

Adding to Our Teacher Toolkit: Formative Assessment in the Science Classroom

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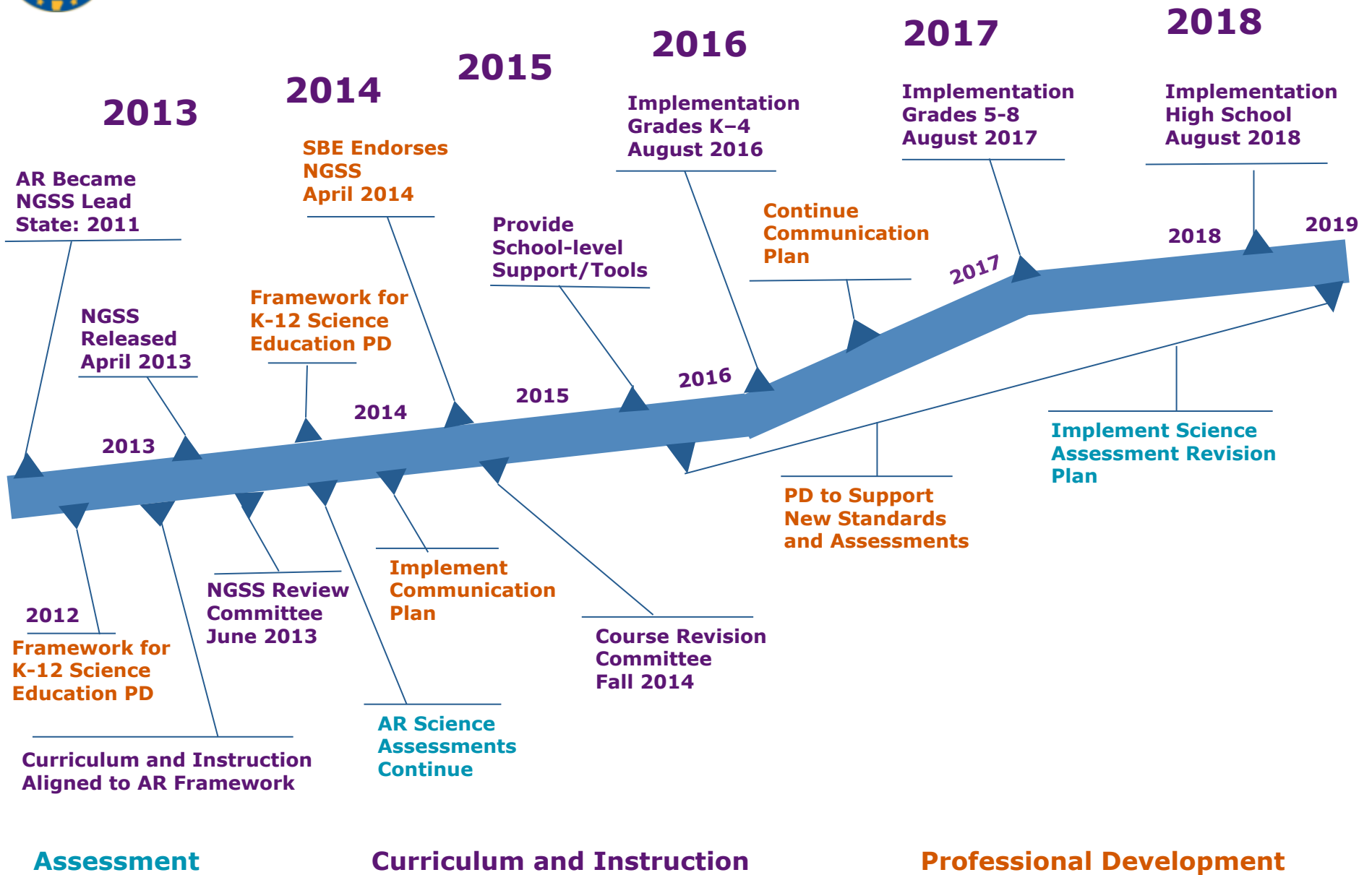
Housekeeping

Today's Purposes

- Develop a Formative-Assessment Mindset
- Become equipped to intentionally integrate formative-assessment strategies into your classroom
- Become more adept at supporting and facilitating student talk so that student talk is more productive.



Science Standards Timeline



A Word about PD. . .

- Research shows traditional workshop-based pd is generally ineffective.
- Why?
- The largest struggle for teachers is not learning new approaches to teaching but implementing them.
- PD should occur over time and be ongoing.
 - (Use this book, look at it with others.)
- Mentors are found to be highly effective in helping teachers implement a new skill.
 - How can I assist you in implementation?

What conceptions do you have currently of formative assessment?

- First word/Last word Formative Assessment Classroom Technique
- Anyone here think like me?

Definition in a nutshell:



The act of collecting information about student learning to inform instruction and provide feedback to the learner while simultaneously promoting learning.

It is assessment **for** learning rather than assessment **of** learning.

