Using Classroom Formative Assessment and Tasks to Improve Student Learning

Used with skill, assessment can motivate
the reluctant, revive the discouraged, and thereby
increase, not simply measure, achievement.

Formative Assessment
Formal and informal processes teachers and students use to gather evidence for the purpose of improving learning

Summative Assessment
Assessment information used to provide evidence of student achievement for the purpose of making a judgment about student competence or program effectiveness.

What Does Research Say the Benefits of Formative Assessment Are

Formative assessment is any assessment task designed to promote students' learning. These tasks give both teachers and students feedback, so that teaching and learning activities can be altered according to the results. Formative assessment is different from summative assessment, the goal of which is to measure mastery. Research indicates the following conclusions:

- Formative assessment produces greater increases in student achievement and is cheaper than other efforts to boost achievement, including reducing class sizes and increasing Teachers' content knowledge.
- Formative assessment that occurs within and between instructional units (medium-cycle assessment) as well as within and between lessons (short-cycle assessment) has been shown to improve students' achievement. Formative assessment across marking periods, quarters, semesters, or years (intervals of four weeks to one year) has **not** been shown to improve students' achievement.
- In classrooms where medium and short-cycle formative assessment was used, teachers reported greater professional satisfaction and increased student engagement.

What strategies contribute to effective formative assessment?

Looking separately at the roles of the teacher, the students, and the students' peers, we find that research suggest that effective assessment can be based on the following five "key strategies":

1. Clarifying, sharing, and understanding what students are expected to know. (Learning Progressions)
2. Creating effective classroom discussions, questions, activities, and tasks that offer the right type
   Evidence of how students are progressing to the espoused learning goals
3. Providing feedback that moves learning forward
4. Encouraging students to take ownership of their own learning
5. Using students as learning resources for one another.

Based on *What Does Research Say the Benefits of Formative Assessments Are?*
The National Council of Teachers of Mathematics (NCTM)

"Using Classroom Formative Assessment and Tasks to Improve Student Learning" KSDE Pre-Conference, Melisa Hancock-KSU and Melissa Fast-KSDE.

Aspects of Assessment *for* Learning

<table>
<tr><th></th><th>Where the learner
is going</th><th>Where the learner
is right now</th><th>How to
get there</th></tr>
<tr><td>Teacher</td><td>Clarifying &
Sharing learning
intentions & criteria
for success</td><td>Engineering effective
classroom discussions,
questions, activities, & tasks
that elicit evidence of learning</td><td>Providing
feedback that moves learners
forward</td></tr>
<tr><td>Peer</td><td>Understanding
& sharing learning
intentions & criteria
for success</td><td colspan="2">Activating students as instructional
resources for one another</td></tr>
<tr><td>Learner</td><td>Understanding
learning intentions &
criteria for success</td><td colspan="2">Activating students as the owners of
their own learning</td></tr>
</table>

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Cognitive Demand and Standards for Mathematical Practice

Bloom's Taxonomy Revised	Webb's Depth of Knowledge	Cognitive Demand in Mathematics	Standards for Mathematical Practice
Remembering	**Level One** Recall and Reproduction	**Level One** Memorize Facts, Definitions, & Formulas.	1. **Make sense of problems and persevere in solving them.** 2. **Reason abstractly and quantitatively.** 3. **Construct viable arguments and critique the reasoning of others.** 4. **Model with mathematics** 5. **Use appropriate tools strategically.** 6. **Attend to precision.** 7. **Look for and make use of structure.** 8. **Look for and express regularity in repeated reasoning.**
Understanding	**Level Two** Skills and Concepts	**Level Two** Perform Procedures	
Applying	**Level Two** Skills and Concepts	**Level Three** Demonstrate Understanding of Mathematics	
Analyzing	**Level Three** Strategic Thinking	**Level Four** Conjecture, Analyze, Generalize, Prove	
Evaluating	**Level Four** Extended Thinking	**Level Five** Solve Non-Routine Problems, Make Connections	
Creating	**Level Four** Extended Thinking	**Level Five** Solve Non-Routine Problems, Make Connections	

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Seven Strategies of Assessment *for* Learning

Where am I going?

1. Provide students with a clear and understandable vision of the learning target.
2. Use examples and models of strong and weak work.

Where am I now?

3. Offer regular descriptive feedback.
4. Teach students to self-assess and set goals.

How can I close the gap?

