Roadmaps for Formative Assessment

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Wide array of students


https://www.dseusa.org/en-us/


http://ii5.picdn.net/shutterstock/videos/8333005/thumb/10.jpg


How do you move these students forward?

- Teacher has to be able to gain access to what the kid does and does not know
- Pinpoint what the student knows about the topic that you’re teaching - or anything that could impact their understanding
- Assess prior knowledge - think some more how to say this in more descriptive terms but not too scholarly
- Identify gaps or misconceptions
- Get “advanced” students thinking
- Ask students to help/teach each other
Many paths...

- Regardless of where the student is/starts, our goal as a teacher is to move them forward in their learning
- Different starting and ending points
- Different routes
- Lay out all the reasons why kids struggle and then point to the tool
- Here’s a tool that helps us collect evidence about student thinking so that we know how to move them forward
  - Where they are starting
  - Have a better understanding of prior knowledge
Learning Map Model

- FA and the learning map address this problem of all kids being so diverse in their needs
- FA helps you collect the evidence
- LM gives you the diagnostic tool
- Takes guess work out of it.
- --helps you create questions to collect evidence
- --go back to the map to figure out how to collect more evidence about the kid’s progress
- Cycle
Our Approach to Formative Assessment

- Assessment of learning
- Interim assessment
- Summative assessment
- Giving a test at the end of a sequence of learning
- Assigning or reporting grades
- Giving students test results
- Individual assignment scores/completion points

Source: Margaret Heritage
Our Approach to Formative Assessment

- Assessment for learning
- Collect evidence of student thinking
- The focus is on informing learning, rather than measuring it
- To gauge how student learning is progressing while students are in the process of learning
- To inform students about their progress - not for grading purposes
- To inform instructional decisions and immediate adjustments to the learning environment
- Move learning forward from its current status
- Use evidence to inform immediate or near immediate teaching and learning
- Provide ongoing feedback to learners
- Generate evidence of student progress through observation, discussion, questioning, and review of student work

“Formative assessment is a planned process in which teachers or students use assessment-elicited evidence to improve what they’re doing” (Popham, 2011, p. 2).

Source: Margaret Heritage
Our Learning Map Model + Resources

- Combines classroom activities and opportunities to implement formative assessment
- Makes the work teachers do more efficient
- No human being has time or knowledge to build a map that reflects the way students progress through learning
Our Learning Map Model

- What do I already know?
- What am I ready to learn?
- Where can I go next?
- How can I close the gap?

- What is the benefit of using this map to inform our instructional decisions?
- Make a transition from FA to LM (Margaret Heritage)
Our Learning Map Model

- ELA
- Mathematics
- Birth through HS
This Model Helps Teachers...

- Identify prerequisite knowledge
- Identify next steps in learning
- See how concepts are related to each other
- Ask questions about particular skills and concepts
Learning Map Information

- Examine the learning map model for the unit.
- What information in the learning map model attracted your attention most?
- How might you use the information in the learning map model?
8.F.3: Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
Teacher Notes

- Read or skim the Teacher Notes document for the unit.
- How might you structure a professional development session around a Teacher Notes document?
- What benefits do you anticipate teachers will gain from reading these documents?
Teacher Notes

Students’ understanding is deepened through activities that require them to **work with the same function in multiple representations**, such as symbolic, graphical, numerical, or verbal forms (Carlson & Oehrtman, 2005; Leinhardt et al., 1990; Lloyd, Herbel-Eisenmann, & Star, 2011; Ronau, Meyer, Crites, & Dougherty, 2014). As students **examine the characteristics of a function in its different representations**, they should be able to articulate how each characteristic can be shown in different ways. For example, the y-intercept appears as (1) an initial value in a verbal description, (2) an ordered pair of the form (0, #) in numerical representation, (3) a point lying on the y-axis of a graph, or developing an understanding of functions as predictable relationships between quantities (Leinhardt et al., 1990). Alternatively, students need learning experiences to **reinforce the idea that functions accept inputs and produce outputs according to predictable rules**, such as a rate of change, as is the case for linear functions. They also need opportunities to **consider how functions act on entire intervals** so they may develop global, rather than local, perspectives.
Instructional Activity

- Choose **one lesson** in the unit to read and try participating in the described activities.

- What reactions do you have about the **activities** students would engage in during the lesson you reviewed?

- What reactions do you have about the **Guiding Questions**?
Instructional Activity

LEARNING GOAL
Students will compare multiple representations of the same function. The critical outcome of this activity is for students to be able to find the rate of change and the \( y \)-intercept of a function given in any representation and to match different representations of the same functions.

