CMS Elementary Science Specialist Support

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Email
The 5th grade page will go live the morning of June 27, 2024. The Under Construction sign will be removed and the 5th grade page will be linked.
1. Open the unit in a separate tab to more easily view the unit.
2. Use the Anchoring Phenomena section within the unit for an outline of the lessons.
3. These units are live documents and are subject to change. Use the links below to ensure that you always have the most current version.

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<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
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<tbody>
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<td>CS.1.1 Matter and its Interactions</td>
<td>ESS.1.1 Earth's Systems</td>
<td>LS.5.2 Ecosystems - Interactions, Energy, and Dynamics</td>
<td>LS.5.3 Heredity - Inheritance and Variation of Traits</td>
</tr>
<tr>
<td>CS.1.2 Motion and Stability - Forces and Motion</td>
<td>LS.5.1 From Molecules to Organisms</td>
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Fifth grade will have 2 options to choose from.

- Option 1: 45 minutes of Science or Social Studies with alternating units taught 2nd and 3rd quarter.
- Option 2: 45 minutes of science everyday with extension lessons.
K-5 Science Curricular Resources

**Student**

**Hands-on**
- Kit Materials

**Reading**
- Student Texts

**Writing**
- Student Notebooks

**Teacher**

**Instruction**
- Unit 1: Matter and its Interactions
## Where We’re Headed Today…

<table>
<thead>
<tr>
<th>Segment 1 Part 1</th>
<th>8:00-9:30</th>
<th>Welcome! Goals for Students in Science/STEM What is Sensemaking?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 2</td>
<td>9:30-12:00</td>
<td>Experience Sensemaking In Unit 1 Lesson 1 and 2; Reflect on Routines</td>
</tr>
<tr>
<td>Lunch</td>
<td>12:00 – 1:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>Segment 3 continued</td>
<td>1:00-2:30</td>
<td>Experience Sensemaking In Unit 1 Lesson 3; Reflect on Doing Science</td>
</tr>
<tr>
<td>Segment 1 Part 2</td>
<td>2:30-3:00</td>
<td>Build and Revise Ideas about Sensemaking; Close Day 1</td>
</tr>
</tbody>
</table>
Welcome!

Making Sense of Three-Dimensional Teaching and Learning-Grade 5 Unit 1

Day 1

July 23-24, 2024
8 am - 3 pm
Today’s Presenters

Kristen Moorhead
NSTA Professional Learning Facilitator
kristen.moorhead@gmail.com

Jesse Semeyn
NSTA Professional Learning Facilitator
jessesemeyn@gmail.com

Cari Williams
NSTA Professional Learning Facilitator
cariw369@gmail.com
Our Goals

- Gain a deeper understanding of the vision for teaching and learning science called sensemaking.
- Gain a deeper understanding of how lessons/units are designed to support sensemaking.
- Experience as learners and learn how to teach Grade 5 Unit 1.
  - We will experience many of the unit’s lessons.
  - We will gain an understanding of how all the lessons fit together to make a cohesive unit.
Housekeeping

● This will be an interactive, action/thinking-packed two days. We invite you to engage as an active participant to make the most of our time together.

● We are here to support you! There is a parking lot for questions and requests.

● Lunch is 1 Hour - from 12-1 ish

● There will be an AM Break.

● Take care of your own needs along the way.
Meet Our Learning Community

**Alone Zone** (independent thinking time)

- Why do you think it is important for all students to learn science?
- What do you want your students to think, feel, and/or know about science when they leave your classroom?
Meet Our Learning Community

**Alone Zone** (independent thinking time)
- Why do you think it is important for all students to learn science?
- What do you want your students to think, feel, and/or know about science when they leave your classroom?

**Small Group**
- Share your thinking with your group.
- What is your group’s #1 hope or goal for students related to science?
Meet Our Learning Community

Small Group
❖ Share your thinking with your group.
❖ What is your group’s #1 hope or goal for students related to science?
❖ Record your group’s hope or goal on your paper strip with a marker in large lettering.
The framework is designed to help realize a vision for education in the sciences and engineering in which students, over multiple years of school, **actively engage in science and engineering practices** and apply **crosscutting concepts** to deepen their understanding of the **core ideas** in these fields.

The learning experiences provided for students should **engage students with their own fundamental questions about the world** and with how scientists have investigated and found answers to those questions.
Meet Ms. Katsanos’ Third-Graders

Students experienced the phenomenon of kidney beans germinating. (The beans look like kidney beans one day and then a few days later some kidney beans look like plants.)

Students have completed an investigation in which kidney beans with water and kidney beans without water were placed in sunny places and dark places.
Elementary Students Sensemaking

Students complete two tasks in this classroom video.

Task 1. **Reach a consensus** [using patterns in data] on what it means for a seed to *germinate* (0:24-3:25)

Task 2. **Make a claim** in answer to the question about the phenomenon, “What do kidney beans need to successfully *germinate*?” (3:40-6:25)
Elementary Students Sensemaking

Alone Zone

1. What are the students doing?

2. What is the teacher doing?

3. Based on what you observed, what is sensemaking?

https://www.teachingchannel.org/video/lesson-claims-evidence-reasoning
Elementary Students Sensemaking

Small Group

1. What are the students doing?

2. What is the teacher doing?

3. Based on what you observed, what is sensemaking?

https://www.teachingchannel.org/video/lesson-claims-evidence-reasoning
Sensemaking in a High School Classroom
High School Students Sensemaking

High school biology students explore the question, “Can nature change populations?” (populations change over time)

Task 1: Use a simulation to identify cause-and-effect relationships between an organism’s ability to avoid prey and changes in that organism’s population over time.

Task 2: Construct an explanation(s) using science ideas and cause-and-effect relationships to help answer the question about what causes population change. (2:53-7:11)
High School Students Sensemaking

Alone Zone

1. What are the students doing?

2. What is the teacher doing?

3. Based on what you observed, what is sensemaking?

2:53 - 7:11

Video not available to the public
What is Sensemaking?

Small Group

• Discuss with your group members:
  o What were the students doing?
  o What was the teacher doing?

  *Cite specific examples from the classroom video.*

• As a group, describe sensemaking.

Set your poster aside; we’ll revisit these ideas later.
Student Hat: Think like a student.

Student/Teacher Hat: Think like a student, but note teacher guidance.

Teacher “Hat”: Reflect on student experience and educator moves.
Learning Community Norms

- We use and build on other’s ideas.
- We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.
- We are open to changing our minds.
- We challenge ourselves to think in new ways.

From OpenSciEd Classroom Norms
Unit 1
Matter and its Interactions
Lesson 1
Materials

- Cake Video
- Explore a New Phenomena
- Initial Model
- Sticky Notes
Explore a new phenomenon
Alone Zone
As we watch the video, jot down on your student sheet what you:

<table>
<thead>
<tr>
<th>NOTICE</th>
<th>WONDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Notice”: describe what happened, what you saw or observed.</td>
<td>“Wonder”: write some questions you have or what you’re not sure about.</td>
</tr>
</tbody>
</table>

Be ready to share your ideas with the group.
STOP and JOT
**Explore a new phenomenon**
Add any other notices and wonderings.

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Be ready to share your ideas with the group.
Share Observations

<table>
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What do you notice?

What do you wonder?

Alone Zone
1 Min
What noticings and wonderings do you want to share?
Share Observations

<table>
<thead>
<tr>
<th>NOTICE</th>
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What do you notice?

What do you wonder?

Turn and Talk
### Share Observations

<table>
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**What do you notice?**

**What do you wonder?**

### Whole Group

What is one notice or wondering you and your partner want to share with the class?
Developing Models

Draw, write and use symbols to show your beginning ideas about what you think happens when you make a cake?

You can write questions and use ? to show you aren’t sure or wondering about something you draw or write.

Alone Zone
3 Min
Learning Community Norms

- We use and build on other’s ideas.
- We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.
- We are open to changing our minds.
- We challenge ourselves to think in new ways.

From OpenSciEd Classroom Norms
Science Circle

Gather your group members and let’s make a big circle where everyone can be seen and heard.

