Engaging students: The role of phenomena and sense-making talk

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Students motivated by events that are important, relevant, connected to events they’ve experienced or care about, problems that are interesting, realistic

Sophomore biology: Why did my aunt get breast cancer and will it spread?

2nd grade: An apple tree starts to grow on a hillsides, where did it come from?

Kindergarten: How can someone little push someone big off the end of a slide?

AP Chemistry: Where does the heat go when I pour out my coffee?

5th grade: Why are solar eclipses predictable and so rare?

8th grade: Why are killer whale populations in Puget Sound declining?

Essential question: How could the re-introduction of a small number of wolves cause dramatic changes in the Yellowstone ecosystem?

What the arc of a unit looks like...

Ecosystems: Yellowstone

- Can I participate?
- Will I participate?
- Can I see my interests in the science?
- Will people care about my ideas?
Studying the “energy story” behind sound (6th grade)

How are auditoriums built to make voices & music clear?

Can ultrasound help us see hidden things?

How can “booming” speakers make me shake?

Can ultrasound help us overcome hearing loss?

How does military sonar use affect orcas?

Can technology help us overcome hearing loss?

How can “booming” speakers make me shake?

Can a person who is blind echo-locate?

How do neighborhoods cut down on noise pollution?

Can a person who is blind echo-locate?

How do neighborhoods cut down on noise pollution?

What makes noise vs. music?

Before Ashley asks students for observations, she scaffolds...

BEFORE, DURING, AFTER
• Before anything happened, I noticed this...
• While ___ was happening, I noticed this...
• After it happened, I noticed...

SAW, HEARD, FELT
• I saw something happen...
• I heard this...it sounded like...
• I felt this...

SHAPE, COLOR, SIZE
• Something was this shape, this color, this size, it was in front of, it was behind...

HOW FAST IT HAPPENED
• Something happened slow...
• Something happened fast...

SMALL DETAILS
• I saw a detail, maybe its not important but I want to state it anyway...
• Something seemed missing...

CONNECTIONS TO YOUR EXPERIENCE
• It was like something else I had seen before...

For real? Can people “break glass” with the sound of their voices? [https://vimeo.com/319554911](https://vimeo.com/319554911)
“Straw inside the glass was freaking out.”

“Flicked the glass, that maybe made a crack...”

“Sound of his voice vibrated the cup and straw.”

Let’s develop a list of “starter” ideas: Under what conditions would the glass break?

- “We think it has something to do with _____.
- “We think _________ caused the glass to break.”
- “We are wondering ________.”

Science modeling

Teacher visits each pair of students for 3 minutes
Talk moves…

**PROBING:** “What do you think about...?”

**PRIMING:** “Would you be willing to share that idea?”

**FOLLOW-UPS:** “Can you say more about that?”

**REVOICING:** “What I think I hear you saying is…”

**LEAVING QUESTION:** “What do you mean by sound dying out?”

BPQs (back pocket questions)

**For students who are moving along:**
- Can you share your thinking about THIS part of your model?
- Can you say more about what you think is happening HERE that we can’t see?

**For students who may be stalling out:**
- Let’s just say out loud what we saw and heard in the video, maybe that will jumpstart us.
- How do you think loud versus soft sounds are made?

**Generic follow-ups:**
- Can you say more about that? • Do you agree with your partner? • Do you want to add on? • Do you think that is important?
- Is there something you’ve seen or heard before outside of school that makes you say that?

Notes on which partners have ideas or questions that could be brought out to whole class?

1. Listen first, ask question about what students already talking about
2. Use follow-ups, not one question after another
3. Don’t funnel students into using technical language or definition
4. Make eye contact with everyone, get students to comment on peers’ ideas
5. Ask a leaving question so they keep talking

What to do To get students to talk
Expanding opportunities to be smart

AP Chem: Where does heat go in my coffee?

Energy on roller coaster
How can we stop a hurricane? (6th)

Why can do few wolves change the Yellowstone ecosystem?