5 Key Features of Formative Assessment

- Links **goal-oriented** instruction and assessment
- **Promotes learning** as well as **informs instruction**
- **Used continuously**- before and throughout instruction
- Encourages students to become more aware of their own learning (**metacognition**) and the **ideas of others**
- Transforms the **learning environment**



It's all about Making Thinking Visible

Importance of MTV

- https://www.youtube.com/watch?v=IGQmdoK_ZfY
- What lessons can we gain from this video related to formative assessment?

Transformative Assessment

Assessment that
fundamentally **transforms**
teaching and learning.

What is a FACT?

- Formative Assessment Classroom Technique
- Could be a
 - Question
 - Process
 - Activity
- Helps to provide teachers and student with information about their factual, procedural, understandings in science.
- Illuminates what students really think.

Importance of Follow Through



Magnetic Phrases: What attracts you? What repels you?

- There are 16 selections from the text in the envelope.
- With the person next to you, take turns reading a phrase aloud. After reading a phrase, discuss what the phrase means and determine if it is something that you all find attractive or not. Sort to different sides of the table.
- Having a continuum is okay as well as having parts of a phrase you are attracted and parts you aren't.
- When the partners across from you finish, discuss. What big ideas stuck out to you? What did you find most attractive? What repelled you?

Using Formative Assessment Classroom Techniques and Probes

As these probes are shared, be thinking how you could use them in your class with your content.

Focus on adapting rather than adopting.

Don't give answers away. Shhh. We will be doing something with each probe.

Objects and Temperature

Taz and Kyle are comparing the temperature readings of four different objects:

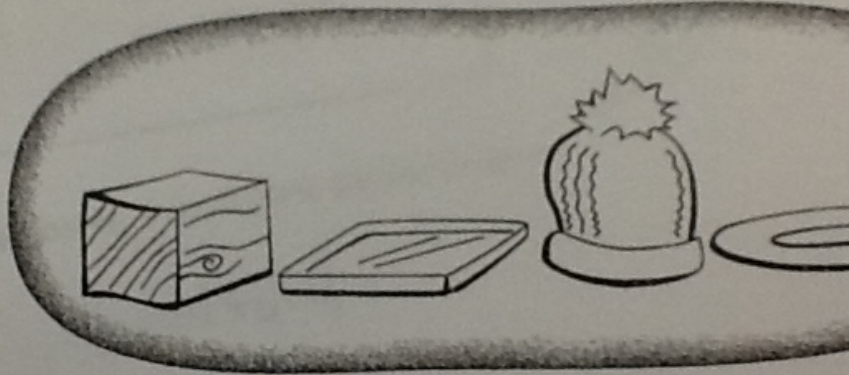
- block of wood
- metal tray
- wool hat
- glass plate

They place the objects on a table in their science classroom and leave them overnight. A

thermometer is attached to each object. The next day they record the temperature of each object at the same time.

Put an X next to the statement that best describes your prediction about the object temperature.

- A None of the objects will have the same temperature.
- B Two of the objects will have the same temperature.
- C Three of the objects will have the same temperature.
- D All of the objects will have the same temperature.



Exploring Objects and Temperature

Please don't touch
anything on your table
until instructed.

<https://plickers.com/liveview>

Investigating Heat Transfer in the Environment

In this lesson, we will be using the FACTs

- Predict/Explain/Observe
- Think/Pair/Share
- Annotated Student Drawings
- Fishbowl Think Aloud

Concept Cartoon, Sticky Bars, and Recognizing Exceptions



What do you think? Who do you agree with?

Community Concept Map

- Get a sheet of big sticky paper from the front.
- Arrange the phrases from the “Heat Concept Map” envelope onto the sticky paper. You will have to add arrows and extra words and phrases to make your concept map make sense and show how the ideas are related.
- Post your concept map to the wall.
- Gallery Walk

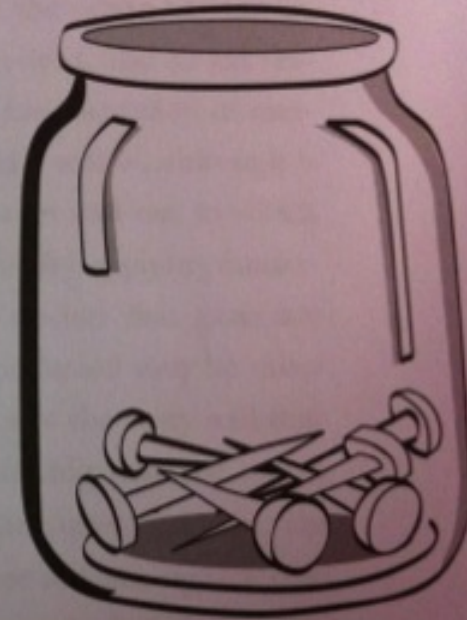
Familiar Phenomena Probe and Human Scatter Plot

Nails in a Jar

Jake put a handful of wet, iron nails in a glass jar. He tightly closed the lid and set the jar aside. After a few weeks, he noticed that the nails inside the jar were rusty. Which sentence best describes what happened to the total mass of the sealed jar after the nails rusted?

