Welcome!

Making Sense of Three-Dimensional Teaching and Learning - HS ES

Day 1

June 25-26, 2024
8 am - 3 pm

Promoting excellence and innovation in science teaching and learning for all
Meet Today’s Presenter

Holly Hereau
Instructional Materials and Professional Learning Specialist
hhereau@nsta.org
Today’s Agenda

**What does it mean to use phenomena and questions to support student sensemaking?**

- **Introduction: (~1 hour)**
  - Reflect on our goals for science instruction
  - Share key elements of the OpenSciEd instructional model

- **Experience Anchoring Phenomenon Routine (~3 hours)**
  - Experience key pedagogical shifts
  - Reflect on Routine Elements

- **Lunch (12-1)**

- **APR continued (~1 hr)**
  - Experience key pedagogical shifts
  - Analyze your anchoring phenomenon elements

- **Closing (~1 hour)**
  - Reflect on the Anchoring Phenomenon Routines
  - Looking forward
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)

- What are your goals for your students in science?

- Why do you think it is important for all students to learn science?
Meet Our Learning Community

Small Group

● What are your goals for your students in science?

● Why do you think it is important for all students to learn science?

● What patterns can you identify in your group’s goals? (What are similarities? What are differences?)
“A major goal for science education should be to provide all students with the background to systematically investigate issues related to their personal and community priorities. They should be able to frame scientific questions pertinent to their interests, conduct investigations and seek out relevant scientific arguments and data, review and apply those arguments to the situation at hand, and communicate their scientific understanding and arguments to others.” (p. 278)
Teacher Driving Question Board

Add questions you have about the unit, the course, the program at any point.
## Two Day Overview:

<table>
<thead>
<tr>
<th>Time Block</th>
<th>Day 1 Phenomena and Questions</th>
<th>Day 2 Coherence, Discussions, Anchor test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1 Hour)</td>
<td>Introduction <em>Introduction slides</em></td>
<td>Introduction <em>Analyze video and student artifacts from an OSE unit</em></td>
</tr>
<tr>
<td>(2 Hours)</td>
<td><em>Experience Anchoring Phenomena Routine</em></td>
<td><em>Unit Time</em> <em>Deeper dive into key lessons Analyze video from an OSE unit (Day 3 Intro Stuff)</em></td>
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<td><em>Lunch</em></td>
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<tr>
<td>(1.5 Hours)</td>
<td><em>Unit Time Experience Anchoring Phenomena Routine</em></td>
<td><em>Deeper dive into key lessons Use discussion planning tool (Day 3 stuff) CMS Anchoring Phenomenon Routine</em></td>
</tr>
<tr>
<td>(.5 Hour)</td>
<td><em>Closing Discussion and reflection</em></td>
<td><em>Closing Discussion and reflection</em></td>
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Key Goals in Science Instruction
Key shifts in the Vision of the NRC Framework & NGSS

“A major goal for science education should be to provide all students with the background to systematically investigate issues related to their personal and community priorities. They should be able to frame scientific questions pertinent to their interests, conduct investigations and seek out relevant scientific arguments and data, review and apply those arguments to the situation at hand, and communicate their scientific understanding and arguments to others. ” (p. 278)

How Do We Support Equitable Sensemaking?

“Realizing this potential [of the NGSS] is particularly important in relation to students of color, students who speak first languages other than English, and students from low-income communities who, despite numerous waves of reform, have had limited access to high-quality, meaningful opportunities to learn in science.” (p. 33)

-Bang, Brown, Calabrese Barton, Rosebery & Warren (2017)
Introduction to OpenSciEd Instructional Materials
OpenSciEd is a nonprofit organization that brings together

- world-class curriculum developers,
- state science administrators,
- teachers, and
- philanthropic organizations

to develop FREELY available, HIGH QUALITY science instructional materials that are three-dimensional and centered on supporting equitable science sensemaking.
The Design of OpenSciEd Curriculum

5 Key Instructional Elements

- Phenomenon-Based
- Coherent from the Students’ Perspective
- Driven by Evidence
- Collaborative
- Equitable
An anchoring *phenomenon* and related *phenomena* motivate building ideas over time within a unit.
OpenSciEd is Coherent from the Students’ Perspective

Coherence is grounded in the initial anchoring phenomenon and driven by students’ ideas and questions.
OpenSciEd is Driven by Evidence

Students seek and use evidence to figure out phenomena as they build new science ideas.
OpenSciEd is Collaborative

OpenSciEd Community Agreements

These agreements are introduced in the first unit of each course and referenced throughout the following units.

<table>
<thead>
<tr>
<th>Community Agreements</th>
<th>Descriptions</th>
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<tbody>
<tr>
<td>Respectful</td>
<td>We provide each other with support and encouragement.</td>
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<td></td>
<td>We share our time to talk. We do this by giving others time to think and share.</td>
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<td></td>
<td>We critique the ideas we are working with but not the people we are working with.</td>
</tr>
<tr>
<td>Equitable</td>
<td>We monitor our own time spent talking.</td>
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<td></td>
<td>We encourage others’ voices whom we have not heard from yet.</td>
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<td></td>
<td>We recognize and value that people think, share, and represent their ideas in different ways.</td>
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<tr>
<td>Committed to our community</td>
<td>We come prepared to work toward a common goal.</td>
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<td>We share our own thinking to help us all learn.</td>
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<td>We listen carefully and ask questions to help us understand everyone’s ideas.</td>
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<tr>
<td></td>
<td>We speak clearly and loud enough so everyone can hear.</td>
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<tr>
<td>Moving our science thinking forward</td>
<td>We use and build on other’s ideas.</td>
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<tr>
<td></td>
<td>We use evidence to support our ideas, ask for evidence from others, and suggest ways to get additional evidence.</td>
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<td>We are open to changing our minds.</td>
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<td>We challenge ourselves to think in new ways.</td>
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</table>

Students figure out ideas **together** as a classroom community.
OpenSciEd is Equitable

The class community values the diversity of resources students bring to science class and understand how the learning is relevant to their own lives and communities.
OpenSciEd Instructional Model

OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.
All units have an anchoring phenomenon or problem. This results in student-driven questions, ideas, and initial explanations that are then explored in future lessons.
Launching a Phenomenon-Based Unit

1. Explore the phenomenon together
2. Attempt to make sense individually and together
3. Make connections to our lives and communities
4. Generate questions and ideas for investigations
Exploring the Anchoring Phenomenon Routine
Examine Lightning Strikes

Watch this video of lightning together. What do you notice and wonder?
Examine Lightning Strikes

Make a chart to record what you notice and wonder about what you see in slow-motion videos of lightning.

