Connection between Assessment and Practice: How to Avoid a Return to Drill and Kill

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Session Summary

- Call for classroom teachers to become more knowledgeable of assessment practices and to more completely integrate assessment within instruction (CCSS, NGSS)
- Session will explore the impact changes to guiding mathematics and science standards have for instruction and related assessment practices.
- Emphasis on discussion and development of strategies that mathematics and science educators can use to help K-12 science and mathematics teachers employ assessment practices consistent with these guiding documents.

Formative Assessment

- Informs instruction and provides feedback to students on their learning (Keely 2008)
- Regular, high quality assessment can positively impact student learning (NRC 2001)
- Must be used to inform the teacher and/or students in deciding “next steps” (NRC, CCSS)

Common Core and Smarter Balanced

- Assessments include performance tasks that require students to demonstrate research, writing, and analytical skills.
- Designed to give teachers the feedback they need to inform instruction, and the tools to improve teaching and learning.

NGSS and Common Core

- Centered around fewer central (big) concepts/processes.
- Require students to have better understanding of interrelated concepts/processes.

NGSS Framework

- Practices
- Disciplinary Core Ideas
  - **broad importance** across multiple sciences or a **key organizing concept** of a single discipline
  - relate to the **interests and life experiences of students** or be connected to **societal or personal concerns**
  - **teachable** and **learnable** over multiple grades at increasing levels of depth and sophistication.
- Crosscutting Concepts
  - Systems and system models; Energy and matter; Structure and function

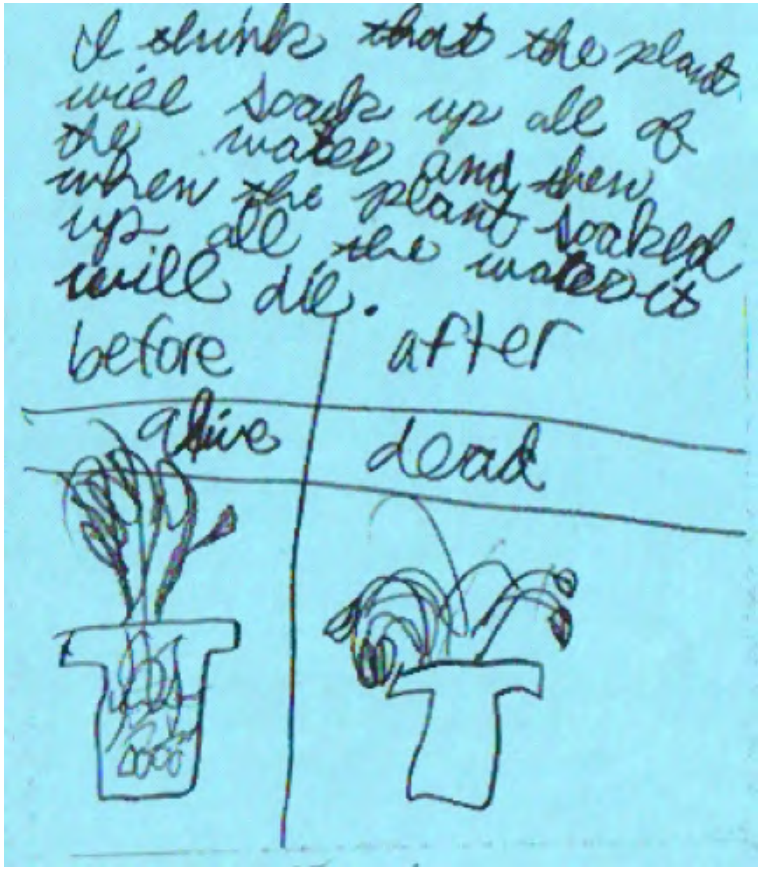
Issue

- Given our current context, how can we help K-12 science and mathematics teachers employ assessment practices consistent with these guiding documents?

One Example

- Some moist soil is placed inside a clear glass jar. A healthy green plant is planted in the soil. The cover is on tightly. The jar is located in a window where it receives sunlight. Its temperature is maintained between 60^{o} and 80^{o} F. What do you think will happen to the plant? Provide a justification for your thinking.

