

Master Class: Assessing to Inform

Francis (Skip) Fennell • McDaniel College

Innov8 • St. Louis, Missouri

November 17, 2016 • 3:15-4:30 p.m.

ems&tl - what we do

Elementary Mathematics Specialists
& Teacher Leaders Project

- Collaboratively work with a core group of elementary mathematics specialists from central Maryland. Their challenges and needs define our initiatives.
- Support McDaniel College's master of science degree program – leading to MD's "Elementary Mathematics Instructional Leader (EMIL)" endorsement.
- Provide PD for mathematics specialists – regionally and nationally (NCTM, NCSM, AMTE conferences).
- Examine, support and write about the impact of the work of mathematics specialists at the regional and national level.
- Develop and maintain the an online clearinghouse for mathematics specialists – mathspecialists.org

ELEMENTARY MATHEMATICS SPECIALISTS & TEACHER LEADERS PROJECT



Supporting the ongoing work of Elementary Mathematics Specialists--professionals who know and understand mathematics, and who effectively lead and mentor their colleagues.

LOGIN OR JOIN

A PARTNERSHIP OF:



Here's what we will do today!

- Consider the intentional, regular use of particular classroom-based formative assessment (CBFA) techniques, and recognize how their use should truly guide planning, teaching, and learning.
- Addressing **YOUR** Problem of Practice (POP).
- Connection to the **Mathematics Teaching Practices**.

Mathematics Teaching Practices

Establish mathematics goals to focus learning. Effective teaching of mathematics establishes clear goals for the mathematics that students are learning, situates goals within learning progressions, and uses the goals to guide instructional decisions.

Implement tasks that promote reasoning and problem solving. Effective teaching of mathematics engages students in solving and discussing tasks that promote mathematical reasoning and problem solving and allow multiple entry points and varied solution strategies.

Use and connect mathematical representations. Effective teaching of mathematics engages students in making connections among mathematical representations to deepen understanding of mathematics concepts and procedures and as tools for problem solving.

Facilitate meaningful mathematical discourse. Effective teaching of mathematics facilitates discourse among students to build shared understanding of mathematical ideas by analyzing and comparing student approaches and arguments.

Pose purposeful questions. Effective teaching of mathematics uses purposeful questions to assess and advance students' reasoning and sense making about important mathematical ideas and relationships.

Build procedural fluency from conceptual understanding. Effective teaching of mathematics builds fluency with procedures on a foundation of conceptual understanding so that students, over time, become skillful in using procedures flexibly as they solve contextual and mathematical problems.

Support productive struggle in learning mathematics. Effective teaching of mathematics consistently provides students, individually and collectively, with opportunities and supports to engage in productive struggle as they grapple with mathematical ideas and relationships.

Elicit and use evidence of student thinking. Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning.



This was the beginning...

President's Message

Go Ahead, Teach to the Test!

Francis (Skip) Fennell



Since NCTM released *Curriculum Focal Points*, I have learned that columnists can say whatever they want in a headline to lure readers into their article. You have to admit, my headline grabbed you, didn't it? Well, now that I have your attention, I'll get serious. Let's talk about assessment—formative assessment, to be exact.

NCTM's Assessment Principle indicates that assessment should not be done *to* students; rather, assessments are *for* students and should be used to guide and enhance their learning. There are several forms of assessment. *Formative assessment* involves using classroom-based assessments to collect feedback that can be used to improve teaching and learning. *Summative assessment* measures what students have learned at the end of a

The student interview is another formative assessment technique that teachers can use; it is particularly valuable for assessing the progress of individual students. The interview protocol might engage a student in solving a few problems or exercises. The accompanying questions might require the interviewee to describe the steps that he or she used to complete the example problems. The assessment would then determine the student's level of understanding and would examine the student's thinking. The interview is especially useful for the early identification of misconceptions.

A Belief: The classroom is your canvas...