Watch this first slo-mo video, then this second slo-mo video, and part of that second strike again even slower.

Be prepared to share your ideas with the class.
When does lightning occur?

1. What do each of these graphs show?
2. What patterns do you notice across the graphs?
3. What questions do you have about these data?

Student Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Question</th>
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</thead>
<tbody>
<tr>
<td>What is lightning?</td>
<td>What makes lightning dangerous?</td>
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<tr>
<td>Why do you have to stay away from trees while it thunders?</td>
<td>Why doesn’t lightning always hit the ground?</td>
</tr>
<tr>
<td>Why stay away from water when raining?</td>
<td>Why does lightning look like it explodes?</td>
</tr>
<tr>
<td>Are we absolutely sure birds don’t affect or cause lightning?</td>
<td>Why when there is lightning does a loud thunder follow it?</td>
</tr>
<tr>
<td>Why is rain connected to lightning?</td>
<td>Why do trees get hit by lightning?</td>
</tr>
<tr>
<td>Why do you have to stay away from water when there’s lightning?</td>
<td>Why do you have to stay away from water when it’s raining?</td>
</tr>
<tr>
<td>Why does lightning spread like it does?</td>
<td>What is lightning?</td>
</tr>
<tr>
<td>Why does lightning occur?</td>
<td>How is thunder created?</td>
</tr>
<tr>
<td>Can you freeze lightning?</td>
<td>Why is it dangerous to be under a tree when it’s raining?</td>
</tr>
</tbody>
</table>

How could answering these questions support figuring out key ideas about the structures and properties of matter?
OpenSciEd HS Launch
Professional Development

What does it mean to use phenomena and questioning to support student sensemaking?
Target PEs for Earth in Space (8.4)

**MS-ESS1-1 Earth's Place in the Universe**
Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.

**MS-ESS1-2 Earth's Place in the Universe**
Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.

**MS-ESS1-3 Earth's Place in the Universe**
Analyze and interpret data to determine scale properties of objects in the solar system.

**MS-PS2-4 Motion and Stability: Forces and Interactions**
Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

**MS-PS4-2* Waves and their Applications in Technologies for Information Transfer**
Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.
**Target PEs for B.1 Unit**

**HS-LS2-7** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

**HS-LS2-8** Evaluate the evidence for the role of group behavior on individuals’ and species’ chances to survive and reproduce.

**HS-ESS3-3** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

**HS-ETS1-3†** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.

* PE built across units   † PE built across courses
Spiraling into Future PEs

This unit’s DCIs do not spiral into the subsequent 8th grade units (8.5 and 8.6).

They are built on in high school, in ESS PEs that develop into more sophisticated models to predict and explain of:

- Elliptical orbits of objects in the solar system
- The motion of distant galaxies
- Light spectra of stars
- Cosmic microwave background radiation
Focal Science Practices

- Target SEPs being developed:
  - Developing & Using Models

- Other focal SEPs:
  - Analyzing and Interpreting data
  - Developing Explanations and Designing Solutions
  - Engaging in Argument from Evidence
  - Obtaining, Evaluating, & Communicating Information

Focal Crosscutting Concepts

- Patterns
- Scale, proportion and quantity
- Systems and system models
- Energy and Matter
OpenSciEd HS Launch
Professional Development

Day 1: Framing Learner Experience
Student Hat

At times throughout our sessions, we will ask you to participate with your “student hat” on—engaging in the activities by thinking as your students would.

In some activities, we ask you to participate in “student hat” — engaging in the activities by thinking as your students would. This can feel strange, and you may be wondering why we don’t just describe how students do those activities and then examine classroom videos and student work. Here’s why.

**A Focus on the students’ perspective:** A key shift in NGSS storylines is that science work should be coherent from the students’ perspective. Students should always see the work they are doing as a way to make progress on the questions and problems that their class has identified. Too often in science classrooms, the curriculum authors and teachers know why the next activity is coming, but students are left to figure it out after the fact, if they ever figure it out at all.

In storylines, teachers work with students to figure out together what the class needs to work on, and how to go about it. Together they reflect on progress and figure out where to go next. Of course, the teacher has guiding ideas of where to go — the storyline is a planned trajectory. But by involving students as partners in reflection and planning, students see how today’s data collection, analysis, or modeling will help the class make progress on the goals they have established.

**How will thinking like a kid help?** To do this joint navigation work, you need to work with students’ ideas. Anticipating your students’ ideas and questions will help you figure out what makes sense to them and how you can work with their ideas to help them develop the target science ideas. To plan your discussions, you need to put yourself in the mindset of your students.

- When your students experience a phenomenon, what ideas will they draw on to explain it? What will they wonder about?
- What kinds of experiences might they bring up to connect to the phenomena they are investigating?
- What kinds of prompts could you give to push them to dig deeper into the ideas they want them to notice?
- What will they be able to figure out from investigating the phenomena in the unit so far? How would they model this?

If we jump ahead to our knowledge as adults, we might overlook steps that will be important to our students. What is a logical next step to us, since we know the end game already, may not seem logical to students. Put yourself in the heads of your students so you can anticipate what they will see as puzzling and what ideas they might have. Then you can orchestrate the conversations to help students develop questions and ideas that will be productive for the storyline.

So in these activities, we will ask you to channel your inner student. Don’t worry about getting the science right at first — your group will build these ideas over time as they engage with phenomena. Resist the urge to use your preexisting knowledge to explain to others. Let the group struggle with the ideas as your students might. Resist the urge to label the phenomena with the right science words — we are trying to develop step by step explanations, not just know that the process is called photosynthesis, sublimation, or endothermic reaction. Storylines require taking the learning step by step — let’s practice doing that.

https://bit.ly/3xzIIsN
Student Hat

Student hat allows you to:

● Experience the unit as students might, feeling both the excitement and frustrations of deciding what to investigate next and building important science ideas together.

