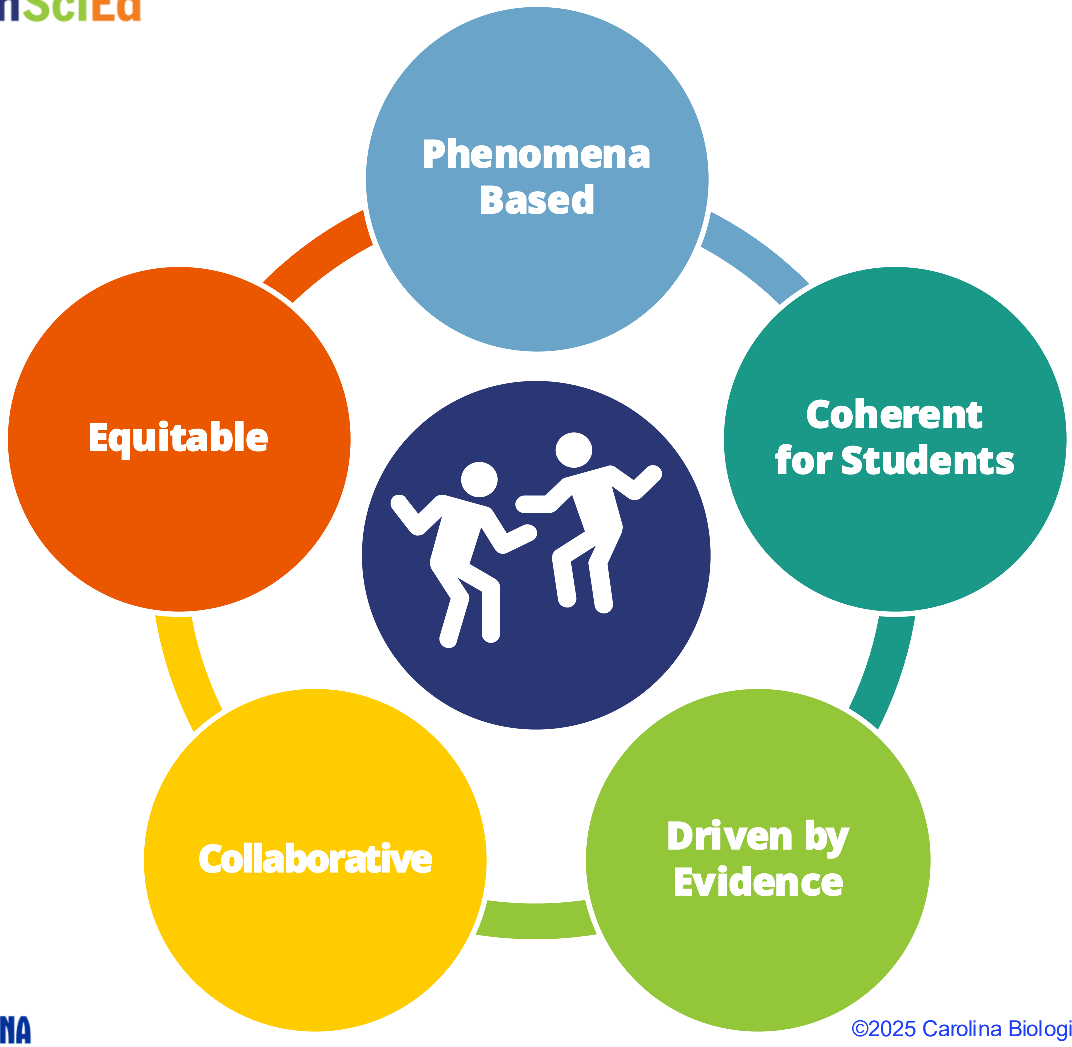
CAROLINA
UNLEASH LEARNING™

CAROLINA® + OpenSciEd®

High-Quality Instructional Materials Just Got Even Better.