As we transition, consider: What might need to happen in the circle for you to feel comfortable sharing an idea? What might prevent you from sharing an idea?

From *OpenSciEd Classroom Norms*
Turn and Talk

Share 1 part of your model.  
Share 1 part of your model.
Turn and Talk

Tell you partner one thing you noticed in their model.  

Tell you partner one thing you noticed in their model.
### Developing A Consensus Model

As a class, develop a model that explains what happens when you make a cake.

#### Science Circle
What do we agree about?
What do we wonder?

<table>
<thead>
<tr>
<th>BEFORE</th>
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<tbody>
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</table>

<table>
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<tr>
<th>DURING</th>
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</table>
Identify related phenomena

What did your noticings and wonderings about the cake remind you of from your own experiences?
Teacher “Hat” Reflecting

Alone Zone
Reflect on student “hat” experiences and educator moves.

What was it like for you to experience a phenomenon (how a cake changes) and start the process of figuring out this phenomenon?

What teacher moves, structures, and strategies did you notice the facilitator (teacher) using?
Small Group
Reflect on student “hat” experiences and educator moves.

What was it like for you to experience a phenomenon (how a cake changes) and start the process of figuring out this phenomenon?

What teacher moves, structures, and strategies did you notice the facilitator (teacher) using?
## Anchoring Phenomenon Routine

### Anchoring Phenomenon Routine Tracker

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<td>What should we do to figure out how to explain this?</td>
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### How do the elements of the Anchoring Phenomenon Routine support all students in figuring things out?

- Notes about what you or the students did:

- How does this support **figuring out**?

- How does this support a classroom culture where all students have access?
Individually jot down some notes about what you did as students in Element 1.

### Anchoring Phenomenon Routine Tracker

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<tr>
<td>Notes about what you or the students did.</td>
<td>How does this support understanding?</td>
<td>How does this support a classroom culture where all students have access?</td>
<td></td>
</tr>
<tr>
<td>How does this support figuring out?</td>
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</tr>
</tbody>
</table>

[Image of the table and diagram]
Individually jot down some notes about what you did as students in **Element 2**.
Individually jot down some notes about what you did as students in Element 3.
How can the steps of the Anchoring Phenomenon Routine support all students in figuring things out?

- Work with a partner to reflect on each element #1, #2, and #3 using the Anchoring Phenomenon Routine Tracker.
Break 15 Minutes

Time to take a break
Unit 1
Matter and its Interactions
Lesson 2
Think back to yesterday…
Think back to yesterday and the video we watched of making a cake. What questions did you have?

Decide on 3 questions you most think answering will help us explain what causes the changes in the cake.

Write one question on a sticky note.

Write one question on a sticky note.

Write one question on a sticky note.

Be ready to share ONE of your questions with the group.
Gather in a science circle.
Gather in a circle so that everyone has a front row seat to our class discussion. Bring your sticky note/s.

Be ready to share ONE of your questions with the group.
Building a Driving Question Board

1. Share a Question. Listen to the question to see if your question relates to it.
2. Share a next question that relates to what was shared. Share how it was related.
3. Continue to the process until one question is shared by each person.
4. Does your question seem unrelated? We will share those after all related questions are shared.
Investigating Our Questions

What are some ideas you have about what could we do to gather observations to answer our questions?
Individually jot down some notes about what you did as students in Element 4.

<table>
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Anchoring Phenomenon Routine

How can the steps of the Anchoring Phenomenon Routine support all students in figuring things out?

- Work with a partner to reflect on element #3 and #4 using the Anchoring Phenomenon Routine Tracker.

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Anchoring Phenomenon Routine

**Whole-Group Discussion**

How did each element of the Anchoring Phenomenon Routine support all students in figuring things out?

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Investigating by Doing Science

How could we use these materials to investigate an idea we had on our investigations list?

Today’s Tray:
1 plastic cup of water
1 empty plastic cup
2 white solids
paper towels
How can we tell if there is a change?

**Make Observations**

<table>
<thead>
<tr>
<th>What did you hear?</th>
<th>What did you smell?</th>
<th>How did it feel?</th>
<th>What did you see?</th>
</tr>
</thead>
</table>

Images Source: freepik at flaticon.com
Pass the Tray Routine

Person 1: Get your table’s tray.
Person 2: Distribute Today’s Tray Materials
Person 3: Make sure everyone has a turn.
Person 4: Dispose of liquids in the assigned bucket.
Person 1: Return all materials on the tray.

Today’s Tray: 1 plastic cup of water, 1 empty plastic cup, 2 white solids, Paper Towels

Before getting materials...
Person 3 - ask each person what they think the team should do with the materials.
Person 4- Write or draw what your team is going to do.
STOP and JOT
Turn and Talk

In what ways did we do science?

What did it feel like to figure something out by doing science?
Did we observe anything today that relates to any of our questions on our DQB?

What other investigations could we do to learn more about the liquids and white solids we used today?
Anchoring Phenomenon Routine

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Notes about what you or the students did:

How does this support **figuring out**?

How does this support a **classroom culture where all students have access**?
Routines

Whole Group

- What other routines did you observe us use?

- How are these routine similar to other classroom routines you spend time putting in place to build your classroom community?
Unit 1
Matter and its Interactions
Lesson 3
Lesson 2 Looking Back

- What did we observe?
Lesson 2 Looking Back

● What did we observe?

● Many of us wondered where the solid tablets went.

● Many of us wondered about bubbles.
Materials

Today’s Tray
- Plastic Cup
- White Solid (salt)
- Clear Liquid
- Paper Plate
- Paper Towel
- Digital Scale
- 1 Gallon Plastic Bag
- Plastic Bucket
Our Questions

- Do we have any questions on our DBQ we could answer or understand more about if we weighed stuff?
Learning Target

I can make observations and record the weight of matter before and after an investigation using a scale.

Anchoring Phenomena

What happens when we make a cake?

Lesson 3 Question
What happens to the weight of substances when they are mixed?
Pass the Tray Routine

Person 2: Get your table’s tray.
Person 3: Distribute Today’s Tray Materials
Person 4: Make sure everyone has a turn.
Person 1: Dispose of liquids in the assigned bucket.
Person 2: Return all materials on the tray.
Lesson Investigation

Digital Scales - Craft Stick, Crayon, Pencil

When we use the digital scale what are we measuring?
### Matter and its Interactions - Sense Observation Sheet Lessons 3, 4, and 5

<table>
<thead>
<tr>
<th>Lesson 3</th>
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<tbody>
<tr>
<td>Sense observations before the interaction.</td>
<td>Sense observations after the interaction.</td>
</tr>
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</table>
### Observation Data Chart

#### Lessons 3, 4, and 5 Student Observation Data Chart

<table>
<thead>
<tr>
<th>Observation/Data</th>
<th>Lesson 3</th>
<th>Lesson 4</th>
<th>Lesson 5 Bottle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of Empty Cup</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of Cup and Solid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of the Solid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight of the Bag, Cup, and Liquid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Weight of the Bag, Cup, Liquid, and Solid Before the Interaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Weight of the Bag, Cup, Liquid, and Solid After the Interaction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of Weight</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Person 4: Make sure everyone has a turn weighing something before the interaction. All - Record the measurements.
Person 4: Make sure everyone has a turn weighing something before the interaction.
Investigating

Person 4: Add the solids to the water in the cup in the bag. Do Not Stir.

All: Observe and Record for 1 minute.
Investigating

Person 1: Stir carefully with the craft stick.

All: Observe and Record for 1 minute.
Person 2: Carefully weigh the system.
Person 4: Make sure everyone has a turn weighing something before the interaction.
Sense Observation Sheet

Record your sense observations from after the investigation.

<table>
<thead>
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<th>Matter and its Interactions - Sense Observation Sheet Lessons 3, 4, and 5</th>
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</table>
STOP and JOT
Lunch  12:00-1:00
Parking Lot and Burning Questions

What questions do we have on our parking lot?

What questions are bubbling up for you that you hope to have answered before the end of Day 2?
Looking at the Data

Look at your data chart.