● Get a feel for how all the moving parts work together in storylines.

● Feel more comfortable supporting your students in their sensemaking.
Switching Hats

**Student hat:** Thinking like a kid. What do you anticipate a high school student might think? What might they say? Channel your inner high schooler.

**Teacher hat:** Reflecting on pedagogical approach, instructional routines, classroom culture, logistics/supports, NGSS, etc.

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**Public Opinion About the 30 by 30 Initiative**

Americans were asked: What is your opinion of setting a national goal of protecting at least 30% of America’s land, ocean areas, and inland waters by the year 2030?

80% of Americans favor this initiative.

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**Teacher Driving Question Board**

Add questions you have about the unit, the course, the program at any point.
Facilitator Notes

Teacher Note: An aside during student hat that provides additional context or explains how your experience will differ from students’ experience.

Modified Student Hat Slides

**Develop Initial Models**

- System
- What are we investigating?
- Components
- What are the living and nonliving parts of the system?
- Interactions
- How do the living and nonliving components interact?

**Navigate**

- Exit Ticket
  - What is one thing you figured out about your conservation profile?
  - What is one question you still have about your conservation profile?

Stand up and find someone you haven't spoken to yet and discuss the questions on the slide.

Next, have a class discussion to look for patterns in your noticings and questions.
Teacher Driving Question Board

Add questions you have about the unit, the course, the program at any point.
Anchoring Phenomenon Routine

This is the first routine of the OpenSciEd curriculum to position students in making sense of a phenomenon, grounding all students in a common experience, and raising student questions.

**Element #1:** Explore the phenomenon

**Element #2:** Attempt to make sense

**Element #3:** Identify related phenomenon

**Element #4** Questions and next steps
How do the elements of the Anchoring Phenomenon Routine support all students in figuring things out?
OpenSciEd HS Launch Professional Development

Day 1: Experiencing the Anchoring Phenomenon
A New Phenomenon

#manhattanhenge

At 8:14 p.m. on May 30, 2020, thousands of people stopped to watch the sunset in Manhattan, NYC.
# Co-Construct Community Agreements

## With Your Class

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<tbody>
<tr>
<td><strong>Respectful</strong></td>
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<td>Our classroom is a safe</td>
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<tr>
<td>space to share.</td>
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<tr>
<td><strong>Equitable</strong></td>
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<tr>
<td>Everyone's participation</td>
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<tr>
<td>and ideas are valuable.</td>
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<tr>
<td>**Committed to Our</td>
<td></td>
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<tr>
<td>Community</td>
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<td>We learn together.</td>
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<td>**Moving Our Science</td>
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<tr>
<td>Thinking Forward</td>
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<tr>
<td>We work together to</td>
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<td>figure things out.</td>
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</table>
A New Phenomenon

Watch a video

Video clip 1: https://youtu.be/SbqmriPA1ck

Make a T-chart in your science notebook and record what you notice and what you wonder about.
Share Manhattanhenge Notice and Wonder

With Your Class

- Why do you think people feel connected to this phenomenon?
- What else did you notice in the Manhattanhenge phenomenon?
- What did you wonder about this phenomenon?
Slide D

What is happening to cause Manhattanhenge?

With Your Class
Orient yourself with these two maps of New York City.
The best views of Manhattanhenge are said to be on 34th Street.
What is happening to cause Manhattanhenge?

On Your Own

Develop and use a model to explain how Manhattanhenge happens and why we don’t see it every day.

Initial Manhattanhenge Model

Standing at the corner of 34th Street and 5th Avenue and facing northwest, where people say you can get some of the best views of the Manhattanhenge phenomenon.

On the next page, develop two models on the different maps to help explain different aspects of this phenomenon.
Individually jot down some notes about what you did as students in Element 1.
Related Phenomena and Patterns

With Your Group

- What other phenomena or patterns have we seen with other objects in the sky (either during the day or during the night)?
- Have you ever noticed something in the sky look totally different than any other time you have seen it?

Record each idea that your group comes up with on a sticky note in bold print so that everyone can see.

Be ready to post your sticky note on the Patterns and Phenomena in the Sky poster.
Home Learning
There might be stories our family or community knows about what they or others have observed in the sky.

Go home and poll your friends and family members:
1. What patterns or phenomena have they seen in the sky?
2. What stories have they heard from their family and community about patterns others have observed in the sky or about things on Earth that are connected to patterns and objects in the sky?

➔ First, share an example of a pattern or event. Explain that we are not curious about weather patterns right now.

➔ Then, ask the questions on your Community Connections to the Sky handout and record their answers.

These ideas will be added on the next day to the Patterns and Phenomena in Sky poster at the start of class.
Adding to Our Patterns

Return to the Home Learning

Share the ideas you got from family and community members with the people at your table.

Record at least one new idea on a sticky note in bold print so that everyone can see.

Look for students to add things like these: Moon phases, eclipses, comets, airplanes, sunsets, planets, days, nights, moonlight, UFOs, origin stories, & Etc.

Be ready to post your sticky note on the Patterns and Phenomena in the Sky poster.
Individually jot down some notes about what you did as students in Element 3.
Break

10 min
Expanding Our Horizons

Turn and Talk

How could we find out more about what phenomena and patterns people across the world have observed in the sky over thousands of years?

Might we be able to observe the same phenomena and patterns today or at some point in the future?

With Your Group

Each group will listen to a different podcast using the close listening protocol below.

Before

- Look at the title of your podcast and discuss it with your group. What does the title tell you about what will be in the podcast?
- What is a question you have that you hope the podcast will help answer?

During

- Listen carefully, following along with the transcript.
- Highlight or underline words, phrases, and ideas that you have never heard before or that you want to know more about.
- Each person in your group will be allowed one pause request. When you hear something that you want to discuss or have clarified, raise your hand to use your pause request.

After

- Look at the title of your podcast again. Now that you have heard the podcast, why do you think the podcast producers chose this title?
- Respond to these questions on the handout and be ready to share with the class.
Additional Patterns

With Your Group

Respond to the questions on your Podcast handout.

As you work, record any new patterns in the sky that you heard about while listening to the podcast.