Typical Conceptions



- “The plant will die in 2 to 3 weeks due to a lack of resources. It will not be watered anymore, so the H2O supply will be gone shortly”

Student Observations after Two Weeks

- The plant is still alive and very green (why?)
- There are some brown (dead) leaves
- Water droplets are forming on the side of the jar
- The soil is dark in color (not dry)

“But what about the air?”

- “As the plant goes through the process of photosynthesis, more and more of the carbon dioxide will be converted to oxygen and the plant will eventually die”

Write, or draw and label, what you think will happen to the plant if it is sealed in the jar, but is provided with just the right amount of indirect light.

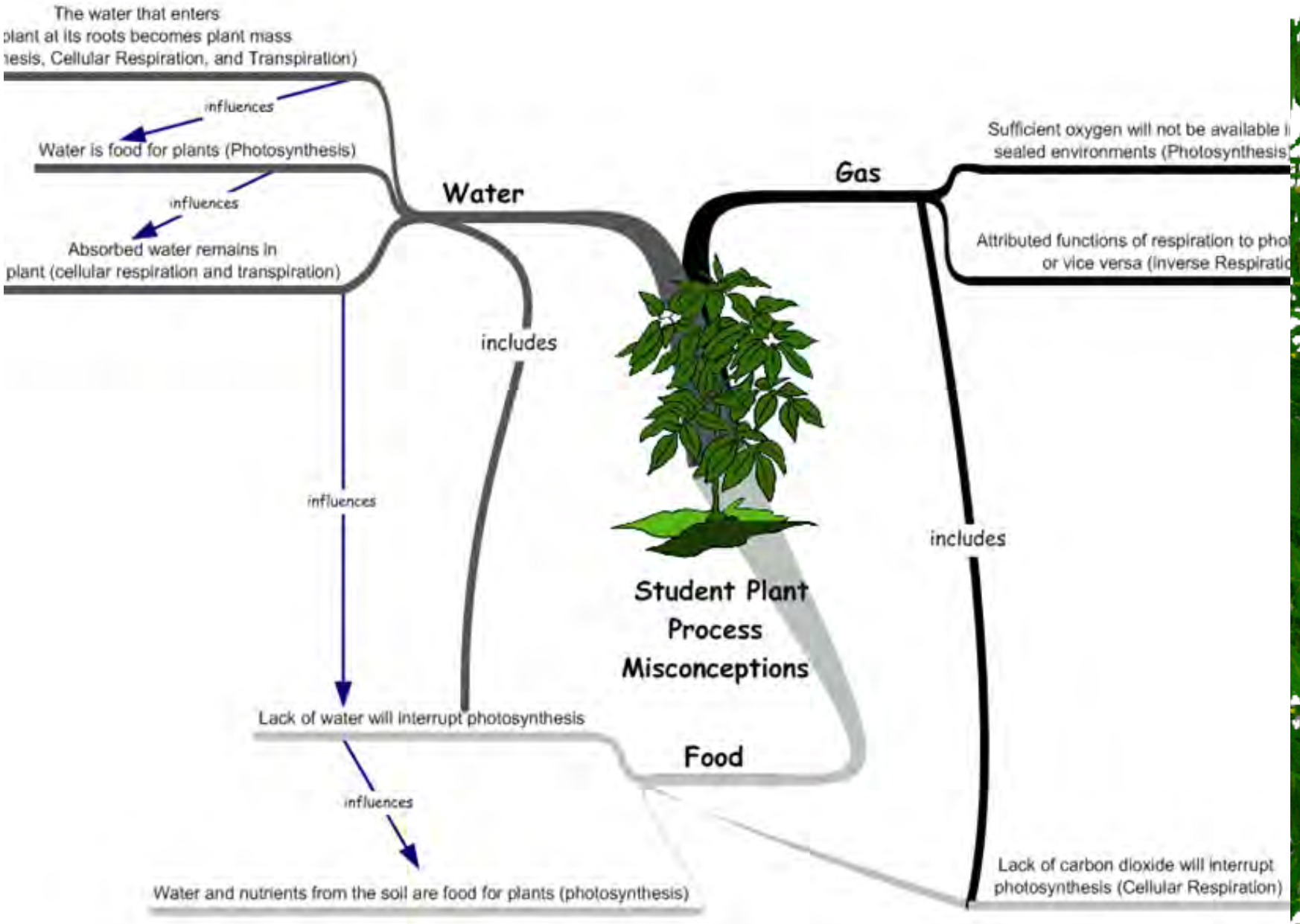
There isn't a way to give the plant water. If the plant does grow there won't be enough room. There won't get enough carbon dioxide / CO_2.