- What do your data say?
- What do your data tell you?

How can we use the data to answer the question:

What happens to the weight of substances (water and salt) when they are mixed?
What happens to the weight of substances (water and salt) when they are mixed?

I observed....
The data show....
I think.... because....

I noticed....
I wonder ....
This reminds me of....

Helpful Hint:
Drawings, labels, symbols, and numbers can help us show our ideas too!
Looking at the Data

What happens to the weight of substances (water and salt) when they are mixed?

The data show that the weight of water and salt __________. The weight before mixing was _____. The weight after mixing was ______.

I noticed the salt __________.
I wonder __________.
This reminds me of __________.
Driving Question Board

Did you see/hear/smell/feel anything today that relates to our questions on the driving question board?

What are your ideas about what we could do next to find out more about things that stay the same and things that change when a cake is made?
Reflection on Our Norms

Alone Zone

○ What is one thing you did to work together with your team to figure things out?
○ What is one thing your team did that helped you figure things out together?

From OpenSciEd Classroom Norms
Reflection on Our Norms

Small Group

○ What is one thing you did to work together with your team to figure things out?
○ What is one thing your team did that helped you figure things out together?

Person 1: Be ready to share one idea with the group.

From OpenSciEd Classroom Norms
Teacher “Hat” Reflecting

Alone Zone
Reflect on student “hat” experiences and educator moves.

What ways were you doing science to figure something out?

What educator moves, structures, and strategies did you notice the facilitator (teacher) using to support your efforts to do science?
Teacher “Hat” Reflecting

Small Group
Reflect on student “hat” experiences and educator moves.

What ways were you doing science to figure something out?

What educator moves, structures, and strategies did you notice the facilitator (teacher) using to support your efforts to do science?
Science and Engineering Practices (SEPs)

1. Asking Questions (Science) and Defining Problems (Engineering)
2. Developing and Using Models

A focus on practices (in the plural) avoids the mistaken impression that there is one distinctive approach common to all science—a single "scientific method."

6. Constructing Explanations (Science) and Designing Solutions (Engineering)
7. Engaging in Argument from Evidence
8. Obtaining, Evaluating, and Communicating Information
K-12 Learning Progression for Developing and Using Models

GOALS
By grade 12, students should be able to

- Construct drawings or diagrams as representations of events or systems—for example, draw a picture of an insect with labeled features, represent what happens to the water in a puddle as it is warmed by the sun, or represent a simple physical model of a real-world object and use it as the basis of an explanation or to make predictions about how the system will behave in specified circumstances.
- Represent and explain phenomena with multiple types of models—for example, represent molecules with 3-D models or with bond diagrams—and move flexibly between model types when different ones are most useful for different purposes.
- Discuss the limitations and precision of a model as the representation of a system, process, or design and suggest ways in which the model might be improved to better fit available evidence or better reflect a design’s specifications. Refine a model in light of empirical evidence or criticism to improve its quality and explanatory power.
- Use (provided) computer simulations or simulations developed with simple simulation tools as a tool for understanding and investigating aspects of a system, particularly those not readily visible to the naked eye.
- Make and use a model to test a design, or aspects of a design, and to compare the effectiveness of different design solutions.

PROGRESSION
Modeling can begin in the earliest grades, with students’ models progressing from concrete “pictures” and/or physical scale models (e.g., a toy car) to more abstract representations of relevant relationships in later grades, such as a diagram representing forces on a particular object in a system. Students should be asked to use diagrams, maps, and other abstract models as tools that enable them to elaborate on their own ideas or findings and present them to others [15]. Young students should be encouraged to devise pictorial and simple graphical representations of the findings of their investigations and to use these models in developing their explanations of what occurred.

A Framework for K-12 Science Education

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Students-as-Scientists (and Engineers)

Alone Zone
As you watch the video, think about:

• What is the phenomenon scientists are trying to explain?
• Which science and engineering practices (SEPs) do they engage with to build to explain how or why the phenomenon occurred?
• How does this “science in action” compare to what your experiences in lessons 1-3?
Small Group

• How does the “science in action” in the video compare to what your experiences in lessons 1-3?

• What is different about doing science in the way compared to your own experiences with “school science” in your own K-12 experience?
Looking at the Data

Look at your data chart.

● What did you notice about what happened today compared to what happened with the salt and water mixture in the last lesson?

● What do you think might have caused this?
What is Sensemaking?

Small Group

Revisit your initial ideas about sensemaking.

- What ideas might you want to add?
- What ideas might you want to say more about?
- What ideas might you want to change?
What is Sensemaking?

Whole Group Gallery Walk

● Observe each group’s poster.

● What are some patterns in our ideas about how we describe sensemaking?
Gots and Needs

As you walk out the door, please add a post it with one thing you “got” today and one thing you “need/want/hope for” tomorrow.

See you tomorrow for an 8am start.
CMS Professional Learning Attendance and Feedback Form

Please ensure you complete this form before leaving your PD each day.

[bit.ly/CMSPD2425]
## Where We’re Headed Today…

<table>
<thead>
<tr>
<th>Segment</th>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segment 4</td>
<td>8:00-10:30</td>
<td>Reflecting on Sensemaking Building the Storyline of Lessons 1-9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Min Break</td>
</tr>
<tr>
<td>Segment 5</td>
<td>10:30-11:00</td>
<td>Productive Talk Moves and Goals</td>
</tr>
<tr>
<td>Segment 6</td>
<td>11:00-12:00</td>
<td>Lessons 10: Reflecting on Developing Models</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12:00-1:00 Lunch</td>
</tr>
<tr>
<td>Segment 7</td>
<td>1:00-2:30</td>
<td>Lessons 12-14; Reflect on Coherence</td>
</tr>
<tr>
<td>Segment 1</td>
<td>2:30-3:00</td>
<td>Celebrating Sensemaking Close Day 2</td>
</tr>
</tbody>
</table>
Welcome!

Making Sense of Three-Dimensional Teaching and Learning-Grade 5 Unit 1

Day 2

July 23-24, 2024
8 am - 3 pm
Reflecting on Sensemaking

- Investigating
- Arguing with evidence
- Asking question
- Students use evidence to support ideas
- Collaboration, discussion
- Building learning/knowledge
- Making mistakes and changing our minds.
- Teacher asking questions
Design for Sensemaking

- Students experience a *phenomenon*;
- engage in *science and engineering practices* and
- share ideas to develop or apply the
- *science ideas* and *crosscutting concepts* needed to explain how or why the phenomenon occurs.
Small Group
Looking Back to Lesson 3.

- What did we figure out?
- How did we figure these things out?
- How might this help us answer some of our questions about the cake?
### UNIT 1 LESSON 4

**Lesson Target**
I can make observations and record the weight of matter before and after an investigation using a scale.

**Objective/s**
PS 5.1.1 Carry out investigations to compare the weight of objects before and after an interaction.

**EXPLORE**
- Primary Science and Engineering Practice
  - Plan and Carry Out Investigations.
- Supporting Science and Engineering Practice/s
  - Analyze and Interpret Data

### UNIT 1 LESSON 5

**Lesson Target**
I can make observations and record the weight of matter before and after an investigation using a scale.

**Objective/s**
PS 5.1.1 Carry out investigations to compare the weight of objects before and after an interaction.

**EXPLORE**
- Lesson Materials
  - PS.5.1 Unit 1 Lesson 5 Slidedeck
  - PS.5.1 Unit 1 Lessons 3, 4 and 5 Observations Data Chart
  - PS.5.1 Unit 1 Lessons 3, 4 and 5 Student Senses Observation Sheet
  - PS.5.1 Unit 1 Lesson 3, 4, and 5 Class Data Chart from Lesson 3
  - Video of bottle and materials

### UNIT 1 LESSON 7

**Lesson Target**
I can record the temperature of matter before, during, and after an interaction using a digital thermometer.

**Objective/s**
PS 5.1.2 Carry out investigations to explain whether the mixing of two or more substances result in new substances.

