Standards-based assessment in a2i

_Telling the Story of Student Achievement_

April 13, 2013
If…

• teachers teach the same algebraic concepts at roughly the same time,

• formative assessment strategies are embedded in instruction roughly every day, and

• inquiry groups within and across schools are looking at the same student tasks at roughly the same time to make instructional decisions

then student achievement in mathematics will be measurably increased.
A2i Key Objectives

• Work with 30 schools over five years, directly supporting one-third of our schools

• 80% of 9th-grade students will pass their first Regents exam in the 9th-grade year

• 75% of 10th-grade students will enroll in 11th-grade algebra II/trigonometry

→ 70% of these students will complete the course and pass a third mathematics Regents exam
Five Principles of Formative Assessment

Start from where the learner is

Students have to reconstruct their idea; merely adding an overlay of new ideas leads students to think of mathematics as disconnected and inconsistent.

Students must be active in the process

Learning has to be done by students; it cannot be done for them.

Students need to talk about their ideas

‘Talking the talk’ is an important part of learning. When pupils are talking about mathematical ideas, whether in whole-class dialogue or in peer groups, they are using and constructing the language of mathematics.

Students must understand the learning intention

Students need to have an understanding of what counts as good quality work. They must also have an idea of where they stand in relation to that target.

Feedback should tell students how to improve

Feedback that focuses on the student as a good or bad achiever is not constructive. Instead, feedback should focus on the strengths and weaknesses of the particular piece of work and what needs to be done to improve.
I. **Overview**: Building Systems Aligned to the Common Core
Designing a Common Core-aligned Mathematics Curriculum

Grade 9: Algebra One

- A0 Intro Unit
  - N-Q 1
  - N-Q 2
  - N-Q 3
  - F-IF 1
  - F-IF 2
  - F-IF 3
  - F-IF 4*
  - F-IF 5*
  - F-IF 9*
  - F-LE 1
  - F-LE 1a, 1b
  - F-LE 3
  - F-LE 5

- A1 Modeling with Functions
  - F-IF 6
  - F-IF 7a
  - F-IF 9
  - F-BF 1
  - F-BF 2
  - F-BF 4a
  - F-LE 1
  - F-LE 1a, 1b

- A2 Linear Functions
  - A-REI 1
  - A-REI 3
  - A-REI 11*
  - A-CED 1
  - A-CED 3
  - A-CED 4

- A3 Linear Equations & Inequalities in One Variable
  - Modeling Unit
  - A-CED 2
  - A-CED 3
  - A-CED 4
  - A-REI 5
  - A-REI 10
  - A-REI 12

- A4 Linear Equations & Inequalities in Two Variables
  - F-IF 4*
  - F-IF 5*
  - F-IF 6
  - F-IF 7a
  - F-IF 8a
  - F-IF 9
  - F-BF 1
  - F-BF 1a, 1b
  - F-BF 3

- P1 Quadratic Functions
  - N-CN 7

- A5 Quadratic Equations
  - A-SE 3a
  - A-SE 3b
  - A-REI 4
  - A-REI 4a, b
  - A-REI 7

- A6 Quadratic Equations
  - S-ID 1
  - S-ID 2
  - S-ID 3
  - S-ID 5
  - S-ID 6
  - S-ID 6a, b, c
  - S-ID 7
  - S-ID 8
  - S-ID 9

Grade 10: Geometry

- G0 Intro and Construction
  - G-CO 12
  - G-CO 13

- G1 Basic Definitions & Rigid Motions
  - G-CO 1
  - G-CO 3
  - G-CO 4
  - G-CO 5
  - G-CO 6
  - G-CO 7
  - G-CO 8

- G2 Geometric Relationships & Properties
  - G-CO 9
  - G-CO 10
  - G-CO 11
  - G-CO 12

- G3 Similarity
  - G-SRT 1
  - G-SRT 2
  - G-SRT 3
  - G-SRT 4
  - G-SRT 5

- G4 Coordinate Geometry
  - G-GPE 4
  - G-GPE 5
  - G-GPE 6
  - G-GPE 7*
  - G-GPE 1