“I just figured I could Google formative assessment and buy whatever formative assessment I wanted/needed.”
Middle School Teacher

Assessment Literacy

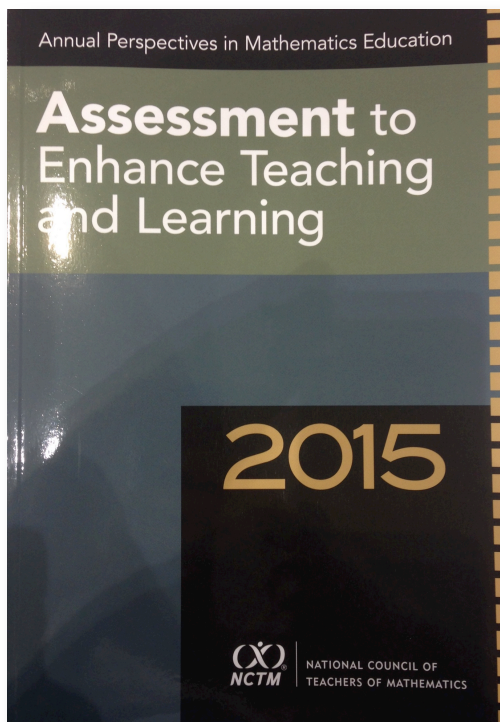
See: *TCM* – February 2015

news*
& views★

Classroom-Based
Formative Assessments—
Guiding Teaching and Learning*

FRANCIS (SKIP) FENNELL, BARBARA ANN SWARTZ, BETH McCORD KOBETT, AND JONATHAN A. WRAY

And, also see NCTM's *APME*, 2015:



■ CHAPTER 5

Classroom-Based Formative Assessments: Guiding Teaching and Learning

Francis (Skip) Fennell, *McDaniel College, Westminster, Maryland*

Beth Kobett, *Stevenson University, Stevenson, Maryland*

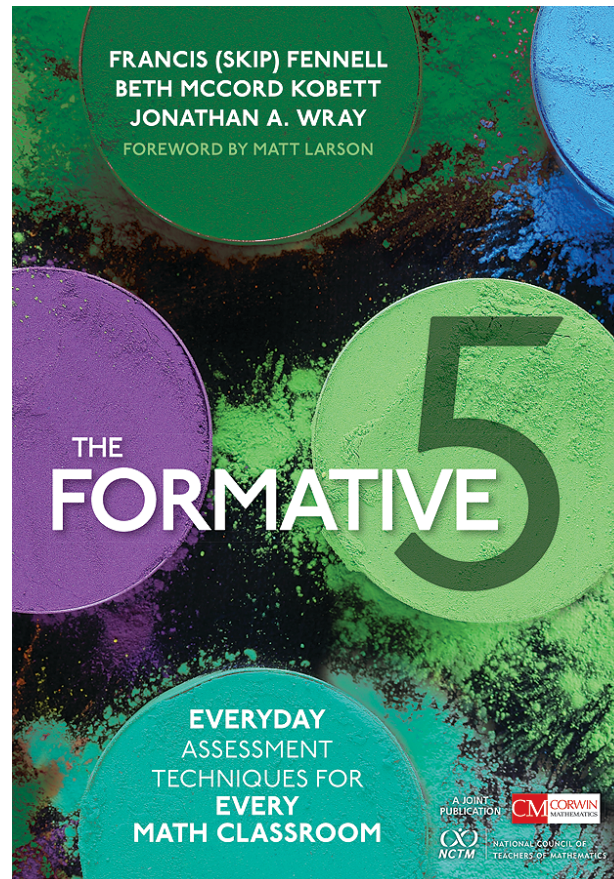
Jonathan A. Wray, *Howard County Public Schools, Ellicott, Maryland*

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Assessment Literacy

- What is it?
- Why is it important?
- Assessment of student learning is the responsibility of every school district, every school, and every teacher.
- Reality – you do this everyday, pretty much all day long!