**EXPLORE**
- Lesson Materials
  - PS.5.1 Unit 1 Lesson 7 Slidedeck
  - PS.5.1 Unit 1 Lesson 7 Observations Data Chart
  - PS.5.1 Unit 1 Lesson 3, 4, and 5 Student Observation Data Chart
  - PS.5.1 Unit 1 Lessons 3, 4 and 5 Student Senses Observation Sheet
  - 4 buckets
Getting to Know Lessons 4, 5 and 7

Step 1: Alone Zone: Read the lesson. Notice the features and support in the lesson.

Step 2: Small Group: Share what you noticed and wondered about the features of a lesson.
Key Lesson Features

- Lesson Overview and Materials Page 1
- Preparing the Lesson Section
- Same lesson structure for every lesson.
  - Introducing the Lesson
  - Carrying Out the Lesson
  - Closing the Lesson
  - Engaging in the Phenomenon or DQB

We want to use the academic language “investigations” instead of experiments. If students use experiments that is fine, when you phrase comments or questions be sure to use the word investigations.

Italicized possible student responses.

Slide Deck for Every Lesson
Getting to Know Lessons 4, 5 and 7

Step 3: Alone Zone: Re-read the lesson.

*What are students figuring out?*

*How are they figuring it out?*
Getting to Know Lessons 4, 5 and 7

What are students figuring out?
How are they figuring it out?

Step 4: Small Group: Come to Consensus.
● Please create 1-3 yellow sticky notes with writing/drawing about what students figure out.
● Please create 1-3 blue stickies with writing/drawing about how they figure it out.
● Please create 1-3 pink stickies with writing/drawing about how what they figure out might relate to the cake.
<table>
<thead>
<tr>
<th></th>
<th>L4</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
<th>G5</th>
<th>G6</th>
</tr>
</thead>
<tbody>
<tr>
<td>w-solid</td>
<td>6g</td>
<td>6g</td>
<td>6g</td>
<td>6g</td>
<td>6g</td>
<td>6g</td>
<td>6g</td>
</tr>
<tr>
<td>w-bag cup, liq.</td>
<td>74g</td>
<td>73g</td>
<td>74g</td>
<td>75g</td>
<td>74g</td>
<td>74g</td>
<td></td>
</tr>
<tr>
<td>Total Before</td>
<td>80g</td>
<td>79g</td>
<td>80g</td>
<td>81g</td>
<td>80g</td>
<td>80g</td>
<td></td>
</tr>
<tr>
<td>Total After</td>
<td>79g</td>
<td>78.5g</td>
<td>79g</td>
<td>80g</td>
<td>79g</td>
<td>79.5g</td>
<td></td>
</tr>
<tr>
<td>Change Weight</td>
<td>1g less</td>
<td>0.5g less</td>
<td>1g less</td>
<td>1g less</td>
<td>1g less</td>
<td>0.5g less</td>
<td></td>
</tr>
</tbody>
</table>

What do you notice about our class data?

What do you wonder?
### PS.5.1 Unit 1 Lesson 5 Bottle Video.mp4

<table>
<thead>
<tr>
<th>L5</th>
<th>Class Demonstration</th>
</tr>
</thead>
<tbody>
<tr>
<td>W-solids</td>
<td>69 g</td>
</tr>
<tr>
<td>W-bottle liquid</td>
<td>67 g</td>
</tr>
<tr>
<td>Total Before</td>
<td>73 g</td>
</tr>
<tr>
<td>Total After</td>
<td>73 g</td>
</tr>
<tr>
<td>Change Weight</td>
<td>no change</td>
</tr>
</tbody>
</table>
Lesson 7 Data

<table>
<thead>
<tr>
<th>Observation/Data</th>
<th>Lesson 7</th>
<th>Sense Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature of the Liquid Before the interaction</td>
<td>76 °F</td>
<td>Clear, Strong smell</td>
</tr>
<tr>
<td>Temperature of the Solid Before the interaction</td>
<td>76 °F</td>
<td>small white powder</td>
</tr>
<tr>
<td>Temperature of the Liquid and Solid during the interaction 30 Seconds</td>
<td>66 °F</td>
<td>big overflowing bubbles; then quickly big bubbles are</td>
</tr>
<tr>
<td>Temperature of the Liquid and Solid during the interaction 1 Minute</td>
<td>66 °F</td>
<td>lots of small bubbles gone. rising in the liquid</td>
</tr>
<tr>
<td>Temperature of the Solid and Liquid During the interaction 1.30 Minutes</td>
<td>66 °F</td>
<td>a small bit of solids</td>
</tr>
<tr>
<td>Temperature of the Solid and Liquid After the Interaction 2.0 Minutes</td>
<td>66 °F</td>
<td>lots of smaller bubbles</td>
</tr>
<tr>
<td>Change in Temperature</td>
<td>10 °F</td>
<td>temp decreased by 10</td>
</tr>
</tbody>
</table>
Sharing What You Found Out

Groups 1, 5, 9  Make a small sharing circle.
Groups 2, 6, 10 Make a small sharing circle.
Groups 3, 7, 11 Make a small sharing circle.
Groups 4, 8, 12 Make a small sharing circle.

Step 5: Each group member share what students figure out and how they figure it out in the lesson you studied.

Step 6: Together create a concept map of lessons 4, 5, and 7.
Whole Group Teacher hat

- What did we find out about lesson 4?
- How does it relate to lesson 2 and 3?

- What did we find out about lesson 5?
- How does it relate to lesson 2, 3, 4?

- What did we find out about lesson 7?
- How does it relate to lesson 2, 4, 5?

Some of us are wondering about lesson 6. Let’s experience lesson 6.
Sharing What You Found Out

Groups 1, 5, 9  Make a small sharing circle.
Groups 2, 6, 10 Make a small sharing circle.
Groups 3, 7, 11 Make a small sharing circle.
Groups 4, 8, 12 Make a small sharing circle.

Step 7: What questions about the cake can we explain with the ideas we have figured out? Together add to the concept map with one idea/writing/drawing per pink sticky note that tells as aspect of the cake we can explain and/or questions we still wonder about.
Student Hat/Teacher “Hat”

Student Hat: Think like a student.

Student/Teacher Hat: Think like a student, but note teacher guidance.

Teacher “Hat”: Reflect on student experience and educator moves.
Unit 1
Matter and its Interactions
Lesson 6
Looking Back and Looking Forward

Looking Back:
What have students figured out in lessons 1-7? What new questions might they have?

Looking Forward:
What have we figured out about the cake? What do we still need to figure out?
Sense Observation Sheets from Lesson 3, 4 and 5

Small Group Go-Around
What are some things that are the same or different about our observations and data from each lesson 3, 4 and 5?

Lesson 3
On the Board

Lesson 4

Lesson 5
Lesson 3

Alone Zone

What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 3

Partner Talk
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?

Turn and Talk
Lesson 3

Whole Group
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 3
Alone Zone with Think Aloud

I think the substances are/are not the same original substances.

- Observation 1:
- Observation 2:
- Observation 3:

Evidence- I can point to it/ I can underline it.
Lesson 4

Alone Zone
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 4

Partner Talk
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?

Turn and Talk
Lesson 4

Whole Group
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 4

Alone Zone

I think the substances are/are not the same original substances.

- Observation 1:
- Observation 2:
- Observation 3:

Evidence- I can point to it/ I can underline it.

<table>
<thead>
<tr>
<th>Lesson 6</th>
<th>Lesson 8</th>
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<tbody>
<tr>
<td>Are the original substances the same or are they something different?</td>
<td></td>
</tr>
<tr>
<td>What evidence supports your answer?</td>
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</table>
Lesson 5

Alone Zone
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 5

Partner Talk
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?

Turn and Talk
Lesson 4

Whole Group
What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
Lesson 5

Alone Zone

I think the substances are**are not** the same original substances.

- Observation 1:
- Observation 2:
- Observation 3:

Evidence- I can point to it/
I can underline it.

<table>
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<th>Lesson 6 and Lesson 8</th>
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<td></td>
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</table>
Gathering More Data

What other observations might help us figure out if new substances have formed when two substances are mixed together?