Designed and Built with Students Front and Center



- Exploration is driven by **students'** questions and ideas
- Builds on **students'** prior knowledge and experiences
- **Students** use evidence to revise their thinking
- **Students** figure out ideas as classroom community

Transforming Science Education

Funded by Renowned Philanthropic Organizations

Bill & Melinda Gates Foundation

Carnegie Corporation of New York

Charles and Lynn Schusterman Family Foundation

William and Flora Hewlett Foundation

Developed by Leading Education and Research Institutions

BSCS Science Learning Team

Dana Center Team

Northwestern University Team

University of Colorado Boulder Team

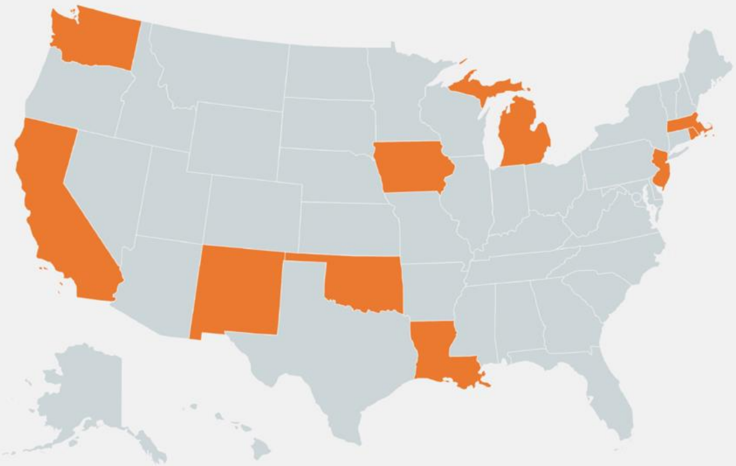
Boston College Team

Field Tested by Teachers and Students Across the Country

OpenSciEd Teachers & Students

265 field test teachers
and
5800 participating students
in
115 school districts
in
10 states
teach the OpenSciEd units and provide feedback.

The 10 OpenSciEd Partner States



California
Iowa
Louisiana
Massachusetts
Michigan
New Jersey
New Mexico
Oklahoma
Rhode Island
Washington