Assessment Literacy

- Major tenets of assessment literacy include being able to create, select, and effectively use classroom assessments and being able to select and effectively interpret and use results from external summative assessments.
- Kahl, Hofman, and Bryant (2012) found that in many preservice teacher education programs, attention to assessment literacy was incomplete, rendering many, if not most, beginning teachers unprepared for the actual use and interpretation of assessments.

“Why didn’t I learn about formative assessment in my teacher prep program?”

First Year Teacher

Assessment Literacy

I actually never knew that my end-of-year and end-of-marking period benchmark tests were summative assessments. Thinking about how I can use both formative and summative assessments has been an eye-opening experience for me. AND, I'm in my 5th year of teaching!

Fourth Grade Teacher

Assessment Literacy

- **Formative assessment** includes all activities that provide information to be used as feedback to modify teaching and learning.
- **Summative assessments** are typically used to assess student learning at the end of an experience. This could be a unit assessment, school district assessment, or the more high-stakes and high-profile end-of-year state assessments.

What about you?

- Reflect back: did you learn this?
- What about now? How confident are you with regard to assessment – all aspects?
- Personal “confession”

- Assessment is integral to instructional practice (planning and teaching).
- Linking assessment to planning and instruction is used to **inform** teaching and learning

Your turn: Assessment Literacy

- Discuss – how does your school or school district define Formative Assessment?
- Discuss – How do **YOU** use formative assessment?

NCTM Research Brief: Formative Assessment

- a) Clarifying, sharing, and understanding goals for learning and criteria for success with learners; - pathfinder
- b) Engineering effective classroom discussions, questions, activities, and tasks that elicit evidence of students' learning;**
- c) Providing feedback that moves learning forward;**
- d) Activating students as owners of their own learning;
- e) Activating students as learning resources for one another.

NCTM “Key Strategies” for Effective Formative Assessment.

We actually know a lot about
formative assessment...

- The term **formative assessment** has been with us for close to 50 years (e.g., Sueltz et al, 1946; Weaver, 1955)....
- Regular use of **classroom formative assessment** would raise student achievement by 0.4 to 0.7 of a standard deviation – 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).

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.

William, Lee, Harrison & Black, 2004

But...

Evidence suggests that actual day-to-day use of formative assessment is *not as prevalent in classrooms as one might expect* (Stiggins, 2013).

And...

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

Glaser & Silver, 1994

What we have done...

- First, we recognized:
 - a need to emphasize and enhance the use of classroom-based formative assessments – to guide teaching and learning.
 - an overload of publications, published assessments and services promising the quick formative assessment fix.
- So, we:
 - Distilled seemingly endless suggestions and strategies to a small pallet of formative assessment techniques.

Today!

Interviews

Show Me

Observations

Next Time!!

Hinge Questions

Exit Tasks



Observations

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

Freudenthal, 1973, p. 84

Note: Many teachers indicate that observing is something they have always done, but have not seen it as a formative assessment technique, or they needed support to use observations to explicitly guide and *inform* their instructional decisions.

“How is observation assessment? Of course I observe my students—all day long every day! I just never considered the assessment potential of my observations!”

First Grade Teacher

Observations

“I actually know more about my students because I am always watching them work and also seeing how they interact—with the mathematics they are learning and with each other. For me, observation is my everyday formative assessment lifeline!”

Fourth Grade Teacher

Observations

Observations – two examples

2.G.A.2

Paige received a large cookie for a prize. She wanted to share it with her two friends. How much of the cookie would Paige and her friends have to eat? [Use a circular or rectangular region to represent your solution]. (2.G.A.2)

5.NF.B.7+

Chase had $\frac{3}{4}$ of large cookie that he wanted to share with his two friends. How much of the cookie would Chase and his friends have to eat? [Use a circular or rectangular region to represent your solution]. (5.NF.B.7+)

Observations



- What would you expect to observe?
- How would you *know it* if you saw it?
- What misconceptions might you observe?
- How might you record and provide feedback of what you observed?