What other investigations could we do to gather this data?
Lesson 7

What data could we use as evidence that the white solid and liquid are the same or different substances before and after mixing?
### Lesson 7 Data

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<td>lots of smaller bubbles a little solid left</td>
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<tr>
<td>Change in Temperature</td>
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</tr>
</tbody>
</table>
Lesson 7

Alone Zone

I think the substances **are** **are not** the same original substances.

- Observation 1:
- Observation 2:
- Observation 3:

Evidence- I can point to it/
I can underline it.

<table>
<thead>
<tr>
<th>Change in Temperature</th>
</tr>
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</table>
Lesson 7

Small Group

I think the substances are/are not the same original substances.

- Observation 1:
- Observation 2:
- Observation 3:

Evidence- I can point to it/ I can underline it.

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<td></td>
</tr>
</tbody>
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Alone Zone

- How confident are you in your claims (answers to the questions)?
- Do you think you have enough evidence to support your claim?
- What additional data/information would help you gain more confidence in your claim?
- What might cause you to change your mind about your current ideas?
Partner Share

- How confident are you in your claims (answers to the questions)?
- Do you think you have enough evidence to support your claim?
- What additional data/information would help you gain more confidence in your claim?
- What might cause you to change your mind about your current ideas?
What happens when we make a cake?

Are there any questions on the DQB we think we can answer based on what we have figured out so far from lessons 3-7?

Or raises new questions?

**Small Group Go-Around**

Persons 1 - 4 Each share an idea.
Person 3- Record something your group can add to the DBQ or Class Model.
Person 4 - Share what was added.
Teacher “Hat” Reflecting

Alone Zone
Anticipating Student Thinking

- How confident do you think students will be in their claims (answers to the questions)?

How do you think students might answer these questions?
- Do you think you have enough evidence to support your claim?
- What additional data/information would help you gain more confidence in your claim?
- What might cause you to change your mind about your current ideas?
Teacher “Hat” Reflecting

Whole Group
Anticipating Student Thinking

● How confident do you think students will be in their claims (answers to the questions)?

How do you think students might answer these questions?
● Do you think you have enough evidence to support your claim?
● What additional data/information would help you gain more confidence in your claim?
● What might cause you to change your mind about your current ideas?
Unit 1
Matter and its Interactions
Lesson 8
Materials

- Observation Data Chart from lesson 3, 4, 5
- Observation Data Chart lesson 7
- Matter and Change Evidence Student Sheet
- Matter and Change Student Text
Sense Observation Sheets from Lesson 3, 4, 5 and 7

What patterns did you notice in your observations in lessons 3, 4, 5 and 7?

Matter and its Interactions - Sense Observation Sheet Lessons 3, 4, and 5

Lesson 3
Sense observations before the interaction.

Lesson 3
Sense observations after the interaction.

Lesson 7 Matter and its Interactions - Observation Data Chart

<table>
<thead>
<tr>
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<th>Sense Observations</th>
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</thead>
<tbody>
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<td></td>
<td></td>
</tr>
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<td>Temperature of the Solid Before the Interaction.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature of the Solid and Liquid During the Interaction 30 Seconds</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature of the Solid and Liquid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Lesson 8 Matter and Change Student Text

When conducting investigations and mixing substances it can be difficult to tell if a new substance has formed. What does it mean that a “new” substance has formed? Sometimes when two or more substances are mixed together there is an interaction that occurs that causes the original substances to change into a new substance. This type of interaction is called a chemical change.

! This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

Underline: This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
Read, Note, Turn and Talk

When substances come together and undergo a chemical change, it’s like witnessing a fascinating transformation happening before our eyes. Chemical changes do something incredible, but on a tiny, particle level. Let’s explore how the properties change. Imagine you have two simple ingredients, like baking soda and vinegar. When you mix them together, they fizz and bubble, creating something entirely new: carbon dioxide gas, water, and sodium acetate! This is an example of a chemical reaction. One way properties change is through the formation of new substances. In our example, the properties of baking soda and vinegar, like their taste, color, and smell no longer exist because they re-combine to form the bubbly carbon dioxide, water, and sodium acetate.

Sometimes when these chemicals come together, heat energy is gained or lost. Loss of heat energy can cause a solid to melt, and a gain of heat energy can cause a solid to freeze.

! This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

Underline: This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
When substances change into new substances, there may be an odor or smell produced or even an unexpected color change. An example is when wood is burned it will produce a smoky smell, the wood changes into carbon dioxide, water vapor and ash. Again an odor being present does not automatically mean that the original substances changed but it is a good indicator when combined with other indicators. An example of an unexpected color change is when you mix strawberry Kool Aid from a clear liquid to a red liquid substance.

* This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

**Underline:** This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
In most cases when original substances change into new substances the change is irreversible. What does that mean? Have you ever gone to the refrigerator and opened a jug of milk and thought…. “Yuck that smells sour!” Well that’s because it might be. When milk sours it changes from the original substance into a new substance. The sour milk will not return to its original condition. Another example of irreversible change is when you eat food, your body chemically digests the food.

This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

**Underline:** This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
Chemical Change

Interaction where a new substance is formed.
Sometimes original substances **physically change** but do not chemically change. In this case, the properties of the original substances remain unchanged, unlike in a chemical reaction where entirely new substances are formed. When you dissolve salt in water, the properties of salt and water remain the same. Salt dissolves in water, but the solution still has the properties of the original substances.

Interestingly, you can dissolve the salt retrieved from the water. * This is an idea that might help me explain something I observed.

? I’m not sure about this.

**Underline:** This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
Read, Note, Turn and Talk

If heat is added or removed from a substance it can cause a change. This does not necessarily mean that a new substance has formed. If this heat loss or gain causes the substance to change states (solid to liquid to gas or gas to liquid to solid) and still be the same substance it would be a physical change but

! This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

Underline: This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
Specialized Language

Physical Change

Change of state or shape without a new substance forming.
We know that matter has mass and takes up space. We know that we can weigh matter and that it can change either physically or chemically. The weight of substances can change depending on the system. A **closed system** does not allow matter to enter or exit. This means the weight before an interaction will be the same as the weight after an interaction. An **open system** however, will allow matter to enter or exit. A **closed** plastic bag and put it in a hot oven to evaporate (change to a gas), the bag is closed and the mass of the bag plus the mass of the bag plus the air in the bag will not change. If the bag is **open** then the weight will change as air can enter or exit the system.

! This reminds me of something I have observed or wondered about.

* This is an idea that might help me explain something I observed.

? I’m not sure about this.

**Underline:** This is an idea I want to use to explain to support my ideas about what caused the changes I have seen in different lessons or the cake.
Specialized Language

Open System
Closed System
### Indicators of Change

**Question:** What indicators in the list do you think could be indicators of a chemical change?

**Question:** What other information from the text could help you know if new substances have formed after an interaction?

<table>
<thead>
<tr>
<th>Matter and Change Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evidence of bubbles when substances are mixed.</td>
</tr>
<tr>
<td>Evidence of unexpected color changes when substances are mixed.</td>
</tr>
<tr>
<td>Evidence of an odor when substances are mixed.</td>
</tr>
<tr>
<td>Evidence of a change in temperature from before substances are mixed to after substances are mixed.</td>
</tr>
<tr>
<td>Evidence of an irreversible change when substances are mixed.</td>
</tr>
</tbody>
</table>

Additional information from the text that I think is important:

Add your thoughts here.
### Supporting or Revising our Claims

Record new information that support if a physical or chemical change took place.

If you changed your mind about your claim, you can record your new thinking on the blank page.

<table>
<thead>
<tr>
<th>Lesson 6</th>
<th>Lesson 6</th>
<th>Lesson 6</th>
<th>Lesson 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are the original substances the same or are they something different?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>What evidence supports your answer?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Lesson 7**

- What evidence supports your answer?

**Lesson 8**

- Information from the text that supports your answers.

**Lesson 3, 4, 5**
STOP and JOT
Teacher “Hat” Reflecting

Alone Zone
Reflect on student “hat” experiences and educator moves.