Record each idea that your group comes up with on a sticky note in bold print so that everyone can see.

Be ready to post your sticky note on the Patterns in the Sky poster.
With Your Class

- Share the patterns your group recorded on sticky notes and post them to the *Patterns in the Sky* poster.
- What did your group wonder about the phenomena in the podcast?
- Why was it important to the people you learned about to study the sky?
Exit Ticket
Record your answers to the following questions on a blank piece of paper.

- Are there any patterns or phenomena in the sky that you feel personally connected to? Explain your connection.
- How are your views about space and science similar to the views you heard about in the podcast? How are they different?
- Did listening to the podcast change any of your views about space and science? If so, how? If not, why not?
Turn and Talk

- Choose a **pattern** for which you want to develop a model and share that pattern with a partner.

- Tell your partner what **parts** you think will need to be in the system you model to explain your pattern.
On Your Own

First, choose one pattern to model. Write what the pattern is in the title of your handout. Then:

1. Show and describe what the pattern phenomenon looks like from Earth and when it happened/happens.

2. Change perspective. Draw and/or describe a model to help explain why that pattern happens. Identify the important parts, motions, and interactions in the system and the perspective you are taking in this model.

3. Describe what is happening with the parts and interactions in your system that is causing us to see your pattern or phenomenon.
Lunch
12:00-1:00
Feedback on Initial Models

Turn and Talk

● With your partner: Each person gets 2 minutes to present their model.

● On your own:
  ○ Go back and make any changes to your model you would like after hearing about other people’s models.
  ○ Prepare for the gallery walk by posting your model in the room.
On Your Own

Visit at least two models recording what you notice on the Initial Models Gallery Walk:

<table>
<thead>
<tr>
<th>What pattern or phenomenon is the model trying to explain?</th>
<th>What parts, movements, and interactions are represented in the system model that are similar to the ones you included in your model?</th>
<th>What parts, movements, and interactions are different?</th>
</tr>
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</tbody>
</table>
On Your Own

Visit at least two models recording what you notice on the Initial Models Gallery Walk:

→ Visit at least 2 other models. Try to visit models where you don’t see any other students so that every model gets visited.
Initial Consensus Model Discussion

With Your Class

Develop a record of what we agree on and where we have competing ideas across the initial models.

Be ready to share:

- What similarities and differences did you see among parts that were represented in the models you visited?
- What similarities did you see among the motions and interactions of objects represented in the models you visited?
- What similarities and differences did you see among perspectives that were represented in the models you visited?
Sample Initial Consensus Model

- Sun
- Earth
- Moon
- Other planets
- Stars
Initial Consensus Model

- ? Are they moving too?
- Stars

Sun goes around Sun
Moon goes around Earth

KEY
- motion direction
- path of motion
- shadow
- other planets

Perspective:
Looking down at the Sun from above
Individually jot down some notes about what you did as students in Element 2.

<table>
<thead>
<tr>
<th>Element 1: Explore the Phenomenon</th>
<th>Element 2: Attempt to Make Sense of the Phenomenon</th>
<th>Element 3: Identify Related Phenomena</th>
<th>Element 4: Develop Questions and Next Steps</th>
<th>?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What do we notice?</strong></td>
<td><strong>How can we explain this?</strong></td>
<td><strong>Where else does something similar happen?</strong></td>
<td><strong>What should we do to figure out how to explain this?</strong></td>
<td>?</td>
</tr>
<tr>
<td>Notes about what you or the students did.</td>
<td>How does this support <strong>figuring out?</strong></td>
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</tr>
<tr>
<td>How does this support a classroom culture where all students have access?</td>
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</table>
Scientists Circle

What kinds of questions could we ask about these phenomena/patterns and the systems that we think cause them that we could investigate as a class?
Scientists Circle

What questions do we have about:
- phenomena and patterns in the sky?
- objects and interactions in the system(s) that might cause them?

Write one question per sticky.
Write in marker—big and bold.
Write your initials in pencil on the back of each sticky.
Driving Question Board (DQB)

Scientists Circle

- The first student reads their question aloud then posts it on the DQB.
- Students who are listening should raise their hand if they have a question that relates to the question that was just read aloud.
- The first student selects the next student whose hand is raised.
- The second student reads their question, says why or how it relates, and posts it near the question it most relates to on the DQB.
- That student selects the next student, who may have a related question or a new question.
- We will continue until everyone has at least one question on the DQB.
Driving Question Board

Post 1 or more post-its with questions you have.

- How long did the different civilizations take to record the movement of the sky?
- Do all planets travel around the sun in the same direction?
- Why do planets look like they move one direction, then switch directions?
- With climate change, are the animals still following their life cycle at the same time as the patterns in the sky?
- How do we know if something we see is a pattern or not? Humans only live so long...
What kinds of investigations could we do, and what additional sources of data might we need to figure out the answers to our questions?

Add your ideas to a new notebook page titled: "Ideas for Future Investigations and Data We Need."

Be prepared to share these with the whole class.
Individually jot down some notes about what you did as students in Element 4.
Observing What We See in the Sky

- Look back at our Patterns and Phenomena in the Sky poster for some objects you could be looking for in the sky.
- Then, over the next few weeks, look up at the sky, if you can, and keep track of what you notice!
- Take this Community Guide for Looking at the Sky home and use it with another person.
OpenSciEd HS Launch Professional Development

Day 1: Reflection
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 using the Anchoring Phenomenon Routine Tracker.
Anchoring Phenomenon Routine

Whole-Group Discussion

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

<table>
<thead>
<tr>
<th>Anchoring Phenomenon Routine Tracker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Element 1:</strong> Explore the Phenomenon</td>
</tr>
<tr>
<td>What do we notice?</td>
</tr>
<tr>
<td>Notes about what you or the students did.</td>
</tr>
<tr>
<td>How does this support <strong>figuring out</strong>?</td>
</tr>
<tr>
<td>How does this support a classroom culture where all students have access?</td>
</tr>
</tbody>
</table>
Discuss Our Community Agreements

Revisit the Community Agreements we established in student hat.

- What do we want to add or emphasize in our work together as adults to make the rest of our time together productive?
  - Consider: time, expectations of each others, and mindset
Reflect on the OpenSciEd Instructional Model
OpenSciEd Instructional Model

OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.
Attendance and Feedback form

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Welcome!