Small Group: Implementation and Recording Tool for Observations

Intent of the Observation	Brief Description/Comments	Observed?
Mathematics Content		
Mathematical Practices		
Student Engagement		
General Comment:		
Feedback to Students:		

Source: Fennell, S., Kobett, B., & Wray, J. (2015). Classroom-based formative assessments: Guiding teaching and learning. In C. Suurtamm (Ed.) & A. R. McDuffie (Series Ed.), *Annual perspectives in mathematics education: Assessment to enhance teaching and learning* (pp. 51–62). Reston, VA: National Council of Teachers of Mathematics. Republished with permission of National Council of Teachers of Mathematics, from *Annual Perspectives in Mathematics Education 2015: Assessment to Enhance Learning and Teaching*, Suurtamm and McDuffie, 2015; permission conveyed through Copyright Clearance Center, Inc.

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Classroom: Observation: Student Representations

Student Representations (Anticipated/Observed)	Who Is Using Specific Representations	Who I Will Select to Share Their Representations (order of presentations; 1st, 2nd, ...)
Anticipated:		
Observed:		
Observed:		
Observed:		
Observed:		
<i>Add more rows as needed to accommodate more students</i>		

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Individual Student: Observation Check-In

Name:	Date:	
Mathematics Focus of the Lesson:		
Elements of the Lesson (Early, Mid, End)		Productively Engaged
Early:	Yes	No
Mid-Lesson:	Yes	No
End of the Lesson:	Yes	No
Need for an interview?	Yes	No
Comments:		

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Observations: Your Turn

- **Discuss:** You observe students all day long. What are you seeing?
- **Discuss:** Think about planning a lesson and then teaching it (ANY topic). Now picture any child in your class (1 student) as the lesson is being taught. What that child be doing? What might you do about it?
- Why did you pick **THAT** child?

“I observe and talk with my students all day long every single day. Now I know how to formalize my comments and conduct an interview. So powerful!”
Kindergarten Teacher

Interviews

“For some reason I thought that you only interviewed those students who were having problems in math class. Now I regularly interview my algebra students because I want to assess how they are transitioning to using equations and inequalities in a more formal way.”

Eighth Grade Teacher

Interviews

Interviews

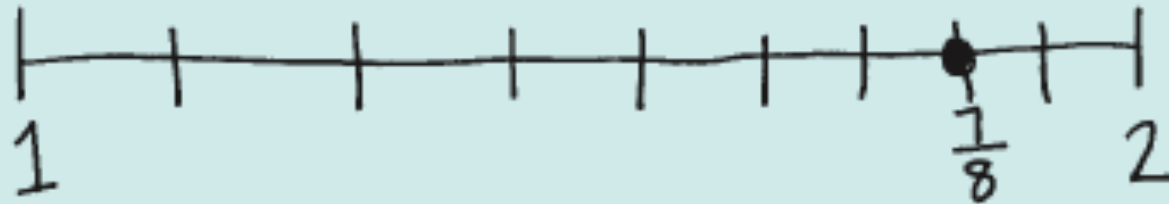
- Long history of use in mathematics and special education (Weaver, 1955; Ginsburg, 1997; Fennell, 1972, 1998 .
- **Extends the observation.**
- Takes some time – focused; 1-on-1 or small group
- Allows you to dig deeper
- **Not deficit-based**
- Provides a glimpse of what a child is thinking

Observation/Interview Recommendations *from a while ago!*

- 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).

Observations to Interviews

Fig. 2 This student's representation of $\frac{7}{8}$ reveals a lack of understanding of relative distance on a number line.



This is $\frac{7}{8}$ because I split the number line into 8 lines. Next, I put a circle on the 7th line. That represents $\frac{7}{8}$.



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 will you anticipate from students? (Consider understandings AND possible misconceptions.)
- What follow-up questions might you ask?