What did you notice about how text was used in lesson 8?

How is this use of text different from other experiences you have had with science texts?

How does using text in this way help students figure things out?
**Small Group**
Reflect on student “hat” experiences and educator moves.

What did you notice about how text was used in lesson 8?

How is this use of text different from other experiences you have had with science texts?

How does using text in this way help students figure things out?
# Meaning-Making in the Science Classroom

## Language Instructional Shifts

<table>
<thead>
<tr>
<th>Modalities</th>
<th>Registers</th>
<th>Student Interactions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linguistic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talk (listening, speaking)</td>
<td>Everyday Language</td>
<td>• One-to-one</td>
</tr>
<tr>
<td>Text (reading, writing)</td>
<td>Specialized Language</td>
<td>• One-to-small group</td>
</tr>
<tr>
<td><strong>Visual</strong></td>
<td>Precise Ideas and Precise Language</td>
<td>• One-to-many</td>
</tr>
<tr>
<td>Drawing</td>
<td></td>
<td>• Small group-to-many</td>
</tr>
<tr>
<td>Symbol</td>
<td></td>
<td><strong>Explicit</strong> beyond the &quot;here&quot; and &quot;now&quot;</td>
</tr>
<tr>
<td>Table</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gesture</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Lee, Quinn, & Valdes (2013)
Sharing What You Found Out

What questions about the cake can we explain with the ideas we have figured out?

Let’s Observe the Cake Again.
Sharing What You Found Out

As a group decide on one idea (concept) to add by writing or drawing to our model to explain something that happened when making a cake.
Unit 1
Matter and its Interactions
Lesson 9
What do you notice about the features this sample concept map?

What do you wonder about the features or purpose of a concept map?
Concept Maps

- Types of Heat Transfer
  - Conduction
    - My Touch
  - Radiation
    - Waves of light
  - Convection
    - Liquids and gases

- Transfer movement of heat
  - H = 0°C
    - Always
  - Insulators
    - Glass, plastic
  - Conductors
    - Metal, rubber

- Dark Colors
  - Absorb more heat energy

- Light Colors
  - Reflect more heat energy

- Tool to measure heat
  - Thermometer

What happens when we make a cake?
Build a Class Concept Map

Group 1 Lesson 3
Group 2 Lesson 4
Group 3 Lesson 5
Group 4 Lesson 7
Group 5 Lesson 8 - Changes
Group 6 Lesson 8 - Systems

Create 3-5 Yellow Stickies (one idea per sticky) with drawings and writing about what you figured out in that lesson.
Build a Class Concept Map

Which of our ideas on our class concept map can we use to explain something about what happens when you make a cake?

Each group record 3 ideas/ one per sticky note and place them on our class model.
Performance Task Part 1, 2 and 3
You will be watching a video blueberry pancakes being made.

1. Before watching the video, make a list of things you would see that might indicate a chemical change has taken place.

2. Observe the phenomenon.

3. After observing, make a model explaining what happens when you make a cake from before to after. Be sure to label changes that you observe.
PS.5.1 Matter and its Interactions Performance Task

**Before** watching the video, what evidence would you need to observe or have that would tell you that a chemical change had occurred? Record your answers below.

**After** watching the video, use evidence from the video to create a model of what happens when the muffin is made. The purpose of models is to show our thinking and can include words and images.

<table>
<thead>
<tr>
<th>Before Making the Muffin</th>
<th>After Making the Muffin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before mixing, the ingredients (Circle one: have or have not) changed. I know this because ...</td>
<td>After baking, the ingredients (Circle one: have or have not) changed. I know this because ...</td>
</tr>
</tbody>
</table>
A Related Phenomenon
Sensemaking Discussions

How can we support students in sensemaking discussions?
Each of the eight practices, as it is introduced and elaborated and experienced in the classroom, requires that students *externalize their reasoning*. It requires that they *work with the reasoning of other students*. …teacher and student talk is the *vehicle* by which every student can make his or her way into a deep and productive relationship with the science and engineering practices.
Productive Talk

Being able to identify and support productive talk is an important part of building a culture of equitable sensemaking.

Productive talk allows students to:
- make their thinking public
- reason about complex ideas
- develop arguments and evidence-based explanations
Goals for Productive Talk

- **Goal 1:** Help individual students share, expand, and clarify their own thinking
- **Goal 2:** Help students listen carefully to one another
- **Goal 3:** Help students deepen their reasoning
- **Goal 4:** Help students think with others
Alone Zone

- Read through the Goals and Talk Moves Handout.
- Reflect: Have you observed an instance of one or more of these moves today?

### Productive Talk Goals and Moves

<table>
<thead>
<tr>
<th>Goal One: Help individual students share, expand, and clarify their own thinking</th>
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| Goal Two: Help students listen carefully to one another |
|---|---|
| 4. **Who can rephrase or repeat?**: “Who can repeat what Javan just said or put it into their own words?” (After a partner talk) “What did your partner say?” |

| Goal Three: Help students deepen their reasoning |
|---|---|
| 5. **Asking for evidence or reasoning**: “Why do you think that?” “What’s your evidence?” “How did you arrive at that conclusion?” |
| 6. **Challenge or Counterexample**: “Does it always work that way?” “How does that idea square with Sonata’s example?” “What if it had been a copper cube instead?” |

| Goal Four: Help students think with others |
|---|---|
| 7. **Agree/Disagree and Why?**: “Do you agree/disagree? (And why?)” “What do people think about what Ian said?” “Does anyone want to respond to that idea?” |
| 8. **Add On**: “Who can add onto the idea that Jamal is building?” “Can anyone take that suggestion and push it a little further?” |
| 9. **Explaining What Someone Else Means**: “Who can explain what Aisha means when she says that?” “Why do you think he said that?” |

Other Observations:

Adapted from TERC (2012). Talk Science in the Inquiry Project
Goals and Talk Moves

Share with a partner:

- Which Goal (1, 2, 3, or 4) is most in use in your own classroom?

- Which Goal (1, 2, 3, or 4) is newest or newer to you?

### Productive Talk Goals and Moves

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Other Observations:

Adapted from TERC (2012), Talk Science in the Inquiry Project.
Explore an Interesting Phenomenon

Make a chart on a blank page on the left side of your science notebook and record what you notice and wonder about.

<table>
<thead>
<tr>
<th>Mt. Everest Phenomena</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notice</td>
</tr>
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</table>

Watch these videos closely and record things you notice and wonder about.

- Scary Day on Mt. Everest
Scary Day on Mt. Everest

- Scientists monitor using satellites (GPS)
- Everest has been moving NE at 4 cm/year
- Earthquake moved it 3 cm SW (same position as 9 months ago)
Explain how Everest grows and moves normally

Develop a model to show your thinking:

- How does Mt. Everest get 6-7 cm taller each year?
- How could Mt. Everest move to the northeast 4 cm each year?

<table>
<thead>
<tr>
<th>Mt. Everest Phenomena</th>
<th>Initial Model</th>
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</thead>
<tbody>
<tr>
<td>Notice</td>
<td>Wonder</td>
</tr>
</tbody>
</table>

Include words, pictures, and anything else to capture your thinking.
Observing Productive Talk

Record observations related to the Goals and Moves.

Video Context:
After previously creating individual models, students now share ideas and the class begins to develop their initial class consensus model about why Mt. Everest moves northeast at 4 cm/year and grows taller each year.

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|---|---|
| 8. Add On: “Who can add onto the idea that Jamal is building?” “Can anyone take that suggestion and push it a little further?” |

Other Observations:

Adapted from TERC (2012). Talk Science in the Inquiry Project
Alone Zone

- What talk moves do you notice from this video clip?

- What other strategies do you notice the teacher using?

Use the transcript as evidence of the talk or other moves.