PRIMARY ACTIVITY
Students will create a table and a graph for a given equation and then will match the function to a corresponding description of a real-world situation.
## Instructional Activity

### Function 1

<table>
<thead>
<tr>
<th>$x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>-5</td>
</tr>
<tr>
<td>2</td>
<td>-10</td>
</tr>
<tr>
<td>3</td>
<td>-15</td>
</tr>
<tr>
<td>4</td>
<td>-20</td>
</tr>
</tbody>
</table>

- **linear function**
- **lesser $y$-intercept**
- **constant rate of change**

### Common Properties of Functions 1 and 2

- **decreasing function**

### Function 2

- **nonlinear function**
- **greater $y$-intercept**
- **variable rate of change**
Guiding Questions

Elicit student thinking:

- How do different representations of the same function show you details about the function?

Determine if the student can RECOGNIZE THE PROPERTIES OF FUNCTIONS:

- Looking at this function only, what is its y-intercept?
- Is this function increasing, decreasing, constant, or both increasing and decreasing?
Student Activity

- Read through the student activity for the unit.
- What is your reaction to the tasks in the activity?
- How do you think you could incorporate these in your routine instructional planning?

Comparing Linear and Nonlinear Functions

1. Use the function \( y = -2x + 7 \) to complete the following questions.

1a. What is the rate of change of the function? Describe how you determined the rate of change from the equation.

1b. What is the \( y \)-intercept of the function? Describe how you determined the \( y \)-intercept from the equation.
Student Activity

**WORD BANK**

- positive rate of change
- negative rate of change
- zero rate of change
- constant rate of change
- variable rate of change
- increasing function
- decreasing function
- linear function
- increasing and decreasing function
- positive y–intercept
- negative y–intercept
- constant function

<table>
<thead>
<tr>
<th>FUNCTION 1</th>
<th>FUNCTION 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 1 + x$</td>
<td>Sam has $12. Sam buys baseball cards for $1 each. How much money does Sam have left if he buys $x$ baseball cards?</td>
</tr>
</tbody>
</table>

| PROPERTIES OF FUNCTION 1 | PROPERTIES OF FUNCTION 2 |
Solution Guide

- Read through the solution guide for the unit.
- What is your reaction to the information provided?
- How do you think you could use this information to
  - Consider student work?
  - Address students’ needs?
## Solution Guide

### Correct Answer

<table>
<thead>
<tr>
<th>FUNCTION 1</th>
<th>FUNCTION 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = 1 + x$</td>
<td>Sam has $12. Sam buys baseball cards for $1 each. How much money does Sam have left if he buys $x$ baseball cards?</td>
</tr>
</tbody>
</table>

### Properties of Function 1
- greater rate of change
- lesser y-intercept
- increasing function

### Properties of Function 2
- lesser rate of change
- greater y-intercept
- decreasing function

### Common Properties of Function 1 and Function 2
- constant rate of change
- linear function
- graphs are equally steep
<table>
<thead>
<tr>
<th>Example Error</th>
<th>Misconception</th>
<th>Missing Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>The student misplaces or does not identify greater rate of change or lesser</td>
<td>is not able to identify the rate of change in all function representations</td>
<td>DESCRIBE THE RATE OF CHANGE IN AN ALGEBRAIC FUNCTION</td>
</tr>
<tr>
<td>rate of change as properties of the individual functions.</td>
<td></td>
<td>EXPLAIN Y-INTERCEPT</td>
</tr>
<tr>
<td>The student misplaces or does not identify greater y-intercept or lesser y-</td>
<td>is not able to identify the y-intercept in all function representations</td>
<td>EXPLAIN SLOPE; EXPLAIN THE RATE OF CHANGE IN AN ALGEBRAIC FUNCTION</td>
</tr>
<tr>
<td>intercept as properties of the individual functions.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The student does not identify equally steep as a shared property.</td>
<td>does not understand the difference between steepness and the rate of change or slope</td>
<td>EXPLAIN SLOPE; EXPLAIN THE RATE OF CHANGE IN AN ALGEBRAIC FUNCTION</td>
</tr>
<tr>
<td>The student does not identify linear function as a shared property.</td>
<td>cannot recognize linear functions in different representations</td>
<td>RECOGNIZE LINEAR FUNCTIONS</td>
</tr>
<tr>
<td>The student does not mention the correct similarities.</td>
<td>can identify properties of a single function but cannot compare functions in order to identify common properties</td>
<td>COMPARE THE PROPERTIES OF 2 FUNCTIONS REPRESENTED IN DIFFERENT FORMS</td>
</tr>
</tbody>
</table>
Learning Maps Models and Teachers

- Explore relationships among concepts and skills
- Identify connections
- Identify nearby and distant prerequisites
- Identify next steps or extensions
- Consider students’ different learning needs
Teacher Feedback

- The map can be used to take students back to nodes/concepts where they have gaps that are preventing them from learning new material.

