Using **Formative Assessment** to Influence Planning, Guide Teaching, and Support Student Learning

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Using Formative Assessment to Guide Planning, Teaching, and Student Learning

Francis (Skip) Fennell
McDaniel College
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www.mathspecialists.org

ELEMENTARY MATHEMATICS SPECIALISTS & TEACHER LEADERS (EMS&TL) PROJECT

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

A PARTNERSHIP OF:

Brookhill Institute of Mathematics

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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

Elementary Mathematics Specialists & Teacher Leaders Project
NCTM’s APME, 2015:

 Assessment to Enhance Teaching and Learning

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
Here’s what we will do today!

Consider the intentional, regular use of particular classroom-based formative assessment (CBFA) techniques, and recognize how their can truly guide planning, teaching, and learning AND discuss bridging toward summative assessments.
The classroom is your canvas...
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.
• Linking assessment to planning and instruction is used to **inform** teaching and learning.

• Thus, formative assessment is very much connected to how one teaches, it’s good pedagogy!
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 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...

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

• November 9, 2015: Formative assessment is one of the most widely used—but poorly understood—instructional techniques.
But…

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

November 9, 2015:

• Formative assessment is one of the most widely used instructional techniques.
So, let’s get started!
Here is 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.
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.
## Observations

<table>
<thead>
<tr>
<th>2.G.A.2</th>
<th>5.NF.B.7+</th>
</tr>
</thead>
<tbody>
<tr>
<td>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)</td>
<td>Chase had ( \frac{3}{4} ) of large cookie that he wanted to share with his two friends. How much of the cookie would Chas and his friends have to eat? [Use a circular or rectangular region to represent your solution]. (5.NF.B.7+)</td>
</tr>
</tbody>
</table>
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?
## Planning Tool - Observations

<table>
<thead>
<tr>
<th>Intent of the Observation</th>
<th>Brief description/comments</th>
<th>Observed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mathematics Content</td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Partially</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Mathematical Practice(s)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>Student Engagement</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Comment:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feedback to Students:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Observations

Observe students as you ask them to decide how many hops of 3 ¼ on a number line are closest to but < 9. Then observe students as they decide how many 3 ¼ number line hops are closest to but < 15.
# Look For’s – Observation Tool

## Mathematical Practice:

<table>
<thead>
<tr>
<th>Key student dispositions:</th>
<th>Teacher actions (to promote student dispositions):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Comments:

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Elementary Mathematics Specialists & Teacher Leaders Project

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Interviews

• Long history of use in mathematics and special education (Weaver, 1955; Ginsburg, 1997; Fennell, 1972, 1998).

• Extends the observation.

• Takes 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 (Sueltz, Boynton, & Sauble, *1946*, p. 145).

- 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).
Fig. 2 This student’s representation of 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?
## Interview Prompt

<table>
<thead>
<tr>
<th>Assessing</th>
<th>Student Response</th>
<th>Feedback to Student(s)</th>
<th>Teacher Comments/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual Understanding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedural Fluency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategies Used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Prerequisites and Misconceptions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disposition</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>General Comment:</td>
<td></td>
<td></td>
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</tbody>
</table>

Adapted from Larson, Fennell, Adams, Dixon, Kobett, Wray, 2012 as cited in Fennell, Kobett & Wray, 2015, p. 55
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.
Think about a *show me* prompt that you might use for the following: *Compare two fractions with different numerators and denominators* (e.g. 3/4 and 5/6) *by creating common denominators or numerators or comparing them to the fraction benchmark 1/2.* (4.NF.A.2)

What might you want a student or students to *show* as they describe their *show me* response?

How is this (the *show me* CBFA technique) different from an interview or observation?

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.
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.
Pause Point!

