they provide an indication of whether the teacher can move from one important idea/concept/skill to the another (or not). Such responses impact both planning and instruction.
- See handout for more.





Exit Tasks

- The exit **task** is designed to provide a capstone problem or exercise that captures the major focus of the lesson of the day. This is a class assessment tool, and like the hinge question, student responses to the exit task help in identifying needs and in the planning for the next day's lesson.
- See handout for more

Our Work...

1. Backmap – Consider a PARCC/SMARTER example item or ***ANY summative assessment task*** as an end goal.
 - NOTE that many lessons would be needed to reach the proficiency necessary for success with such summative items.
2. Consider each formative assessment Pathway and how you might use it within one lesson that is prerequisite to the summative target you might select.
 - Think about / chat about your response to each formative assessment Pathway as we discuss an example...

43328



Jared is testing how much weight a bag can hold. He plans to put juice bottles into three bags. He wants each bag to have a total weight within the given range.

- Drag juice bottles into each bag so that the weight is within the given range.
- Leave the bag empty if the given range is not possible using juice bottles.

3 $\frac{5}{8}$ lb

Delete

Between 6 lb and 7 lb Between 10 lb and 11 lb Between 14 lb and 15 lb

Interview

Working with individual students or small groups of students, have them use fraction bars or rectangular regions to create $4\frac{3}{4}$.

Then ask them to create 3 more regions of the same size and determine the total amount.

Ask the following: Is the total amount $<$ or $>$ 17? How is what you did, when creating 4 regions of $4\frac{3}{4}$ similar to multiplying whole numbers?

Observations

Observe students as you ask them to decide how many hops of $3\frac{1}{4}$ on a number line are closest to but $<$ 9. Then observe students as they decide how many $3\frac{1}{4}$ number line hops are closest to but $<$ 15.

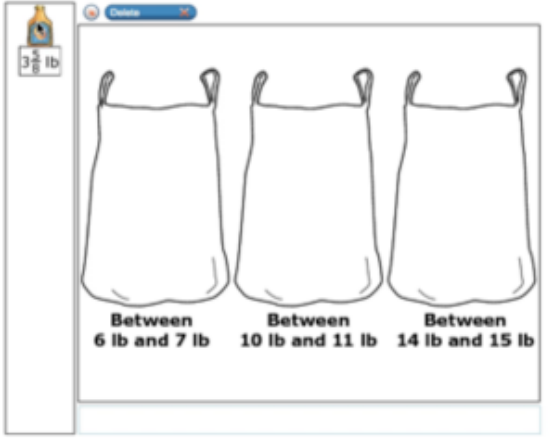
Hinge Question

I walked $2\frac{3}{4}$ miles on Monday, Tuesday, and Wednesday. Have I walked more or less than 10 miles? How do you know? How far did I walk?

43328

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Between 6 lb and 7 lb Between 10 lb and 11 lb Between 14 lb and 15 lb

Show Me

Make a drawing or use fraction representations to show 6 groups of $2\frac{1}{2}$ pieces. Is the total $<$, $>$ or $=$ to 15. Now show the same solution using the number line. Which is easier for you to do?

Exit Task

Bree's Pizza Palace has to load boxes of cheese. Each box weighs $5\frac{3}{4}$ lbs. There were 4 boxes. Was the total weight $<$ or $>$ 25 lbs.? Write a response to show how you know.

Your Turn: Pathways Activity

1. Backmap – Consider a PARCC/SMARTER example item or ***ANY summative assessment task*** as an end goal.
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2. Consider each formative assessment Pathway and how you might use it within one lesson that is prerequisite to the summative target you might select.
 - Think about / chat about your response to each formative assessment Pathway as we discuss an example...

Sample Items: PARCC and SBAC

Smarter Balanced Assessment Consortium
Mathematics | English Language Arts / Literacy

43044

Look at point P on the number line.

Look at number lines A – E. Is the point on each number line equal to the number shown by P ? Choose Yes or No.

A. Yes No

B. Yes No

C. Yes No

D. Yes No

E. Yes No

SBAC, Grade 3, 3.NF.3a

Ava and Mia are comparing the fractions $\frac{3}{2}$ and $\frac{5}{6}$.

Part A

Ava created this number line to graph $\frac{3}{2}$. Select the correct point on the number line to represent $\frac{3}{2}$.

Mia created this number line to graph $\frac{5}{6}$. Select the correct point on the number line to represent $\frac{5}{6}$.

PARCC, Grade 4, 4.NF.A

Mr. Edmunds shared 12 pencils among his four sons as follows:

- Allen received $\frac{1}{3}$ of the pencils.
- Bill received $\frac{1}{4}$ of the pencils.
- Carl received more than 1 pencil.
- David received more pencils than Carl.

Part A

On the number line, represent the fraction of the total number of pencils that was given to both Allen and Bill combined. Use the buttons on the right to increase or decrease the number of equal sections on the number line.

More Tick Marks

Fewer Tick Marks

Part B

What fraction of the total number of pencils did Carl and David **each** receive? Justify your answer.

PARCC, Grade 5, 5.NF.2

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Relay Race

Students are running in a relay race. Each team will run a total of 2 miles. Each member of a team will run $\frac{1}{5}$ of a mile.

How many students will a team need to complete the race? Choose the correct number.

You may use the number line to help find your answer.

How many students will a team need to complete the race?

$\frac{2}{5}$ $\frac{5}{2}$ 9 10 20

SBAC, Grade 5, 5.NF.7

Let's Discuss

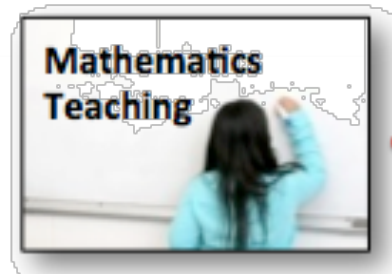
Assessment – formative and summative in your classroom/school

- What's going on?
- Use of formative assessments - regularly?
- Role of assessments and grading?
- What works?

Assessment – formative and summative in your PD opportunities

- What's going on?
- What works?

Next Steps?



Daily Considerations

- **Observations** – to guide what's going on...
- **Interview** – As needed 1-1 or small group
- **Show me** – Math notebooks, daily link to Language Arts, more than vocabulary!
- **Hinge Questions** – Deal breakers! See next slide.
- **Exit Task** – Hinge Question + Exit task (next day's plan!)

Assessment Resources...

- Mathematics Common Core Coalition (MC³) – <http://www.nctm.org/standards/mathcommoncore>
- Illustrative Math Project - <http://illustrativemathematics.org>
- Institute for Mathematics and Education – University of Arizona; Bill McCallum - ime.math.arizona.edu
- Dana Center and Agile Mind: Common Core Tool Box - <http://ccsstoolbox.org>
- PARCC Educator Leader Cadre Portal - www.parcc.nms.org
- SMARTER Balanced Scientific Sample Pilot Test Portal - www.sbac.portal.airast.org

Questions?

The logo for the Elementary Mathematics Specialists & Teacher Leaders Project. It features the lowercase letters 'ems&tl' in a serif font. The 'e' contains a small icon of a building with a sun rising over it. The ampersand and the 't' are colored green, while the 'm', 's', and 'l' are black.

*Elementary Mathematics Specialists
& Teacher Leaders Project*

www.mathspecialists.org