Interviews: Your Turn

- **Discuss:** Think of a lesson, any lesson, you have recently taught. What did a student do (or not) that might have caused you to have a brief interview (5 minutes or less) with the student?
- **Discuss:** Consider the following. Based on this student's response, what's your next step - instructionally?

Mathematics Goal(s):			
Assessing	Student Response	Feedback to Student(s)	Teacher Comments/ Observations
Conceptual Understanding			
Procedural Fluency			
Strategies Used			
Student Prerequisites and Misconceptions			
Disposition			
General Comments:			

Source: Adapted from Larson, M. R., Fennell, F., Adams, T. L., Dixon, J. K., Kobett, B. M., & Wray, J. A. (2012). *Common core mathematics in a PLC at work: Grades 3–5* (pp. 145, 146). Bloomington, IN. Adapted version published in C. Suurtamm (Ed.) & A. McDuffie (Series Ed.), *Annual perspectives in mathematics education: Assessment to enhance teaching and learning*. Reston, VA: National Council of Teachers of Mathematics. Republished with permission of National Council of Teachers of Mathematics; permission conveyed through Copyright Clearance Center, Inc.

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Classroom: Interview Record

Student	Mathematics Content Focus	Mathematical Practice(s)	Learning Task	How did you solve that?	Why did you solve the problem that way?
<i>*Add more rows as needed.</i>					

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Individual: Student Interview Prompt

Interview Prompt*		
Name:	Date:	Math Topic:
Question		Student Responses
1. How did you solve that?		
2. Why did you solve the problem that way?		
3. What else can you tell me about what you did?		

*Note: Attach completed work sample(s).

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“Can you show me how you would order 76, 54, 47, and 89 using the number line?”

“How do you know $\frac{3}{4} < \frac{7}{8}$? Show me.”

“Show me your graph for that equation.”

Show Me

Show Me

- A performance-based response to what a teacher observes.
- Combines elements of the observation and interview.
- A *stop-and-drop* activity where a student, small group of students or perhaps the entire class might be asked to show how something works, a problem solved, or a particular representation used.



Show Me

1. Provide a *show me* prompt that you might use for the following: *Compare two fractions with different numerators and denominators (e.g. $\frac{3}{4}$ and $\frac{5}{6}$) by creating common denominators or numerators or comparing them to the fraction benchmark $\frac{1}{2}$. (4.NF.A.2)*
2. What might you want a student or students to say as they describe their *show me* response?
3. How is this (the *Show Me* technique) different from an interview or observation?
4. When might YOU use a show me in your own setting?

Show Me examples

- Show at least three equivalent fractions for $\frac{1}{4}$ using a number line.

- Compare the fractions $\frac{3}{4}$, $\frac{5}{6}$ and $\frac{7}{8}$ using whatever representation you like.

SHOW ME: Mathematics Content:	
Lesson Focus/Standard:	Anticipated Student Show Me Responses:
Student:	Student:
Student:	Student:
Student:	Student:

Note: Pictures of student Show Me responses may be dropped into the student response locations above.

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Show Me: Your Turn

- **Discuss:** Are there particular lessons that you think would provide opportunity for more *Show Me's* than other lessons? Which? Why do you think so?
- **Discuss:** Think through a lesson topic (ANY level). Think about planning this lesson – what might you observe? What would you have your students show you?

Summing Up...

- Observations – Paying attention, monitoring
- Interviewing – specifics, “I want to know more about what I just observed.”
- *Show Me* – This is an explicit performance of what I would like to see demonstrated.

Year long pilot – with teachers...

- Has working with the CBFA's made a positive impact on your work with teachers?
- 0-5 rating scale
- Mean rating: 3.78
- Median rating: 4
- $n = 32$

Year long pilot – CBFA's and planning

- Can you now claim that teachers consider classroom based formative assessment as they plan lessons for teaching mathematics?
- 0-5 rating scale
- Mean rating: 3.30
- Median rating: 3
- $n = 33$

Year long pilot – CBFA's and teaching

- Can you claim that teachers regularly (as in every day) use classroom based formative assessment as they implement mathematics lessons.
- 0-5 rating scale
- Mean rating: 3.32
- Median rating: 3
- $n = 31$

Your Test...