Carbon Dioxide(O_2)
Oxygen: O_2
Water H_2O

- the hieght of stem
- the length of leaves
- weight
- width of plant

Student Observations at Four Weeks

- The plant seems to have gotten greener and there is more condensation on the jar. Several of the leaves on the bottom are dying and laying on the soil. I still don't understand how the gases are interacting."


The water that enters
plant at its roots becomes plant mass
nesis, Cellular Respiration, and Transpiration)
influences
Water is food for plants (Photosynthesis)
influences
Absorbed water remains in
plant (cellular respiration and transpiration)
Water
includes
influences
Lack of water will interrupt photosynthesis
influences
Water and nutrients from the soil are food for plants (photosynthesis)
Gas
Sufficient oxygen will not be available i
sealed environments (Photosynthesis)
Attributed functions of respiration to phot
or vice versa (inverse Respiratio
includes
Lack of carbon dioxide will interrupt
photosynthesis (Cellular Respiration)
Student Plant
Process
Misconceptions
Food

Charge

- Think of other strategies/ techniques to help teachers enact these types of assessment practices.
- Share ideas with a neighbor

Interactions and Ecosystems

Examine this photo of a bald eagle eating a salmon on a river bank.
What role or roles does each organism play in the ecosystem?

Share your response with a partner after 30s.

(Roscoe, Derksen, & Curtis, 2013, *Science Scope*)

Elicit Student Ideas

Agree/Disagree Statements

All magnets have 2 poles

___agree ____disagree

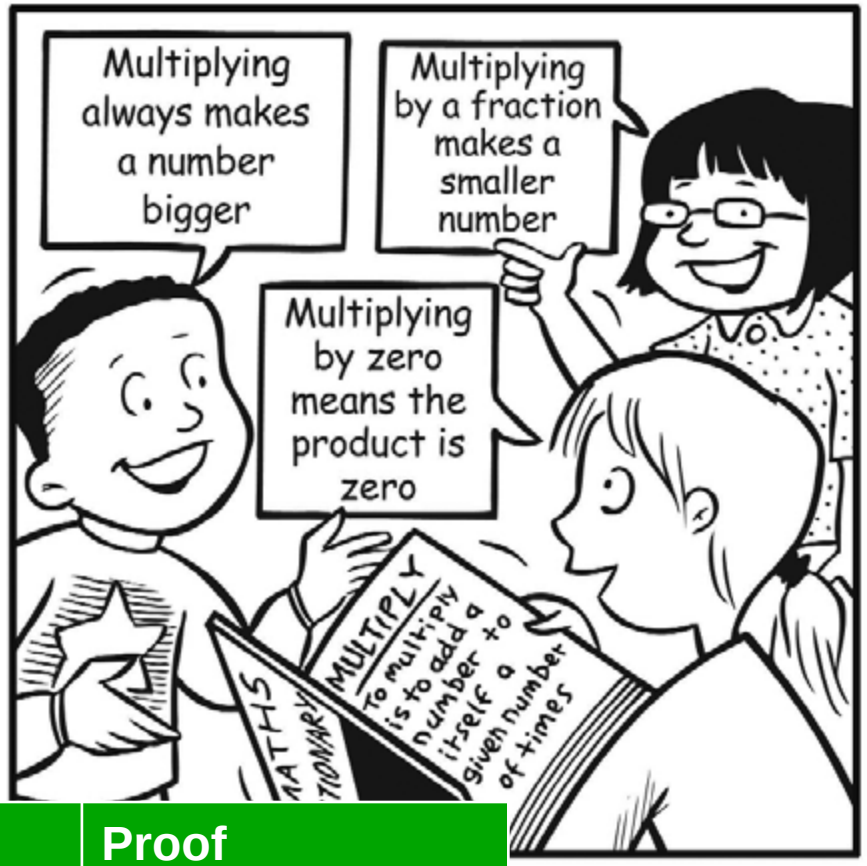
___it depends ____not sure

My thoughts:

Do as a Think-Pair-Share and then have students' design a way to test the statements or find evidence in sources (textbook, documents, readings, etc.)