- A** The mass of the jar and its contents increased.
- B** The mass of the jar and its contents decreased.
- C** The mass of the jar and its contents stayed the same.

Select the answer that best matches your thinking. Explain what happened to the mass before and after the nails rusted.



Card Sort: Which objects reflect light?

- Remove the cards from the envelope labeled “Does It Reflect Light?”
- Sort the cards into two groups according to those objects that reflect light and those that do not.

Juicy Question and Agreement Circle

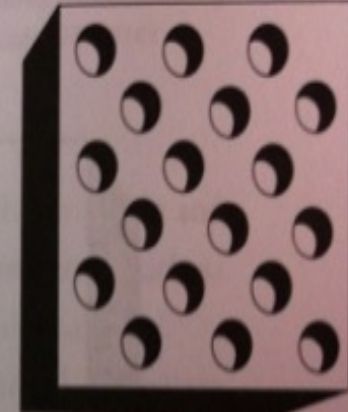
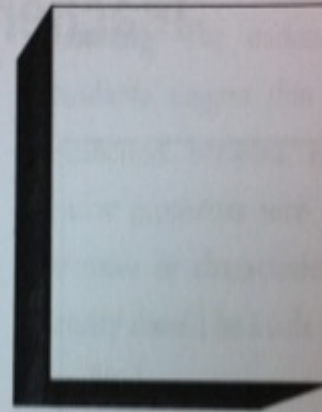
If I find the mass of a chicken egg when it is first laid and then again right after the chicken has hatched (I weigh the chick together with its broken shell), how would I expect the masses to compare?

- A. The egg will have the same mass at each time.
- B. The egg will have different masses at each time.

Exploring Density

Solids and Holes

Lance had a thin, solid piece of material. He placed the material in water and it floated. He took the material out and punched holes all the way through it. What do you think Lance will observe when he puts the material with holes back in the water? Circle your prediction.



- A** It will sink.
- B** It will barely float.
- C** It will float the same as it did before the holes were punched in it.
- D** It will neither sink nor float. It will bob up and down in the water.

Explain your thinking. Describe the “rule” or reasoning you used to make your prediction.

Constructing Explanations and Arguing from Evidence: CER

- What **claim** can you make about the density of water, alcohol, and ice?
 - Claim: A definitive statement (about their densities in this case).
- What **evidence**?
 - Evidence: What did you see? Read?
- What **reasoning** did you practice to make your claim?
 - What does the evidence mean? What bigger scientific idea does your evidence related to?

Why does ice float in one liquid + not the other?

Claim: The ice is less dense than one of the liquids + more dense than the other liquid.

Evidence: The spacing between molecules in liquid alcohol is larger per unit volume than that of ice. In the investigation we observed that ice floated in water but sank in alcohol.

Reasoning: Therefore the density of alcohol must be less than the density of water whether it is a liquid or a solid.

Why does ice float in one liquid and not another?

The ability of ice to float in a liquid depends upon the density of the liquid. Ice floated in water and sank in alcohol. "The density of alcohol is less than the density of water either as ice or liquid."

Evidence from observations and reading explain why ice floats in water and sinks in alcohol. Therefore ice floats in a liquid that is more dense than ice and sinks in a liquid that is less dense than ice.

Talk: One of the most important,
productive formative assessments

How satisfying do you find your classroom
discussions?

There are moves we can make to improve
classroom discussion to make it more
productive and meaningful.

Modified Book Walk

- Read the entirety of the six FACTs assigned to you.
- Complete a row for each FACT on handout in packet.
- Should you finish early, browse the rest of the book or think how you could implement one FACT in your classroom.
- Structured Share-Out
 - Describe FACT
 - Will you use this in your classroom? Why or why not?
 - As other's share, fill out more spots on chart or mark in book FACTS you are interested in exploring on your own.

Classroom Implementation

- Pick a FACT that you could implement in the first two weeks of school. Hopefully you have an idea of one that might be useful from your explorations or what you heard from others.
- On your think sheet, develop a specific way you could implement this in your classroom.
- Share your thinking with a table partner.
- Be sure to browse the additional books at your table. Feel free to take pictures. I can also make copies for you. Mark the pages and let me know.

Selecting and Using FACTs to strengthen the Link between Assessment, Instruction, and Learning

- Think like a diagnostician.
- Make students' thinking explicit during scientific inquiry.
- Create a classroom culture of ideas, not answers.
- Develop a discourse community.
- Encourage students to take risks.
- Encourage students to listen carefully.
- Use a variety of FACTs in a variety of ways.
- Use a variety of grouping configurations.
- Encourage continuous reflection.

Final Thoughts. . .

- Last word– add, change, enrich.
- 2/1
 - Write down two things you can commit to doing related to Formative Assessment after this pd
 - Write down one thing I can do for you.
 - Share with neighbor.
 - If you'd like for me to follow up with you, leave me a note on a post-it with your name and email.

Meaning is something that is actively created rather than passively received.

--Doug Buehl

Thanks for coming!