Making Sense of Three-Dimensional Teaching and Learning - HS ES

Day 2

June 25-26, 2024
8 am - 3 pm
Meet Today’s Presenter

Holly Hereau
Instructional Materials and Professional Learning Specialist
hhhereau@nsta.org
Today’s Agenda

What does it mean to use phenomena and questions to support student sensemaking?

● Navigation: Revisit and extend learning - storyline routines
● Experience Navigation and Investigation Routines (~3 hours)
  ○ Experience key pedagogical shifts
  ○ Investigation Immersion
  ○ Reflect on Routine Elements
  ○ Equitable
● Introduction to Talk Moves (1 hr)
  ○ Facilitation Tools to move learning forward
  ○ Creating a culture for ALL students to contribute to knowledge building
● Lunch (12-1)
● Continue Talk Moves/Discussion Types (.5 hr)
● CMS Lesson 1 facilitation (~1 hour)
  ○ Reflect on the implementation of elements of the Anchoring Phenomenon Routine
● Closing/Reflection (.5 hr)
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.
Revisit Community Agreements

With Your Class

<table>
<thead>
<tr>
<th>Respectful</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Our classroom is a safe space to share.</td>
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</table>

<table>
<thead>
<tr>
<th>Equitable</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Everyone’s participation and ideas are valuable.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Committed to Our Community</th>
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</thead>
<tbody>
<tr>
<td>We learn together.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Moving Our Science Thinking Forward</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>We work together to figure things out.</td>
<td></td>
</tr>
</tbody>
</table>
Add questions you have about the unit, the course, the program at any point.
OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.

Navigation Routine
We figure out where we are and where we need to go next.

Investigation Routine
We develop evidence from investigations to explain parts of the phenomenon.

Putting the Pieces Together Routine
We come to a consensus on what we've figured out, and have a more complete explanation of the phenomenon.

Driving Question Board
We develop questions for the Driving Question Board.

Problematising Routine
But new questions emerge through evidence we find.

Questions Answered
We've answered many of the questions from our Driving Question Board and are ready to explain some new phenomena.
Day 1: What does it mean to use phenomena and questioning to support student sensemaking?

Individually (1 min)

- Jot down ideas in day 1 in terms of what you have figured out and what you wonder and have questions about.
- Reflect on how starting with an anchoring phenomenon can support your students’ sensemaking.
Reflect on OpenSciEd Instructional Model

Day 1: What does it mean to use phenomena and questioning to support student sensemaking?

Small Group (2 min)
- What have you figured out?
- What do you wonder? What questions do you still have?

Whole Group (4 min)
- Share key ideas from your small group.
<table>
<thead>
<tr>
<th>Question</th>
<th>Routine</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do we kick off each unit?</td>
<td>Anchoring Phenomenon</td>
<td>Common experience of a phenomenon, develop student curiosity, and connect to students’ lives.</td>
</tr>
<tr>
<td></td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>How do we work with students to motivate the next steps?</td>
<td>Navigation Routine</td>
<td>Motivate the next lesson from gaps in what the class figured out so far.</td>
</tr>
<tr>
<td>How do we help students use practices to build science ideas?</td>
<td>Investigation Routine</td>
<td>Support students in using science and engineering practices to make progress on our questions and problems.</td>
</tr>
<tr>
<td>How do we help students put science ideas together?</td>
<td>Putting Pieces Together</td>
<td>Help students assemble ideas from multiple lessons and apply them to the class’s questions.</td>
</tr>
<tr>
<td></td>
<td>Routine</td>
<td></td>
</tr>
<tr>
<td>How do we push students to go deeper?</td>
<td>Problematizing Routine</td>
<td>Help students uncover limitations and unanswered questions in the explanations, solutions, and models so far.</td>
</tr>
</tbody>
</table>

OpenSciEd Instructional Model
All units have an anchoring phenomenon or problem. This results in student-driven questions, ideas, and initial explanations that are then explored in future lessons.
Elements of the Anchor in the Microwave Unit

Watch a classroom video of students sharing what they notice about the microwave phenomenon.

Individually:
- How was your experience similar or different from what is happening in this classroom during the Anchoring Phenomenon Routine?
Guidelines for Watching Videos of Teaching*

- These are real classrooms, which means there are also students who did not give consent.

- Ground Rules:
  - Teaching and the classrooms we will see are complex. There is much we don’t know about the students and teacher and their history together.
  - Presume expertise on the part of the teacher.
  - Assume what the kids are saying makes sense to them.
  - Focus on how what the teacher and students are doing is serving the learning goals of the lesson and providing access for diverse learners.

Elements of the Anchor in the Microwave Unit

- Watch a classroom video of students sharing what they notice about the microwave phenomenon.
Elements of the Anchor in the Microwave Unit

Watch a classroom video of students sharing what they notice about the microwave phenomenon.

Whole Group:
- Share key ideas.
Reflecting on the Anchoring Phenomenon Routine

A few field test teachers reflect on their rationale for using an anchoring phenomenon in their classroom.
Reflect on what/who is driving instruction
Vignettes: What/who is driving instruction?

- Individually read 2 vignettes from two units on carbon cycling. Silently jot down your answers to the following question:
  - What is driving the figuring out that students are doing?

Vignette of Science Instruction

**Unit 1: The Carbon Cycle**

Mr. Quadri’s class recently started a new science unit. In Lesson 1, Mr. Quadri introduced the unit by telling his class they were starting a unit on - The Carbon Cycle. A good context for seeing the carbon cycle at work is analyzing ecosystems and creating food webs. Since all ecosystems have different organisms as part of their system, let’s begin by watching a video on ecosystems in the Arctic. Students make a food web from using the organisms they see in the video.

In Lesson 2, Mr. Quadri said that they would be learning about how matter cycles within ecosystems by tracing the movement of carbon. He asked the class, “Where have you heard the word matter before?” One student said, “Like what’s the matter?” Another student said, “Matter has another meaning too—it is like what all stuff is made of.” Mr. Quadri built off that idea and wrote a definition on the class word wall: Matter is everything around you. Matter has mass and takes up space (volume). He then had the class watch a video about matter with examples. During Lesson 2, Mr. Quadri said, “Now that we know what matter is, how does it cycle in an ecosystem?” He explained that matter cycles between living and nonliving parts as he drew on the board model of carbon cycling in a forest ecosystem. He then had students play a carbon cycle board game where they saw carbon moving through an ecosystem.