Consensus model by kindergarteners: How can someone little bump someone big off the end of a playground slide?

There is more...
POSSIBLE CLASSROOM TALK NORMS BY CATEGORY

**Preparation:** We come prepared for discussion with notes, examples, stories, our readings.

**Accountability to Science and Classmates**
- Responsible learners: We are responsible for our own learning. This means we speak, request clarification, show agreement or confusion, verify, ask others to repeat.
- Pushing ourselves: We push ourselves and each other to think beyond the obvious, to disagree with ideas, draw out comments from classmate, and we are open to changing our minds.
- Focus: Our comments and stories will stay on topic, and we have the right to explain how our contribution connects with the science.

**Hearing from all:** Everyone deserves to be heard.

**Equity**
- Air-time: Don’t monopolize the conversation, a.k.a. “Watch your air-time.”
- Priority to newcomers: We’ll give priority to those who have not had chances to talk yet.
- Time to think: The teacher will give “think time” before asking for our ideas.

**Respect for each other**
- Impulse control: Don’t interrupt or talk over your classmates when they have the floor.
- Fair critique: We, students and teacher, can critique ideas of others, but personal attacks are out of bounds.

My anchoring event is a phenomenon rather than a topic or a question. The explanation for my anchoring event requires students to integrate at least a half dozen important science ideas together.

My anchoring event is context-rich, meaning that it is embedded in a story that happens in a certain place, in a particular situation, under certain conditions, happens for a particular length of time. The story may include specific people.

My anchoring event would allow students to emphasize different aspects of the event or process as they construct their explanations and models.

My anchoring event is relatable by students to their personal, family, or community experiences, or to their interests about “things outside their direct experiences.”

The essential question requires students to go beyond an explanation they can just look up on the internet: why did something stop happening? Why did something not go as expected? Did it take place in an unusual situation? Maybe there is a comparison between two “cases” of the phenomenon?

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**Our “checklist” for finding good anchoring events + essential question**

**Topic is cell mitosis**

**EQ:** Why did I get skin cancer from too much sun? Will it spread?

**Strong**
- The explanation for my anchoring event requires students to integrate at least a half dozen important science ideas together.
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- My anchoring event would allow students to emphasize different aspects of the event or process as they construct their explanations and models.
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**OK**
- The essential question requires students to go beyond an explanation they can just look up on the internet: why did something stop happening? Why did something not go as expected? Did it take place in an unusual situation? Maybe there is a comparison between two “cases” of the phenomenon?

**A bit weak**
- The explanation for my anchoring event requires students to integrate at least a half dozen important science ideas together.
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Inside Ashley’s 6th grade classroom

- Diverse urban K-8 school
- 80% Low income, 47% English Learners
- 20% Homeless

Modeling to make thinking visible: Is this share-out more than just sharing?

https://vimeo.com/319649634

In this video...

- Who has opportunities to talk in this routine?
- What groundwork for talk has likely been laid by the teacher earlier this year? Is there scaffolding or structuring of this conversation that you see evidence for?

https://vimeo.com/319636999

Directions:
1. In the three panels below, draw what is happening that you can and cannot see that is causing the glass to shatter.
2. Use the drawings to help you write an explanation about what is happening at each point in time.
3. For each picture, be sure to include the ideas from the Gotta-Have Checklist
4. After completing your model, provide evidence from one class activity that supports one of your claims. Write the evidence on a sticky note and place on the relevant drawing.

Day 15

A final model template

- How might the teacher framing be thought of an equity move—increasing participation?
- Are there ideas or puzzles from Kelanie that could be used as resources for reasoning by her peers?

https://vimeo.com/319649634

Names _______________________________________________________________________________________
Period ___________________

Gotta-Have checklist: in each of the three panels:
- How compression waves move energy
- How frequency and amplitude play a role in the glass breaking
- The full story of energy transfers from person to glass
- How resonance plays a role in the story