(Keeley, 2008, *Science Formative Assessment*)

Math Concept Cartoon



http://niagaramethods.wikispaces.com/file/view/~Dabell~Using+concept+cartoons.pdf

Statement (conjecture)	We agree/ disagree	Proof
Multiplying always makes a # bigger	Agree	Give some examples here
Multiplying by a fraction…		
Multiplying by zero…		

Teachers and students learning through inquiry

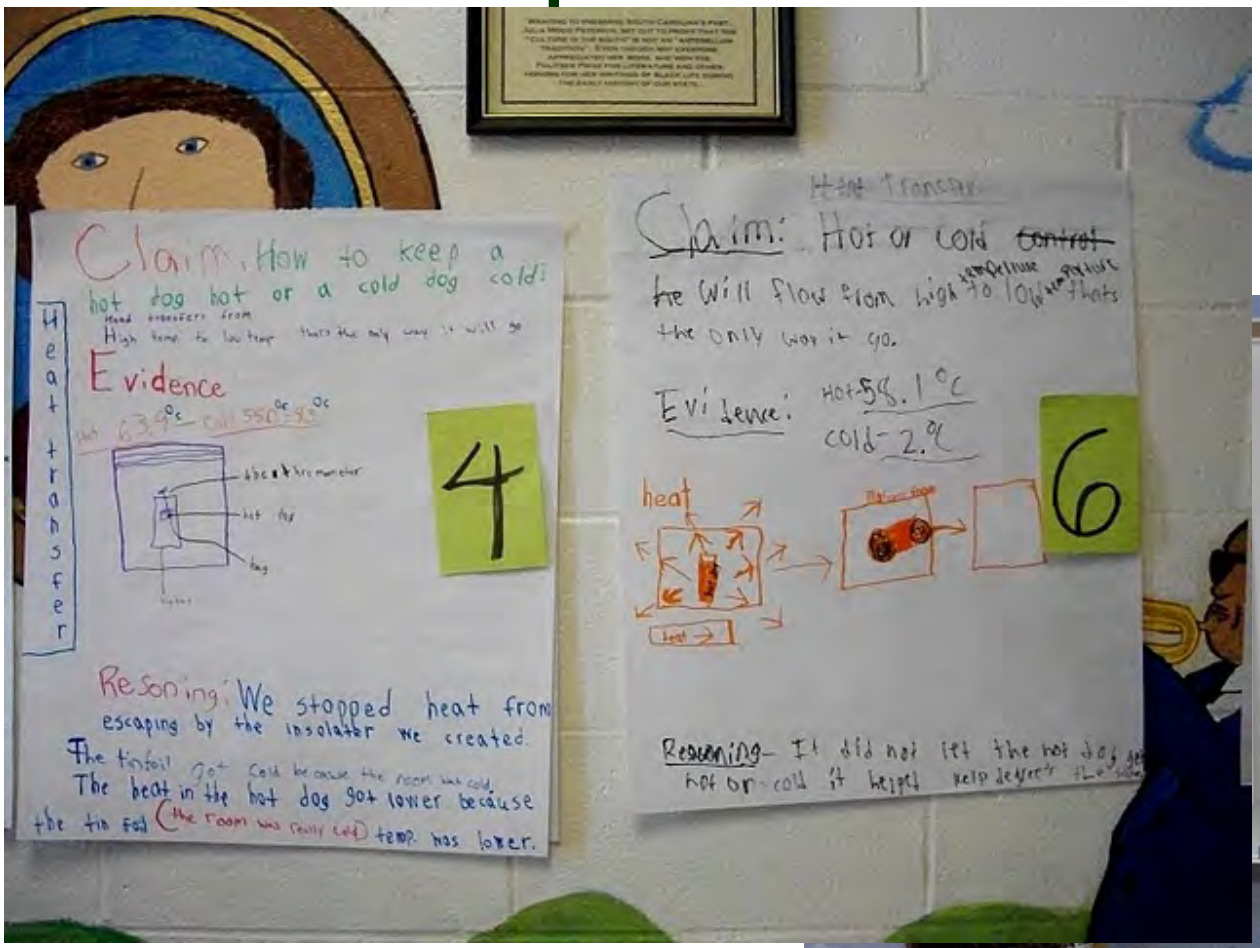
6th grade teachers and later students led by the same teachers: making coolers and collecting temperature data