In Lesson 3, the topic for the day on the board is photosynthesis. Mr. Quadri tells the class that photosynthesis is an essential part of matter cycling. Mr. Quadri explains that during photosynthesis a plant makes its own food, called glucose, through a chemical reaction that uses sunlight to turn water and carbon dioxide into glucose and oxygen. As he explains, he writes the formula for photosynthesis on the board and students copy it. Mr. Quadri then tells the class that they can see for themselves how this works through a lab he has set up with a small plant, a baggie, and a carbon dioxide and water detector. Mr. Quadri explains that they will put the plant in the baggie and then record the carbon dioxide and water levels. Then they will graph the results and answer questions about how the data relate to the photosynthesis formula.

**Unit 2: What causes fires in ecosystems to burn?**

The students in Ms. Velazquez’s class recently started a new science unit. In Lesson 1, the students analyze an image of burn scars in Alaska. Near the burn scars there are new fires burning which are increasing in frequency and intensity. They notice that scientists have named these “zombie fires” because some of the fires don’t seem to die or go out. Many students have questions about how a fire can keep burning, especially in a place that is cold and covered by ice. In order to analyze more data about zombie fires in the Arctic, students work with their small groups, analyzing a set of images from the Arctic. From images of the ecosystem, students notice zombie fires burn underground throughout the winter. They read that the Arctic is covered by permafrost but it has now begun to thaw. The stuff burning underground is called “peat.” They also find that smoke is coming from these fires and travels very long distances and that tons of CO₂ is going into the air. They also wonder what peat is and how it can keep burning under ice in such a cold place.

In Lesson 2, Ms. Velazquez brings in some peat and other materials that burn—grass, charcoal, and wood—for students to investigate. Students compare the different materials. A few students wonder aloud about wanting to burn the different materials to see how they compare to peat. Ms. Velazquez asks how burning the materials will help them figure out more about the zombie fires. One student says that if they burn these materials, they can see how long they burn. Another says, “Yeah and maybe we can keep track out...
Vignettes: What/who is driving instruction?

● Small-Group Discussion:
Discuss the following questions:

○ What is driving the figuring out that students are doing?

● Whole-Group Discussion:
Share key ideas from your small group.

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A Vignette of Science Instruction

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Coherent for Students
Coherent for Students

Organize and enact curriculum that is:

- “...designed to help children continually build on and revise their knowledge and abilities, starting from their curiosity about what they see around them and their initial conceptions about how the world works.” (NRC, 2012)

- “Impactful science teaching happens when we start in the lives of the children and empower them to make sense of the world in their own voice.” (Brown, 2019)
“By attending closely to what students actually say and do in science, teachers can expand the relationships that are possible among themselves, their students, and science. In this way, they can begin to create more equitable opportunities to learn in science for historically underserved students.” (p. 33)

-Bang, Brown, Calabrese Barton, Rosebery & Warren (2017)
OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.
OpenSciEd Instructional Model Routines

ANCHORING PHENOMENON ROUTINE

NAVIGATION ROUTINE

INVESTIGATION ROUTINE

PUTTING THE PIECES TOGETHER ROUTINE

PROBLEMATIZING ROUTINE
OpenSciEd Instructional Model Routines

All units have an anchoring phenomenon or problem. This results in student-driven questions, ideas, and initial explanations that are then explored in future lessons.
Navigation occurs within and between lessons so that students see why they are doing each activity or investigation and how what they are learning connects to previous and upcoming lessons.
The Navigation Routine
Navigation Occurs Within a Lesson & Across a Unit

- Students often experience science class as a series of disconnected activities that lack coherence both within lessons and across the unit.

- We are going to watch a classroom video and think about how the teacher is supporting coherence within the lesson and across the whole unit.
Vignettes: Navigation Routine

- Individually re-read the 2 vignettes from two units on carbon cycling. Silently annotate, highlight or jot down examples of the Navigation Routine in each classroom.

Navigation occurs within and between lessons so that students see why they are doing each activity or investigation and how what they are learning connects to previous and upcoming lessons.

Vignettes: Navigation Routine

Small Group:

- Share some of the examples of the Navigation Routine from the vignette.
- How can these strategies support coherence for students?

Whole Group:

Be ready to share.
OpenSciEd Instructional Model

OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.
Switching hats

**Student hat:** Thinking like a kid. What do you anticipate a middle school student might think? What might they say? Channel your inner middle schooler.

**Teacher hat:** Reflecting on pedagogical approach, instructional routines, classroom culture, logistics/supports, NGSS, etc...

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**In Your Notebook**

Record what you notice and wonder as you watch the video about the Navajo Nation sky story.

<table>
<thead>
<tr>
<th>Navajo Nation sky story</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What I noticed</strong></td>
</tr>
<tr>
<td><strong>What I wonder</strong></td>
</tr>
</tbody>
</table>

→ Be ready to share your ideas with the class.

---

**Analyze Lesson 1 for UDL Principles**

With a partner:

- How were the 3 UDL principles evident in your anchoring phenomenon routine?
- How might you need to modify Lesson 1 to meet the needs of your diverse learners?
Navigation: Preparing to Observe the Sky

Turn and Talk

What were some of the things in the sky that we were interested in observing to figure out more about some of these patterns?
Native American Sky Story: Navajo Nation

In Your Notebook
Record what you notice and wonder as you watch the video about the Navajo Nation sky story.

Be ready to share your ideas with the class.
Native American Sky Story: Navajo Nation
Native American Sky Story: Paiute

In Your Notebook

Record what you notice and wonder as you watch the video about the Paiute sky story.

Be ready to share your ideas with the class.
Native American Sky Story: Paiute
Turn and Talk

With a Partner

- What similarities did you notice in each of the two Native American sky stories?
- What differences did you notice in each of the two Native American sky stories?
Your Observations of the Night Sky

With Your Class

- Have you heard of or seen the North Star?
- Are there other things you have noticed in the sky that don’t appear to move over time?
Observe the Sky

In Your Notebook
Record what you notice and wonder as you watch the video about the sky.