- G5 Circles and Conics
  - G-C 1
  - G-C 2
  - G-C 3
  - G-C 5
  - G-GPE 2

- G6 Trigonometric Ratios
  - G-SRT 6
  - G-SRT 7
  - G-SRT 8

- G7 Geometric Measurement & Dimensions
  - G-MG 1*
  - G-MG 2*
  - G-MG 3*

- M4 Capstone Geometric Modeling Project
Designing a Common Core-aligned Mathematics Unit

**Learning Plan**
- Developmental Lessons
- Concept Lessons
- Problem Solving Lessons

**Formative Assessment Task & Lesson**
- Re-engagement Activities
- Convergence Activities

**Long Task:** Building Fluency and Range

**Final Performance Task**

**Long Task Presentations**
Initial Tasks Offer Insight Into Student Successes and Struggles

4a: Student A starts with a strong sense of extending patterns to find a solution:

- Uses the pattern to extend the function and finds a solution; is also able to describe her process.
- Writes function rule but does not use given variables (F.BF.1).
- Uses the given pattern (not the inverse), but with situational rounding error (F.IF.9).
Final Tasks Offer Insight Into Student Growth In Doing Math

5a: Student A, starting from the strongest use of pattern and proportion, show little improvement over the course of the unit.

Uses the pattern to extend the function

Uses the standard form of a linear function and recognizes rate of change but confuses the starting point of the tables with that of the chairs. (F.BF 1)

Applies incorrect \( r \) but computes correctly

Again uses the standard form of a linear function with correct rate of change and incorrect intercept (F.BF 1)

Substitutes into (incorrect) rule but not in inverse position F. IF 9
Formative Assessment Lessons Measure and Address Learning Gaps

CONCEPT DEVELOPMENT

Mathematics Assessment Project
CLASSROOM CHALLENGES
A Formative Assessment Lesson

Lines and Linear Equations

FALs are available at map.mathshell.org
## Re-teaching vs. Re-engagement

<table>
<thead>
<tr>
<th>RE-TEACHING</th>
<th>RE-ENGAGEMENT</th>
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<tbody>
<tr>
<td>• Teach the unit again</td>
<td>• Revisit student thinking</td>
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<tr>
<td>• Address basic skills that are missing</td>
<td>• Address conceptual understanding</td>
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<td>• Do the same or similar problems over</td>
<td>• Examine tasks from different perspective</td>
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<td>• Practice more to make sure students learn the procedures</td>
<td>• Critique student approaches and solutions to make connections</td>
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<tr>
<td>• Focus mostly on underachievers</td>
<td>• Engage the entire class in doing math</td>
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→ Cognitive level is usually lowered  
→ Cognitive level is usually increased
II. Assessment: Understanding Our Achievements
### Performance Monitor Tool Tracks Student Growth

#### Final Task Scores

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#### Above cut score on both assessments
- 187 (18%)

#### Improvement, scored below cut score on IPAT
- 325 (32%)

#### Improvement from 0 to 1+
- 181 (18%)

#### Similar score on both assessments; below cut score
- 115 (11%)

#### Decline, below cut score on FPAT
- 174 (17%)

#### Decline, 0 points on FPAT
- 19 (2%)

#### Zero on both assessments
- 11 (1%)

#### Total
- 1012 (100%)
Performance Monitor Tool Tracks Student Application of Standards

Standard MA.8.4: Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. 

Tested in Unit 2

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Students with Same High Score: 450

Students Improving: 393

Students with Same Mid Score: 83

Students Declining: 59

Students with Same Low Score: 14

Growth in Student Scores

Scores

0 250 500 750 1,000

High Score

Improving

Mid Score

Decline

Low Score
Student Growth in Standards

Some units test the same standard(s) on both the IPAT and FPAT. It therefore becomes possible to track student growth within a unit on a particular standard.
If performance in a **standard** is low, did the curriculum properly support student learning opportunity of math content?

If performance in a **cluster** is low, how does curriculum, do we need to better support sense-making/math practices?
What did we learn
Inquiry Cycle Identifies Needs Near the Sphere of Success

*Teachers as Learners*
Lessons Learned

• If given the chance, kids will make sense of the mathematics

• Participating on a team (of teachers) is crucial to analyzing student work

• Performance tasks and FALs provide evidence for teachers’ discussion, rooted in learning and instruction