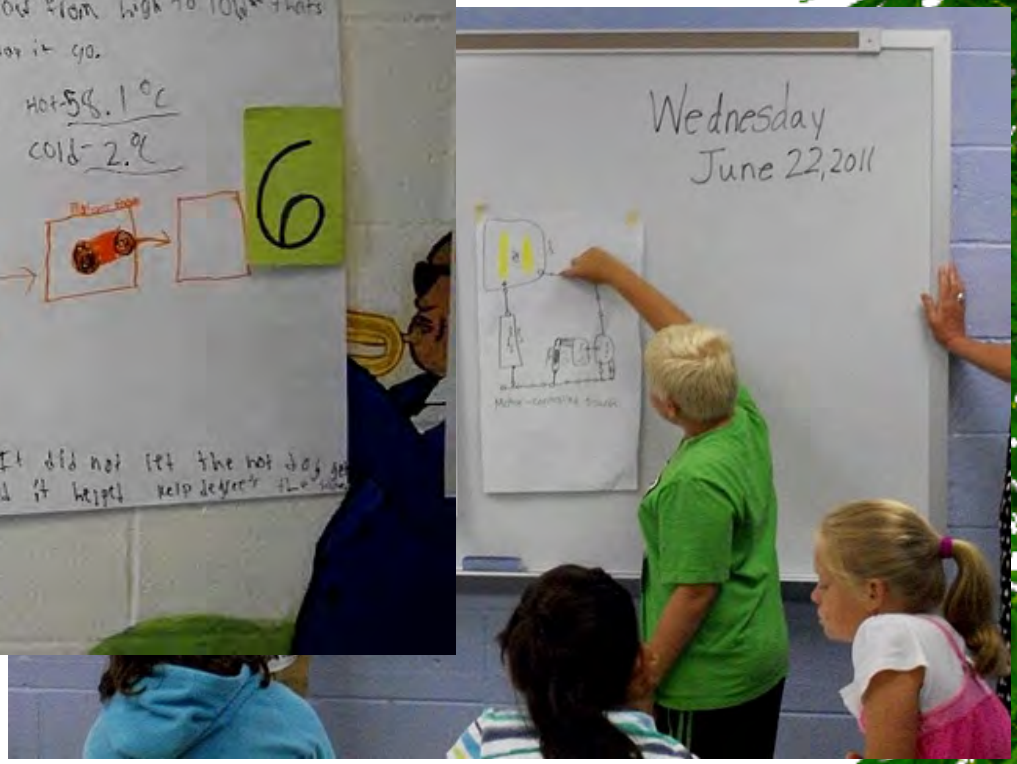
Explanation

1. Claim: a statement or conclusion that addresses the original question (Why did the ice melt faster on Block A?)
2. Evidence: data that support your claim
3. Reasoning: justification that shows why data count as evidence; ties in the scientific content knowledge (standards)

(McNeil & Krajcik, 2008, *Science as Inquiry in the Secondary Setting)*

Student-driven Explanations





Student Questions

Guided Reciprocal Peer Questioning

- Students develop questions from question stems and then get in groups and ask each other and discuss problems
  - Stems
    - What causes_____?
    - What is an example of _____ that causes _____?
    - How are _____ and _____ similar?
    - Why is it important to know _____?

Exit Slips

- What's the Principle: give students a few problems and they state the principle that applies
- One Sentence Summary: "Who does what to whom, when, where, how and why?"
- Minute Paper
  - Take two or three minutes to answer the following: "What was the most important thing you learned in class?"
- What was the "Muddiest Point"?

Other Questions to Consider

- How is formative assessment employed in Math?
- How can we help science/math teachers better focus on interrelated concepts in instruction?
- How can we help teachers use formative assessment as an instructional tool?
- How can we avoid a return to the drill and kill of science/mathematics facts?