5. Design lessons to focus on one learning target or aspect of quality at a time.
6. Teach students focused revision.
7. Engage students in self-reflection, and let them keep track of and share their learning.

Source: Adapted with permission from R. Stiggins, J. Arter, J. Chappuis, and S. Chappuis, *Classroom Assessment for Student Learning: Doing It Right—Using It Well* (Portland, OR: Pearson Assessment Training Institute, 2004), p. 42.

Strategies to Turn Assessment into Instruction

- **G**et one, give one
- **E**xplain your answer/reasoning
- **T**ry a different answer
- **A**dd to/extend the problem
- **C**onnect concepts
- **L**ogical eliminations
- **U**nderstand the problem
- **E**rror analysis

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Common Core State Standards, Mathematics Practices
Questions for Planning & Observation

Make sense of problem and persevere in solving.
Do students:

- Unpack the problem?
    - What is the story?
    - What are the given quantities?
    - What needs to be found out?
- Use strategies to enter the problem?
    - Previous similar or simpler problems.
    - Knows representations/models that work.
    - Language needed to understand problem.
- Recognize relationships in the problem? Relationships needed to find a solution?
    - Solve a part of problem needed to solve second part?
    - Relationship between quantities?
    - Look for regularities, trends?
- Know what the answer tells you? What form should the answer be? What units are called for?
- Do strategies and results make sense?
    - Can students explain why they are trying a particular strategy?
    - If not making progress, can students change course and try a different strategy?
    - Use another strategy to verify and explain solution?
- What mathematics should be evident in all solutions? How will students see the same mathematics in each representation and solution?

Reason abstractly and quantitatively.
Do students:

- Mathematize the problem?
    - What are the given quantities?
    - How do they relate to each other?
- Represent the problem symbolically?
    - Can students explain what symbols mean and how relate to quantities, other symbols, representations, models?
    - Explain the context of problem?
- What properties and reasoning will support solutions? How can the problem be decomposed and recombined?
- What are the units needed while solving and reporting answer?

Construct viable arguments and critique the reasoning of others.
Do students:

- Make conjectures?
    - Explore the problem to support or disprove their conjecture?
    - Refine or change their conjecture?
- Construct their justification? Use objects? Drawings? Diagrams? Examples and counter examples? Cases?
- Have opportunities to explain their conclusions and communicate their reasoning with others? What language is needed?
- Have opportunities to ask useful questions to seek clarity? Follow the arguments of others looking for flaws and explaining them?

Model with mathematics.
Do students:

- Apply the mathematics to the problems?
- Make and recognize assumptions and approximations?
- Understand they may need to make revisions?
- Identify important quantities and the relationships between them?
- Interpret the mathematics in the context of the problem?
- Reflect on the results?
    - Make sense of solutions?
    - Evaluate model to see if can be improved?

Use appropriate tools strategically.
Do students:

- Choose tools to fit the problem and know how to use them?
- Recognize usefulness and limitations of tool?
- Use technological tools to explore and deepen understanding?

Attend to precision.
Do students:

- Communicate precisely to others?
    - Do they use clear definitions?
    - State the meaning of the symbols they use?
- Calculate accurately and precisely?
- Examine their claims and check reasoning?

Look for and make use of structure.
Do students:

- Recognize the structure of problem?
    - Patterns (e.g., commutative property)
    - Definitions (e.g., rectangles have 4 sides)
    - Utilize properties
    - Decompose & recombine numbers and expressions?
- Are students able to shift perspective?

Look for and express regularity in repeated reasoning.
Do students:

- Notice if calculations repeat themselves?
- Look for general methods? Shortcuts?
- Maintain oversight of process & attend to details?
- Evaluate the reasonableness of the results?

Useful Formative Assessment Websites

- http://educateiowa.gov/index.php?option=com_content&task=view&id=1072&Itemid=1171
- http://www.michigan.gov/mde/0,4615,7-140-22709_55936---,00.html
- http://wvde.state.wv.us/teach21/FormativeAssessment.html
- http://elementarymath.cmswiki.wikispaces.net/+2012.2013+Formative+Support

Learning Progression
http://ime.math.arizona.edu/progressions/

Illustrative Math Project
http://illustrativemathematics.org/standards/k8

Sample SBAC Items 3-HS (Math and ELA) organized by Missouri
http://dese.mo.gov/divimprove/assess/sbac.html#sbacsample

MARS – Secondary Lessons, Tasks, and Assessment examples
http://map.mathshell.org/materials/index.php