Let’s hear from you.
What questions do you have?
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.
Hinge Question

I walked 2 ¾ miles on Monday, Tuesday, and Wednesday. Have I walked more or less than 10 miles? How do you know? How far did I walk?
## Hinge Question Planning Tool

<table>
<thead>
<tr>
<th>Hinge Question:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will the hinge question assess important mathematical understandings of the day?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will students understand the question?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will students be able to respond in about a minute?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Will expected responses be such that they can be analyzed and interpreted quickly?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General consideration:** Will responses assist in shaping planning for tomorrow’s lesson? (circle one) **YES** | **NO** (if no, revise hinge question)

**HOW?**
Hinge or Not?

• Is $7/8 > 3/4$?
• Can you name a fraction that is $> 3/4$?

• Is $1/2 = 2/4$?
• Represent $1/2$ at least 3 different ways – using equivalent fractions.
Turn these into Hinge Questions

• Compare two fractions with the same numerator or the same denominator. (3.NF.A.3d)

• Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication (e.g. \( \frac{3}{4} \times \frac{1}{2} \)). (5.NF.B.5a)
Types of Hinge Questions

1. Can you name a fraction that is greater than \( \frac{3}{4} \)?

2. Which of the fractions below is \( > \frac{3}{4} \)?
   
   A. \( \frac{1}{4} \)
   
   B. \( \frac{1}{2} \)
   
   C. \( \frac{4}{4} \)
   
   D. \( \frac{3}{5} \)

Note the differences – both regarding responses and creation and use.
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.

• Exit tasks can be a bridge to **summative-like** performance tasks.
Bree’s Pizza Palace has to load boxes of cheese. Each box weighs 5 ¾ pounds. There were 4 boxes. Was the total weight < or > 25 lbs.? Write a response to show how you know.
ESSA – Think About

• **State Authority**: Under the new law, the job of holding schools accountable largely shifts from the federal government to the states.
ESSA – Summative Assessments

• States still have to test students in reading and math once a year in grades 3 through 8, as well as once in high school.

• States will now have flexibility in how and when they administer the tests (e.g. a single annual assessment can be broken down into a series of smaller tests). There's also an emphasis on finding different kinds of tests that more accurately measure what students are learning.
Daily Considerations

- Interviews
- Observations
- Show Me
  - As needed 1-1 or small group
  - To guide/monitor what’s going on...
- Hinge Questions
  - Every lesson’s “deal breaker”
  - Performance-based, perhaps a regularly reviewed and used math notebook
- Exit Tasks
  - Hinge Question + Exit task (next day’s plan!)

Source: Brookhill Institute of Mathematics & Teacher Educators Project
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 William, 2007

Love this...
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...

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

Classroom-Based Formative Assessments: Guiding Teaching and Learning

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YOUR Timeline – Right Now!

• Connecting Classroom-Based Formative Assessments to summative assessments, particularly performance-enhanced tasks.

• Considering the adaptation of SMARTER Balanced/PARCC and other state-based summative items for regular formative assessment use.
ESSA – and there’s much more

• **Accountability:** The new law is much more specific about which schools need intervention but much less specific on what those interventions should be. Schools at the bottom 5% of assessment scores (as defined by the state), high schools that graduate less than 67% of students, or schools where subgroups are consistently underperforming would be considered failing and could be subject to state takeover - although the law doesn't say what the state needs to do.

• **ESSA and Assessment:** Start asking questions NOW. When will assessments be administered? What types of assessments? Intervention plans? Spend time actually considering questions you might have.
ESSA and CCSS-M

• **Common Core:** ESSA allows states to adopt the CCSS-M but does not require it. In fact, it requires the Education Department to remain neutral: "The Secretary shall not attempt to influence, incentivize, or coerce State adoption of the Common Core State Standards developed under the Common Core State Standards Initiative or any other academic standards common to a significant number of States, or assessments tied to such standard."

• **Reality Check:** For most states this is done/implemented; for some the language related to how standards are discussed is different (e.g. College and Career Readiness Standards).
Thank you!

ffennell@mcdaniel.edu
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