- I often speak of the learning gaps students have. Now I feel I have a better tool to help identify with the goal of filling in those gaps.
Teacher Feedback

- Teachers can use the map to look forward or back depending on the needs of their students. This (map) could really help an instructor differentiate their teaching.

- I have a mental roadmap for the future of equations and functions that my students will be traveling. I really think this helps me visit the topics I currently teach.
Learning Map Models and Formative Assessment

- Clarify learning goals
- Promote effective learning by focusing on connections
- Help to determine where students are in their learning and move them to next steps.
Informed Instruction

Establish learning goals & success criteria

Close learning gaps

Teach new ideas by building relevant existing knowledge

Elicit evidence of student thinking

Exposé gaps in learning

Provide feedback

Adjust instruction

Adapted from Heritage, 2010
Scaffolding the Process

Mathematics
- Learning map information
- Teacher notes
- Instructional activity
- Student activity
- Solution guide

ELA
- Learning map information
- Teacher notes
- Instructional activity
- Student practice *(in development)*
- Tool for Evaluation *(in development)*
Informed Instruction

Establish learning goals & success criteria

Teach new ideas by building relevant existing knowledge

Elicit evidence of student thinking

Expose gaps in learning

Provide feedback

Adjust instruction

GUIDING QUESTIONS

Adapted from Heritage, 2010

STUDENT ACTIVITY & SOLUTION GUIDE

TEACHER NOTES

INSTRUCTIONAL ACTIVITY

GUIDING QUESTIONS
Informed Instruction System

- Establish learning goals & success criteria
- Adjust instruction
- Provide feedback
- Teach new ideas by building relevant existing knowledge
- Elicit evidence of student thinking
- Expose gaps in learning

Adapted from Heritage, 2010
Explore

- Please go to: http://www.ksassessments.org/formative
- Select one standard or group of standards
- Our opportunity to learn from your feedback starts NOW!
Learning Map Information

- **Examine** the learning map model for your unit.
- **What information** in the learning map model attracted attention most?
- How might **teachers** use the information in the learning map model?
RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
Zooming In

Answer wh-questions about key details in an informational text

Answer questions by referring to an informational text
## Node Description Table

<table>
<thead>
<tr>
<th>NODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Answer questions by referring to an informational text</td>
<td>Answer questions about informational texts by referring back to the information and details provided in the text.</td>
</tr>
<tr>
<td>Answer wh-questions about key details in an informational text</td>
<td>Answer questions that use who, what, where, when, why, and how that are posed by others about the key details in an informational text.</td>
</tr>
</tbody>
</table>
Teacher Notes

- Read or skim the Teacher Notes document for your unit.
- How might you structure a professional development session around a Teacher Notes document?
- What benefits do you anticipate teachers will gain from reading these documents?
With age, students produce more effective questions and are better able to differentiate between effective and ineffective questions (Mills et al., 2010; Mills et al., 2011). The most successful prompts in helping students produce good questions are signal words (for example, what, who, where, how, why), generic question stems (for example, “How are A and B similar?” and “What caused A to occur?”), and generic questions (for example, “What is the topic of the text?” and “What is the main idea of the text?”; Rosenshine, Meister, & Chapman, 1996).

To answer a question, students must identify the kind of information the question is seeking and locate the correct information in an informational text (Guthrie & Mosenthal, 1987). When teachers model and provide reminders about this search process, the ability of elementary and middle school students to answer questions successfully improves (Dreher & Brown, 1993; Symons, MacLatchy-Gaudet, Stone, & Reynolds, 2001).
Lessons

- Consider one lesson in your unit.
- What reactions do you have about the activities students would engage in during the lesson you reviewed?
- What reactions do you have about the checks for understanding or guiding questions?
LEARNING GOAL
In this lesson, students will create and answer In the Text and In My Head questions.

PRIMARY ACTIVITY
Students will create In the Text and In My Head questions using the Q & A organizer independently. Then students will be paired, trade Q & A organizers, answer the questions, and indicate the type of question.
### Instructional Activity: ELA

Using the question cards, create at least three **In the Text** questions and three **In My Head** questions.

<table>
<thead>
<tr>
<th>Question</th>
<th>In the Text</th>
<th>In My Head</th>
<th>Answer</th>
<th>What was the main source of information I used to answer this question?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Checking for Understanding: ELA

Determine if students can **generate questions about informational text using different question-generating approaches**:

- Can you point to three different question-creating approaches you used in your questions?

Determine if students can **generate questions that have answers based on personal knowledge**:

- Why did you place this question in the In My Head column?
Questions?

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