CAROLINA UNLEASH LEARNING

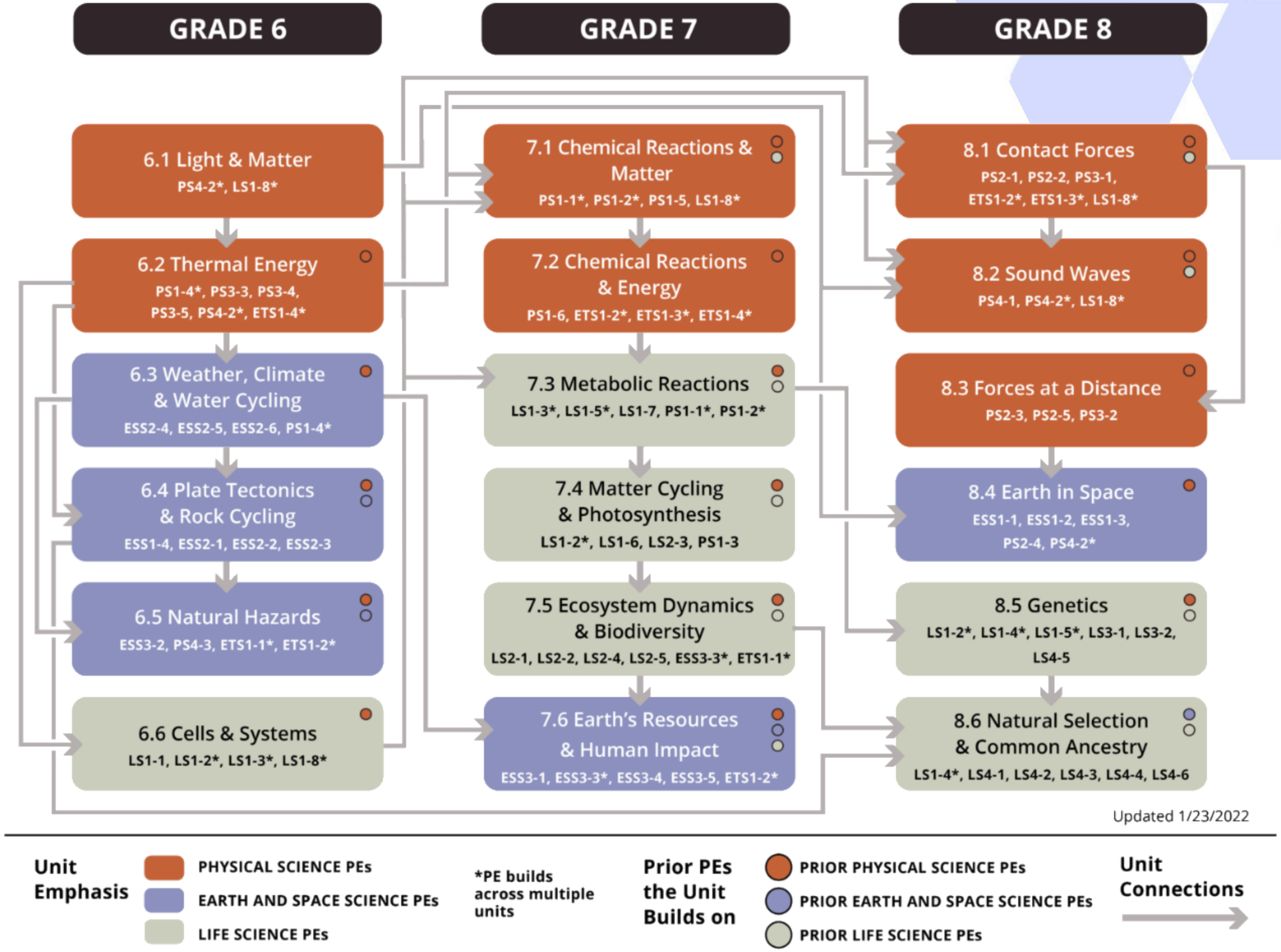
OpenSciEd

How OpenSciEd Materials Rank

All units were reviewed by the Science Peer Review Panel at NextGenScience using the EQuIP Rubric.

- ALL units are rated Quality Examples of Science Lessons and Units
- 16 units received the High Quality NGSS Design Badge ranking
- EdReports® reviewed OpenSciEd and determined it meets expectations for all 3 gateways