Be ready to share your ideas with the class.
Observe the Sky

The video is separated into two parts; January through June and July through December using two different points of view.

Group 1: Start at 0:08

Group 2: Start at 9:00

Be ready to share your ideas with the class.
Identifying Patterns

With Your Group

- What patterns did your group notice while observing the video of the sky?
- Were there any objects that did not follow a pattern?

Record each idea that your group comes up with on a sticky note in bold print so that everyone can see.

Be ready to post your sticky note on the Patterns in the Sky poster.
Scientists Circle

- What questions do we have about our observations of the sky?

Write one question per sticky.
Write in marker—big and bold.
Write your initials in pencil on the back of each sticky.
Building Understanding

With Your Class

- What do the patterns we identified from observing the sky help us determine about the interactions of:
  - the Earth and Sun?
  - the Earth and Moon?
  - the Earth and North Star?
  - the Earth and other stars?
Model Patterns in the Sky

With Your Class

- What objects should we include in our models?
- What movements should we include in our models?

In Your Notebook

Create a model to help explain why these objects appear to move the way they do.
You drew a model on a piece of paper today instead of working with 3D manipulatives to represent the movement of the objects in the system.

If we wanted to explain patterns that occur over the course of a year (e.g., changes in amount of sunlight each day), let's consider the following:

**With Your Class**

- What would be some possible advantages in developing a 3D model of the system?
- What are some possible disadvantages or limitations you think we may encounter with such a model?
Turn and Talk

What are some changes in activities that occur during certain times of the year that are related to changes in the amount of sunlight?

Have participants share out as a whole group to the question. Record on chart paper.

Introduce the word “solar”
Observe Changes in the Sun

With Your Class

What patterns do we think we are going to see related to the Sun over one day (24 hours) when we speed up time in the software?
Slide C

Making Predictions

With Your Class

What about if we speed it up even more and watch the Sun over a year? What patterns will we see?
Making Observations

With Your Team

Divide your team into smaller groups that will make the measurements over three to four months.

After the groups have made their measurements, share them with the rest of the team.

➔ Be ready to share these with the class.
Making Observations

Collect data for your respective months:


Be ready to share these with the class.
Share Measurements

Scientist Circle
Share your team’s measurement with the other team.
Observing Solar Patterns

With Your Class

- What yearly patterns do you observe?
- What evidence do you have for these patterns?
- What relationship do you think there is between these solar patterns?
Connections to Other Cultures

With Your Class

Think back to the stories we have heard in the previous lessons.

- What connections can you make between those stories and changes in the Sun during a year?
Do you think these year long patterns have happened over thousands of years? Why or why not?
Making Connections

With Your Class

- What connections can we make between the patterns in the data collected in this lesson back to the patterns identified by other civilizations we studied in earlier lessons?

- Look back to the model of the Earth-Sun-Moon system you made in Lesson 2. How could we use that model to see if the data we’ve collected can be explained by the model?
Modeling the System

With Your Group

- What parts of the system do we need to include in our 3D model in order to explain the patterns of the Sun from one year to the next that we collected in this lesson?
- What could we use to represent them?
- What changes could we make to the parts of the 3D model to see if the data we've collected can be explained by it.

➔ Be ready to share these with the whole class.
<table>
<thead>
<tr>
<th>Feature of the representation ...</th>
<th>is like this feature of the real world ...</th>
<th>because ...</th>
<th>and is not like it because ...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light bulb</td>
<td>Sun</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Large foam ball on a stick</td>
<td>Earth and its axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Round pushpin (with twist tie around it)</td>
<td>Person on earth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rubber band</td>
<td>Path the person follows over 24 hours (latitude line)</td>
<td></td>
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</tr>
</tbody>
</table>
Modeling Length of Day

Place 1 pushpin at sunrise and 1 push pin sunset, where the path of the observer (the rubber band) intersects with the shadow edge line (indicated with the dashed line in the slide photo). The diagram below shows one of these places it intersects.
Modeling Length of Day

The shorter the measurement, the less time the observer spends in the light and the more time the observer spends in the dark.
Modeling the Earth-Sun System in 3-D

1. Position your observer (round pushpin), and mark the observer’s path with a rubber band. Place the sphere on the wire stand, and push it down until it is level with the lightbulb.

2. One group member should move the foam Earth slowly around the lamp Sun while keeping the North Pole pointed at Polaris in the classroom. Pause at each of the positions illustrated on the handout and use pushpins to mark sunrise and sunset.

3. For each position, record the length of the observer’s path between the two pushpins (to the nearest half-inch). The shorter the measurement, the less time the observer spends in the light and the more time the observer spends in the dark. Then on the image of the horizon in the table draw what you predict the path of the Sun will look like for this observer at each position.
Evaluating Our Model

With Your Class

Make sure your model map is filled out.

Based on the measurements you have made, are our models accurate? How well does what you measured with our 3-D model match the data we recorded from the NOAA websites?
With Your Group

Modeling Assumptions:

- Earth spins on its axis.
- Earth’s axis points towards Polaris.
- Polaris is directly above us.
- The hours of daylight and nighttime flip during the year.

Which of the modeling assumptions would you change that would let us reach 15 hours of daylight?
Revise Our Modeling of the System

With Your Group
Adjust your group’s 3D models to better match the data we recorded.
Analyzing and Interpreting Our Data

With Your Class

- What adjustment did you make to your model that was the best fit for the data we recorded?
Lunch
12:00-1:00
OpenSciEd Universal Design Professional Learning

Engaging in Key Lessons - Lesson 10
With Your Class

- How did adjusting the orientation (tilt) of the Earth affect the following over the course of the year?
  - the amount of sunlight on the surface
  - the path of the Sun in the sky and the angle of the elevation of the Sun in the sky
- How does this change where we need to position the Polaris our model?
In Your Progress Tracker

- Write the question we are working on in the left column: *How can we explain the Sun’s path change over time?*
- Write what you figured out in the middle column. Use words and/or pictures. Take as much space as you need to record your thoughts.
- Write how this connects to or influences you, your community, or other communities in the right column.
Navigation: Brainstorm Phenomena

Turn and Talk

- What other phenomena on Earth could we explain with tilt?
- Which of the “Activities that happen when the amount of sunlight changes” could be explained by Earth’s tilt?
Unit Questions by Lesson

Driving Question: How are we connected to the patterns we see in the sky and space?