Classroom Transcript: Make Sense of the Phenomenon

1. Teacher: Can somebody share out what they said was puzzling, but o partner said was puzzling about their model? As a way to show listening to our partners. [Student 1], go ahead.
2. Student 1: The tectonic plates make it grow bigger.
3. Teacher: What do you mean the tectonic plates?
4. Student 1: So how they shift and then points it up and then it gets bigger.
5. Teacher: So I heard you say it was puzzling. And who did you say?
6. Student 1: [Student 2]
7. Teacher: Okay, so it was puzzling about tectonic plates you say? Great. Thank you for sharing about [Student 4].
8. Student 2: So this was kind of. I had two partners so both tectonic plates actually worked and like what's the mountain made of? Why was it made of?
9. Teacher: Uh,确实. It seemed kind of similar ideas. Right? And I see you guys laughing, why are you laughing?
10. Student 3: I had two partners and [Student 4] said, although push the mountain up because it would all collapse.
11. Teacher: Okay.
12. Student 3: And then [Student 4] said that it would be safer or the mountain might go up a hill, and that's how it's going to grow.
13. Teacher: Interesting. Those seem like different ideas. Right? And I see you guys laughing, why are you laughing?
14. Student 4: Cause the ideas are not the best.
15. Teacher: Hold on a second, but we have to recognize, I know how this works. We have a lot of questions similar, different, are different ideas in our classrooms.

Productive Talk Goals and Moves

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Other Observations:

Adapted from TEIC (2012). Talk Science in the Inquiry Project
Teacher: Interesting. Those seem like different ideas. Right. And that’s interesting and puzzling too, right?
Observing Productive Talk

Small Group:

- What talk moves do you notice from this video clip?
- What other strategies did you notice the teacher using?
- How did the talk moves and other strategies support all students in engaging in equitable sensemaking?
Observing Productive Talk

Small Group:

● What talk moves do you notice from this video clip?
● What other strategies did you notice the teacher using?
● How did the talk moves and other strategies support all students in engaging in equitable sensemaking?

Whole Group:

● Share some key ideas from your small group
Rationale for Talk Moves
Teacher Interview
Reflecting on Talk Moves and Other Strategies

What are talk moves and/or strategies you would like to try to support productive talk in your own classroom? Why?
Student Hat/Teacher "Hat"

Student Hat: Think like a student.

Student/Teacher Hat: Think like a student, but note teacher guidance.

Teacher "Hat": Reflect on student experience and educator moves.
Learning Community Discourse Norms

- We use and build on other’s ideas.
- We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.
- We are open to changing our minds.
- We challenge ourselves to think in new ways.

From *OpenSciEd Classroom Norms*
Unit 1
Matter and its Interactions
Lesson 10
Revisiting the Driving Question Board

We had a lot of questions about heat and temperature.

How could we investigate some of those questions?
Materials

- 1 hot plate
- 1 metal pot
- 1 pair of tongs
- 2 empty (no water) disposable water bottles with lids
- 1 plastic ziploc bag
- Water

How could we use these materials to see what happens to air when it is heated?
Conducting the Investigation
What do you observe happening?

What do you think might be causing the changes you observe?
Lunch 12:00-1:00
Feedback Survey

Your feedback is valuable to us! We use it to provide follow-up support as well as inform choices about future professional learning opportunities.

Presenter 1: Other: Jesse Semeyn

Where this workshop took place: Charlotte, NC Grade 5

For Presenter 2 and Presenter 3:

14. Who was the Presenter #2?

There was only one presenter so there is no Presenter #2

Feedback Survey

Your feedback is valuable to us! We use it to provide follow-up support as well as inform choices about future professional learning opportunities.

Presenter 1: Kate Soriano

Where this workshop took place: Charlotte, NC Grade 5

For Presenter 2 and Presenter 3:

Feedback Survey

Your feedback is valuable to us! We use it to provide follow-up support as well as inform choices about future professional learning opportunities.

Presenter 1: Other: Cari Williams

Where this workshop took place: Charlotte, NC Grade 5

For Presenter 2 and Presenter 3:

14. Who was the Presenter #2?

There was only one presenter so there is no Presenter #2

<table>
<thead>
<tr>
<th>My Show and Tell Story</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I would tell... about the investigation.</td>
<td>I would show... from the investigation.</td>
</tr>
</tbody>
</table>

What did you observe happening?

What do you think would be important to include in your drawings and words to show and tell a story about what happened?
Now that we have investigated what happens when we add heat, what other questions or investigations could we do next to learn more?
Unit 1
Matter and its Interactions
Lesson 11
### My Show and Tell Story

<table>
<thead>
<tr>
<th>I would tell... about the investigation.</th>
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</table>

What did you observe happening?

What do you think would be important to include in your drawings and words to show and tell a story about what happened?
We showed and told what we observe happening?

What might we need to add if we wanted to show and tell what we think *caused* the changes?
Developing a Model

What do you think **caused** the bag to get bigger when heated?

What would need need to add to our drawings and writing to show and tell what we think is **causing** the changes?

Must-Have List to show what is causing the changes.

•
Developing a Class Consensus Model

What do we agree on about what is causing the changes?

What do we still wonder?

What are we unsure about?
Looking Forward

Many of us wondered, what would happen if we put the bag of air in cold water?
What happened when we put the bag and bottle into the hot water?

What do you predict will happen if we place the bag and bottle into cold water?
Conducting the Investigation
Hot vs. Cold

What happened to the bag and bottle in the hot water compared to the bag and bottle in the cold water?

Lesson 11 Cold Air Student Observation Sheet

Lesson 11 Investigation Observations: include drawings and words to explain your observations.
Developing a Model

What do you think is causing the bag to get bigger when heated and smaller when cooled?

What would need need to add to our drawings and writing to show what is causing the changes?

What must we show and tell?

•
Developing a Model

Add to your ideas to show what you think is causing the changes. Use blank space on the left if you prefer to start fresh rather than add to what you have.

What must we show and tell?

●

Lesson 11 Cold Air Student Observation Sheet

Lesson 11 Investigation Observations: include drawings and words to explain your observations.
Silent Reflection
How might these investigation help us explain some of our cake observations?
Teacher “Hat” Reflecting

Alone Zone

During lesson 10 and 11, sometimes we focused on the question:
What do you see happening?

Other times we focused on:
What do you think is causing the change?

What did you notice was the effect of each of these questions on your thinking and figuring out?
Teacher “Hat” Reflecting

Small Group
During lesson 10 and 11, sometimes we focused on the question:
What do you see happening?

Other times we focused on:
What do you think is **causing** the change?

What did you notice was the effect of each of these questions on your thinking and figuring out?
Developing and Using Models

Scientists use models ... to represent their current understanding of a system (or parts of a system) under study, to aid in the development of questions and explanations, and to communicate ideas to others.
Developing and Using Models

Creating scientific models (key features):

- **Components** (parts) needed to explain the phenomena.

- **Relationships and/or interactions** between the components.
  - What moves?
  - What changes?

- **Mechanisms** that account for relationships and/or interactions between components of the model (connections to science ideas).
Supporting Students in Developing Models

All-purpose back-pocket questions:

• What do you absolutely need to include model (parts/components) to explain the phenomenon?

• What is the relationship or interaction between component [x] and component [y]? How might you represent that?

• How or why are the components interacting (mechanism) in this way? How might you represent that?
Student Hat/Teacher “Hat”

Student Hat: Think like a student.

Student/Teacher Hat: Think like a student, but note teacher guidance.

Teacher “Hat”: Reflect on student experience and educator moves.
Learning Community Discourse Norms

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● We are open to changing our minds.
● We challenge ourselves to think in new ways.

From OpenSciEd Classroom Norms
Unit 1
Matter and its Interactions
Lesson 12
What are your notices and wonderings about the following pictures?
Notice and Wonderings
Materials

- 40 sheets of copy paper
- 2 pots
- Oven mitt
- Paper towels
- 4 digital thermometers
- 3 feet of aluminum foil
- 2 blocks of styrofoam
- Cardboard
- Water
- Hot plate
Conducting the Investigation

First Pair

Paper

Oven Mitt

Second Pair

Foil

Styrofoam
Collecting the Data

Lesson 12 Materials Comparison - Heat

Initial Material Temperature **IMT** - Temperature reading on the digital thermometer in the investigation setup *before* placing the pot of water on the material.