Middle School Scope & Sequence

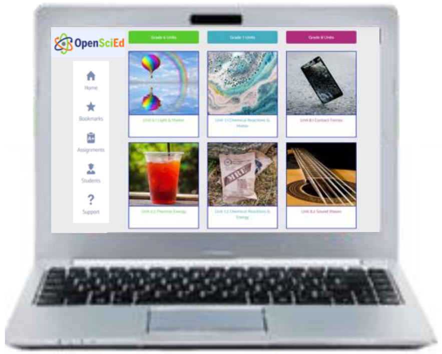


Carolina Certified Version

Redesigned Print Materials

Simplified Investigations

Enhanced Digital Content



Redesigned Print Materials

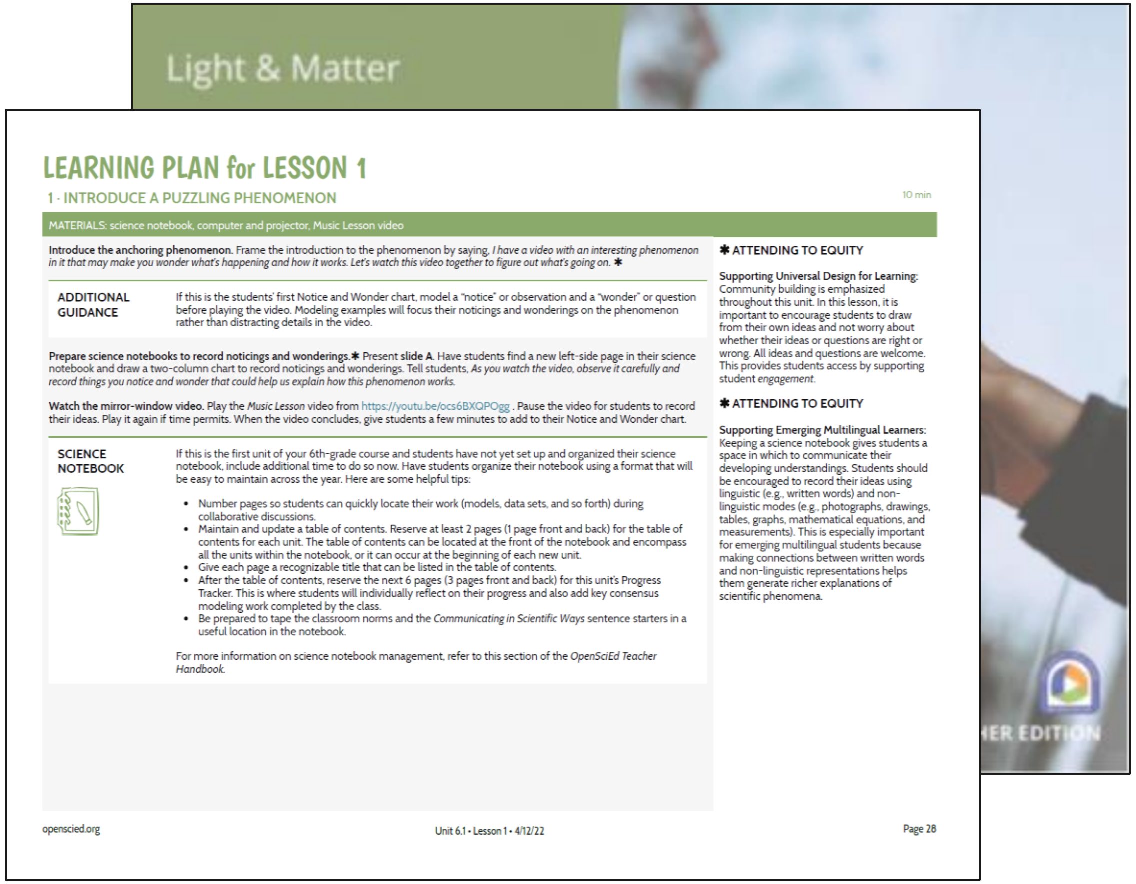
TEACHER EDITION

- Reformatted to traditional portrait format
- Reorganized content with a consistent flow that is simple to follow
- Improved layout, labeling, callouts, and images that are easy to read
- ADA compliant

STUDENT EDITION

- Bound print versions of all student resources organized **by lesson**
- Includes all handouts, references, and readings
- Student Procedures and Assessments available online
- ADA compliant

Redesigned Teacher Edition



Light & Matter

LEARNING PLAN for LESSON 1

1 · INTRODUCE A PUZZLING PHENOMENON

10 min

MATERIALS: science notebook, computer and projector, Music Lesson video

Introduce the anchoring phenomenon. Frame the introduction to the phenomenon by saying, *I have a video with an interesting phenomenon in it that may make you wonder what's happening and how it works. Let's watch this video together to figure out what's going on.* ✱

ADDITIONAL GUIDANCE — If this is the students' first Notice and Wonder chart, model a "notice" or observation and a "wonder" or question before playing the video. Modeling examples will focus their noticings and wonderings on the phenomenon rather than distracting details in the video.

Prepare science notebooks to record noticings and wonderings. ✱ Present slide A. Have students find a new left-side page in their science notebook and draw a two-column chart to record noticings and wonderings. Tell students, *As you watch the video, observe it carefully and record things you notice and wonder that could help us explain how this phenomenon works.*

Watch the mirror-window video. Play the *Music Lesson* video from https://youtu.be/ocs6BXQPOgg . Pause the video for students to record their ideas. Play it again if time permits. When the video concludes, give students a few minutes to add to their Notice and Wonder chart.

SCIENCE NOTEBOOK — If this is the first unit of your 6th-grade course and students have not yet set up and organized their science notebook, include additional time to do so now. Have students organize their notebook using a format that will be easy to maintain across the year. Here are some helpful tips:

- Number pages so students can quickly locate their work (models, data sets, and so forth) during collaborative discussions.
- Maintain and update a table of contents. Reserve at least 2 pages (1 page front and back) for the table of contents for each unit. The table of contents can be located at the front of the notebook and encompass all the units within the notebook, or it can occur at the beginning of each new unit.
- Give each page a recognizable title that can be listed in the table of contents.
- After the table of contents, reserve the next 6 pages (3 pages front and back) for this unit's Progress Tracker. This is where students will individually reflect on their progress and also add key consensus modeling work completed by the class.
- Be prepared to tape the classroom norms and the *Communicating in Scientific Ways* sentence starters in a useful location in the notebook.

For more information on science notebook management, refer to this section of the *OpenSciEd Teacher Handbook*.

✱ ATTENDING TO EQUITY

Supporting Universal Design for Learning: Community building is emphasized throughout this unit. In this lesson, it is important to encourage students to draw from their own ideas and not worry about whether their ideas or questions are right or wrong. All ideas and questions are welcome. This provides students access by supporting student engagement.

