Making Student Thinking Visible through Modeling
Hi!

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When you think of a science model, what do you think of?
Why is modeling an important skill in science?

Why is it an important skill for our students to learn?
**Course of Study**

**SEP #2: Developing and Using Models**

**Focus:** Make the progression of student thinking visible as they explore unobservable phenomena & communicate their thinking by making and revising models

- Individual, Small Group & whole class consensus Models
- Sticky Notes and Sentence Frames as Tools for revising Models and given feedback
- “Gotta-Have” explanation checklists

Using evidence and information to revise models to make student thinking visible as they develop, use, and revise models

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Objective: students will develop and use a model to explain the differences between warm and cold substances.
1. Thermal energy Phenomenon

1. Phenomenon Observation

- HOT WATER
- ICE
- WATER

2. Students drew an initial model

- Hot air rises up
- Cold air rises up
Objective: students will develop and use a model to explain the differences between warm and cold substances.

1. Thermal energy Phenomenon

2. What is modeling in Science?
Amanda: 6.1.1 Thermal Energy Lesson Overview

2. What is modeling in Science?

Student experiences:
What was that experience like?

I saw the balloon inflate & deflate but I couldn’t see what caused it so it was hard to model.

The bottle was empty, but something had to be happening to cause the balloon to change.

It was difficult because you asked us to model something that we couldn’t see.

Prior knowledge & Experience

- Layers of the Earth
- Silly Shapes
Amanda: 6.1.1 Thermal Energy Lesson Overview

2. What is modeling in Science?

Low Stakes Modeling
Objective: Students will develop and use a model to explain the differences between warm and cold substances.
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3. Model Reflection

Student Presentations & Virtual Gallery Walk

- A pulls B, B pulls A
- A and C, C pulls A
- A and D, and D pulls C and A
- A and B and C are connected, and C and D are connected

Model "Gotta have it" Checklist

- Arrows
  - to show movement
- Strategically using thick/thin lines
  - to identify details in your drawing
- Color coding
  - makes it easier to identify which strings were connected
- Labels and captions
  - easier to understand what someone drew
  - helps to explain movement when drawing the movement isn’t possible
Objective: students will develop and use a model to explain the differences between warm and cold substances.

1. Thermal energy Phenomenon
2. What is modeling in Science?
3. Model Reflection
4. Explain the phenomenon
Amanda: 6.1.1 Thermal Energy Lesson Overview

4. Understand Science Phenomenon

PHet Simulations
Objective: students will develop and use a model to explain the differences between warm and cold substances.

1. Thermal energy Phenomenon
2. What is modeling in Science?
3. Model Reflection
4. Explain the phenomenon
5. Revise initial models
Amanda: 6.1.1 Thermal Energy Lesson Overview

5. Revise initial models

Use new understanding and “Gotta Have It” List
**Student Work**

- **Initial model**
- **Revised model**

**boucle softly decreasing pressure**

**bouncing aggrievedly**

**hot water particle**

**cold water particle**

**hot air particle**

**cold air particle**

**heat transfer**

**heat transfer (cold)**

The hot air then rises up the bottle and into the balloon, due to the particles moving faster.

The cold then makes the bottle and the air inside it cold.
Takeaways

Opportunity to observe a variety of lessons

Amplify student voice

Feedback from colleagues

SEP Lessons
Moving forward...

- Introduce modeling as a scientific skill using low-stakes phenomena
- Gotta-Have-It list with student input
- Small group modeling and individual modeling opportunities