Renny...

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.

Love this...

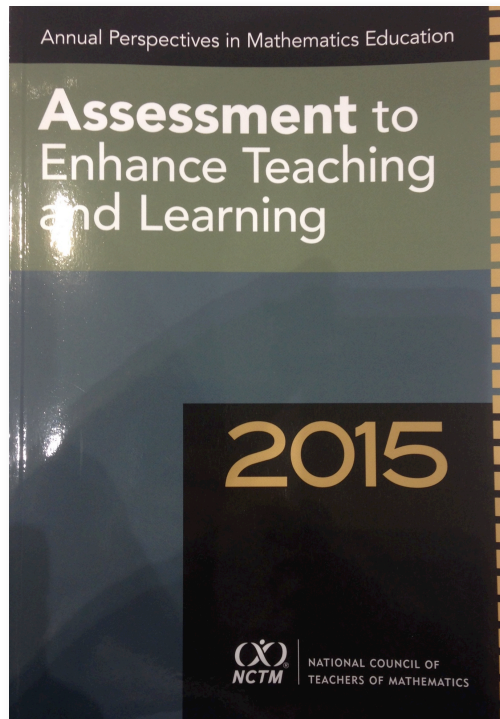
Thompson and William, 2007

Assessment Resources...

- 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

And...Available Now

NCTM's *Annual Perspectives in Mathematics Ed 2015: Assessment to Enhance Learning and Teaching*



■ CHAPTER 5

Classroom-Based Formative Assessments: Guiding Teaching and Learning

Francis (Skip) Fennell, *McDaniel College, Westminster, Maryland*

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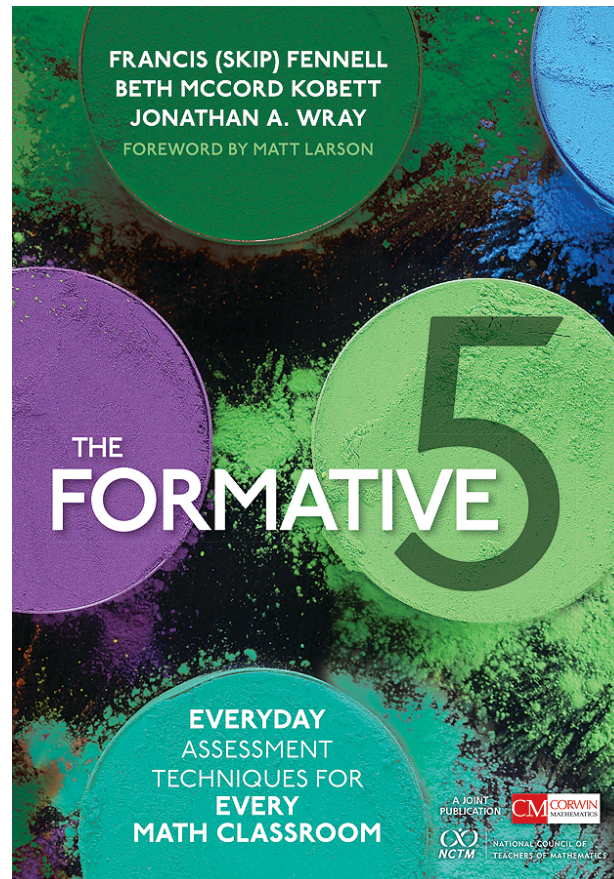
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YOUR Timeline – Right Now!

Connecting Formative Assessments to summative assessments, *particularly performance-enhanced tasks.*

Thank you!

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 dome. The ampersand is colored green, while the other letters are black.

*Elementary Mathematics Specialists
& Teacher Leaders Project*

Slides/Handouts:

<http://mathspecialists.org>