**Temperature Change** **TC** - Temperature difference between 3.0 minutes and the IMT.

<table>
<thead>
<tr>
<th>Materials</th>
<th>IMT 'F</th>
<th>30 sec 'F</th>
<th>1 min 'F</th>
<th>1 min 30 sec 'F</th>
<th>2 min 'F</th>
<th>2 min 30 sec 'F</th>
<th>3 min 'F</th>
<th>TC 'F</th>
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<td>Cloth Oven Mitt</td>
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<td>Styrofoam</td>
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<td>161</td>
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</tbody>
</table>
Looking at the Data

- What changes took place?
- What caused the change?
- Did one material change more than the others?
Using the Data To Answer a Question

- What material do you think would be best for baking a cake the fastest?
- Claim:
  I think _____ would be the best material to bake a cake the fastest.
Using the Data To Answer a Question

Evidence: What can you point to in your data that supports your claim.

1. The temperature of ____ increased by ____ degrees F.
2. The temperature of ___ was the highest.
3.
STOP and JOT
<table>
<thead>
<tr>
<th>Lesson 12</th>
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<th>Reasoning:</th>
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Silent Reflection

How does the investigation help us understand what happens when we bake a cake?
Unit 1
Matter and its Interactions
Lesson 13
Materials

- 4 buckets
- 3-6 trays
- 3 Clear plastic cups
- 2 cups of liquid
- 1 tablespoon solid
- Paper towels for each tray
- Digital scale per tray
- Digital thermometer per tray
What were the types of changes we discussed?

What are the characteristics of those types of changes?

What makes them different from one another?
What do you think this jacket is doing for this student?
If we could put a jacket on a cake after we take it out of the oven, do you think it would help the cake cool down slower or quicker than without a jacket?
What types of materials do you think would be best to use to cool a cake down slowly?
Conducting the Investigation

Which do you think will keep water warmest longest?
### Lesson 13 Materials Comparison - Heat

**Initial Water Temperature (IWT)** - Temperature reading on the digital thermometer of the water in the pot before adding water to the cups.

**Temperature Change (TC)** - Temperature difference between 4.0 minutes and the IWT.

<table>
<thead>
<tr>
<th>Materials</th>
<th>IWT °F</th>
<th>30 sec °F</th>
<th>1 min °F</th>
<th>2 min °F</th>
<th>3 min °F</th>
<th>4 min °F</th>
<th>TC °F</th>
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<td>Water in the Plastic Cup</td>
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<tr>
<td>Water in the Paper Cup</td>
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<td>180</td>
<td>178</td>
<td>141</td>
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<tr>
<td>Water in the Glass Cup</td>
<td>210</td>
<td>164</td>
<td>155</td>
<td>150</td>
<td>140</td>
<td>140</td>
<td></td>
</tr>
</tbody>
</table>

*Ceramic*
Looking at the Data

- What changes took place?
- What caused the change?
- Did one material change more than the others?
Using the Data To Answer a Question

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Silent Reflection

How does all the learning from today help us understand our Anchoring Phenomenon?

What happens when we make a cake?
Unit 1
Matter and its Interactions
Lesson 14
Materials

- Heating and Cooling... What Happens to Matter?
- Student Text
- Add science ideas that support our claims and evidence.
Heating and Cooling…. What Happens to Matter?

Lesson 14 Student Text  Heating and Cooling…. What Happens to Matter?

1. What happens when we place a water bottle full of air into hot water? That’s right, it expanded! Was it the air inside the bottle or the bottle that expanded or was it both? In this case both the bottle and the air inside the bottle expanded. Sometimes we can see when this expansion happens and other times we can’t. In this case we may not have been able to see the plastic material of the bottle actually expand, but we could see the effects of the air inside the bottle expanding.

2. When we add energy to something, like heating it up, we’re giving it a push. Think of it like a game of bumper cars: the more energy we add, the faster the particles inside the material move. As they speed up, they start bumping into each other more often and with more force. This increased movement and collisions cause the particles to spread out, making the material expand. So, whether it’s metal or even air, when they get hot, they take up more space!

How can we use ideas to add to our models in lesson 11? What science ideas support our models?
Lesson 11 Investigation Observations: include drawings and words to explain your observations.

Lesson 14 Information from the text that explains your observations from Lesson 11.
Now, let's think about what happens when we cool things down. When we take away energy, like cooling something down, it's like telling it to slow down. As the particles lose energy, they start to move slower. With fewer collisions and less movement, the particles occupy less space, causing the material to shrink or **contract**. So, whether it's metal cooling down after being heated or getting cold outside, when things lose energy, they shrink!

Understanding why things **expand** and **contract** is important for many reasons. For example, engineers need to know how materials behave when exposed to different temperatures to design structures that can withstand changes without breaking. Even in our everyday lives, knowing about expansion and contraction helps us work smarter and safer when cooking or fixing things at home.

**How can we use these ideas to add to our models in lesson 11?**

**What science ideas support our models?**
### Lesson 11 Cold Air Student Observation Sheet

**Lesson 11** Investigation Observations: include drawings and words to explain your observations.

| **Lesson 14** Information from the text that explains your observations from Lesson 11. |
Have you ever thought about why sand feels hot, but the water in a pool feels cool on a hot summer day? Or on a really hot summer day, a barefoot person usually walks across a cement driveway much faster than a grassy lawn. Why does the handle of a wooden spoon feel cooler to the touch than the handle of a metal spoon, even if both spoons are sticking out of the same pot of hot soup?

**Conductors** are materials that allow heat to transfer from one material to another faster. Metals like copper, aluminum, and iron are good conductors of heat. **Insulators**, on the other hand, are materials that slow down the transfer of heat from one material to another. Materials like wood, plastic, and rubber are good insulators.

The difference between conductors and insulators is important in many practical applications. For example, the handle of a cooking pot is often made of an insulating material to prevent heat from the stove from reaching your hand, while the pot itself is made of a conducting material to distribute the heat evenly to the food.

How can we use these ideas to support our claims in lessons 12 and 13? What science ideas tie our claims and evidence together?
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</table>
**Conductors or Insulators... What’s Your Thinking?**

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<tr>
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<th>Photo Courtesy of Unsplash</th>
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<td>Photo Courtesy of Pixabay</td>
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Expand:

Materials gain heat (heated) and the particles that make up the material increase in energy so they move more and take up more space.
Material loses heat (cooling) causing the particles to move less, and take up less space.
Conductor: Material that allows heat to pass through faster.
Insulator: Material that causes heat to pass through more slowly.
Making Sense of Our Learning

Concept Connections
Add to our Concept Maps

What ideas can we add to our concept map from lessons 10-14?

What more can we now explain about the cake?

What questions do we still have?
The unit is designed to be coherent from the students’ perspective.

What are some strategies, questions, or activities you noticed helped us build science ideas piece by piece to be able to explain aspects of the our observations, the cake phenomenon and our related phenomenon?
Teacher “Hat” Reflecting

Small Group

The unit is designed to be coherent from the students’ perspective.

What are some strategies, questions, or activities you noticed helped us build science ideas piece by piece to be able to explain aspects of the our observations, the cake phenomenon and our related phenomenon?
Tomorrow is Big Brain End-of-Unit Assessment Day
You’ve Got This!!

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<tr>
<th>QUESTIONS</th>
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<td>2- A B C D</td>
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<td>3- A B C D</td>
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<td>4- A B C D</td>
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<tr>
<td>5- A B C D</td>
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<tr>
<td>6- A B C D</td>
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</tbody>
</table>
Celebrate Sensemaking

What else would you like to add to your poster to put the “icing on the cake” related to our question: What is sensemaking?

Be prepared to share a celebration about sensemaking.
Traditional View and Contemporary View

Information Frame

Scientists and Teachers

Knowledge of Science Disciplines

Some Students

Sensemaking Frame

Students as Scientists and Engineers

Making Sense of Phenomena

All Students

Teachers Facilitate
thank you
END