Lesson Set 1: How can we explain the patterns of the Sun we see and connect to in the sky and space?

Lesson 1
Students analyze how the sunset has aligned with human-made structures and consider other interesting patterns in the sky from their own experiences, community members’ ideas, and additional cultures’ stories about how these patterns are connected to the rhythms of human life.

Lesson 2-4
Students investigate patterns they and others have observed in the sky related to the Sun and stars, then analyze seasonal temperature data and to explain seasonal temperature variation and determine why the seasons are opposite in Australia from the United States.

Lesson 5:
Students use what they have figured out about the Earth and Sun system to model and explain the sunset alignment phenomena from Lesson 1.
Navigating from Lesson 4-10

Lesson 4: How do these changes in sunlight impact us here on Earth?

We analyze seasonal temperature data from 2 U.S. cities and argue that changes in Earth’s distance from the Sun do not explain seasonal temperature differences.

Using a physical model we figure out Earth’s tilt changes in solar elevation resulting in seasonal temperature changes.
Navigating from Lesson 4-10

Lesson 5: How can we explain phenomena like Manhattanhenge?

We use a video simulation to investigate patterns we think might be responsible for Manhattanhenge and revise a model to explain the phenomenon.

We then problematize the model to see where and how the moon fits in based on the DQB questions about the moon.
Unit Questions by Lesson

Driving Question: How are we connected to the patterns we see in the sky and space?

Lesson Set 2: How can we explain the patterns of the Moon we see and connect to in the sky and space?

Lesson 6-7

Students investigate patterns they and others have noticed in the shape of the moon over time for lunar phases and eclipses and develop a physical model of the earth, sun, moon system to explain and predict these patterns.

Lesson 6: Why do we see the shape of the Moon change?

Lesson 7: Why do we see eclipses and when do we see them?
Driving Question: How are we connected to the patterns we see in the sky and space?

Lesson Set 3: Why do we see colors change in the sky and space?

Lesson 8
Students analyze images of lunar eclipses, list possible causes for the unexpected changes in color and dimness in its appearance. They brainstorm other color related phenomena for object and add additional color-related questions and ideas for investigations.

Lesson 9-12
Students investigate what happens to the color, brightness, and bending of light as it moves from its source to their eyes (or other detectors) and then apply what they have figured out to lunar eclipses and to a new phenomenon: light changes underwater.
Navigating from Lesson 4-10

Lesson 8: What does a lunar eclipse look like and how can we explain it?

We analyze images of lunar eclipses and compare it to the predictive model.

We problematize how the color changing is not predicted within the model, so we motivate to explore related phenomena.

What causes a change in color for the Sun, Moon, or other things?

Ideas for Investigation:
- Use flashlights and spheres again
- Use simulations
- Analyze photos of these objects and when these color changes occur
- Shine lights on or through various things to look for color change
Navigating from Lesson 4-10

Lesson 9: Why do the Moon and Sun appear to change color near the horizon?

We investigate images of the Sun and Moon at different times of the day.

We examine how the Earth’s atmosphere is relevant as well as the different angles of light, which we are motivated to investigate these variables further.
Using the Talk Goals and Moves
OpenSciEd Discussion Types

- Consensus Discussion
- Initial Ideas Discussion
- Building Understanding Discussion
- Building Understanding Discussion

Discussion Types Explained:

1. **Initial Ideas Discussion**
2. **Building Understanding Discussion**
3. **Consensus Discussion**
<table>
<thead>
<tr>
<th>Type</th>
<th>Purpose</th>
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</thead>
<tbody>
<tr>
<td>Initial Ideas Discussion</td>
<td>● Share initial ideas and experiences</td>
</tr>
<tr>
<td></td>
<td>● An initial tentative chance at sense making</td>
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<tr>
<td></td>
<td>● Realize there are gaps in understanding and support wondering how to figure these out</td>
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<tr>
<td>Building Understanding Discussion</td>
<td>● Share claims and reasoning based on evidence</td>
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<td></td>
<td>● Connect, critique and build on each others’ findings</td>
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<tr>
<td>Consensus Discussion</td>
<td>● Collectively work towards a common model</td>
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<td>● Take stock and capture areas of agreement</td>
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</tbody>
</table>
Use the handout to record any of your observations related to the Goals and Moves.

Video Context:

● This video is from a high school chemistry class. This is at the end of day 1 of the Lightning Unit.

● After previously brainstorming with a partner, students now share ideas and then co-develop a class consensus model to explain what causes lightning.
Observing Productive Talk
High School Teachers’ Community Agreements Reflection

Listen to two high school teachers reflect on classroom discussion. Pay attention for any of the agreements from the reading.
NSTA Survey

- Location:
  Charlotte, NC ESS
- Presenter 1:
  Holly Hereau
- Leave Presenter 2 and Presenter 3 blank
- Scroll down and answer the last 2 questions (17 and 18) then hit “submit”

Reflection and Navigation
Individual Reflection

Day 3: How can we support students in sensemaking discussions?

● Jot down ideas for day 3 in terms of what you have figured out and any lingering questions.

<table>
<thead>
<tr>
<th>PD Questions</th>
<th>What have you figured out?</th>
<th>What do you wonder? What questions do you still have?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1: What does it mean to see phenomena and questions to support student sensemaking?</td>
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<tr>
<td>Day 2: How do we help students see coherence across the curriculum?</td>
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<tr>
<td>Day 3: How can we support students in sensemaking discussions?</td>
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<tr>
<td>Day 4: How do we support and assess student growth in 3 dimensional learning?</td>
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</tbody>
</table>
OpenSciEd units are based on a science storyline.

- Each step is driven by students’ questions that arise from phenomena.
Link out to CM L1 Unit 1

https://docs.google.com/presentation/d/1QXVBt_K1B-uSTCnMGeUrS30IaRZ7ekQwJudqQmZKmyk/edit#slide=id.g21214093394_0_0