✱ ATTENDING TO EQUITY

Supporting Emerging Multilingual Learners: Keeping a science notebook gives students a space in which to communicate their developing understandings. Students should be encouraged to record their ideas using linguistic (e.g., written words) and non-linguistic modes (e.g., photographs, drawings, tables, graphs, mathematical equations, and measurements). This is especially important for emerging multilingual students because making connections between written words and non-linguistic representations helps them generate richer explanations of scientific phenomena.

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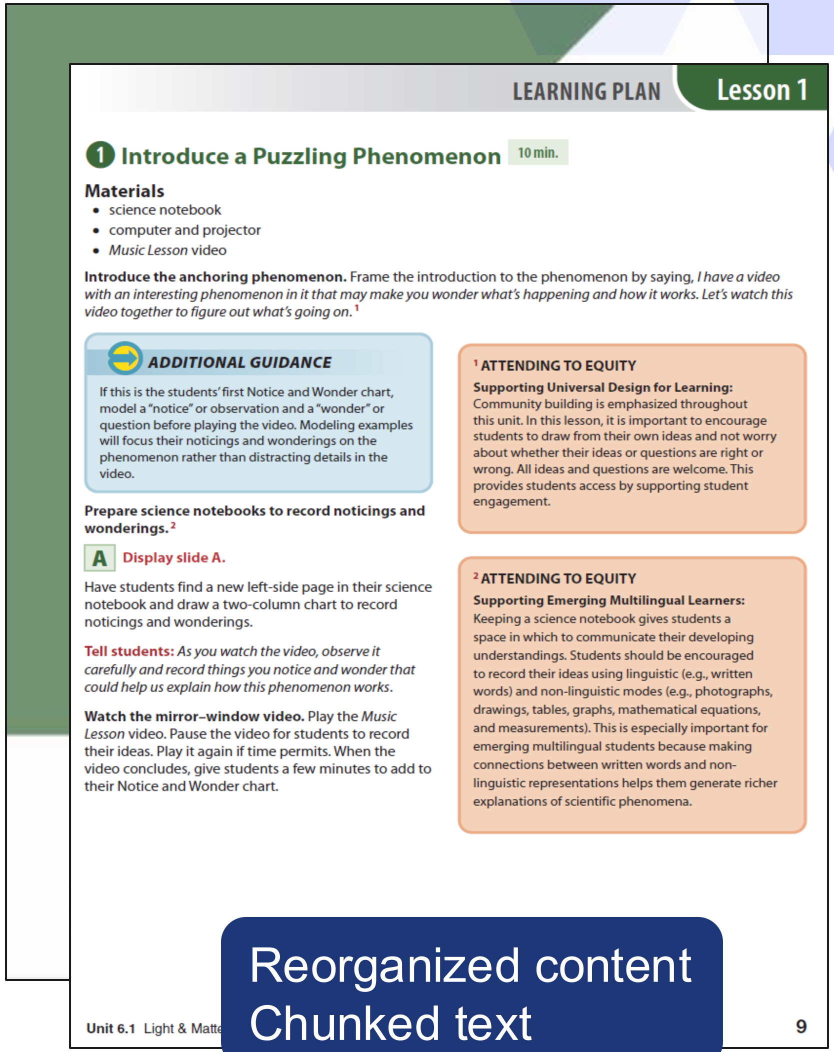

LEARNING PLAN **Lesson 1**

1 Introduce a Puzzling Phenomenon 10 min.

Materials

- science notebook
- computer and projector
- *Music Lesson* video

Introduce the anchoring phenomenon. Frame the introduction to the phenomenon by saying, *I have a video with an interesting phenomenon in it that may make you wonder what's happening and how it works. Let's watch this video together to figure out what's going on.*[1]

ADDITIONAL GUIDANCE

If this is the students' first Notice and Wonder chart, model a "notice" or observation and a "wonder" or question before playing the video. Modeling examples will focus their noticings and wonderings on the phenomenon rather than distracting details in the video.

Prepare science notebooks to record noticings and wonderings.[2]

A Display slide A.

Have students find a new left-side page in their science notebook and draw a two-column chart to record noticings and wonderings.

Tell students: *As you watch the video, observe it carefully and record things you notice and wonder that could help us explain how this phenomenon works.*

Watch the mirror–window video. Play the *Music Lesson* video. Pause the video for students to record their ideas. Play it again if time permits. When the video concludes, give students a few minutes to add to their Notice and Wonder chart.

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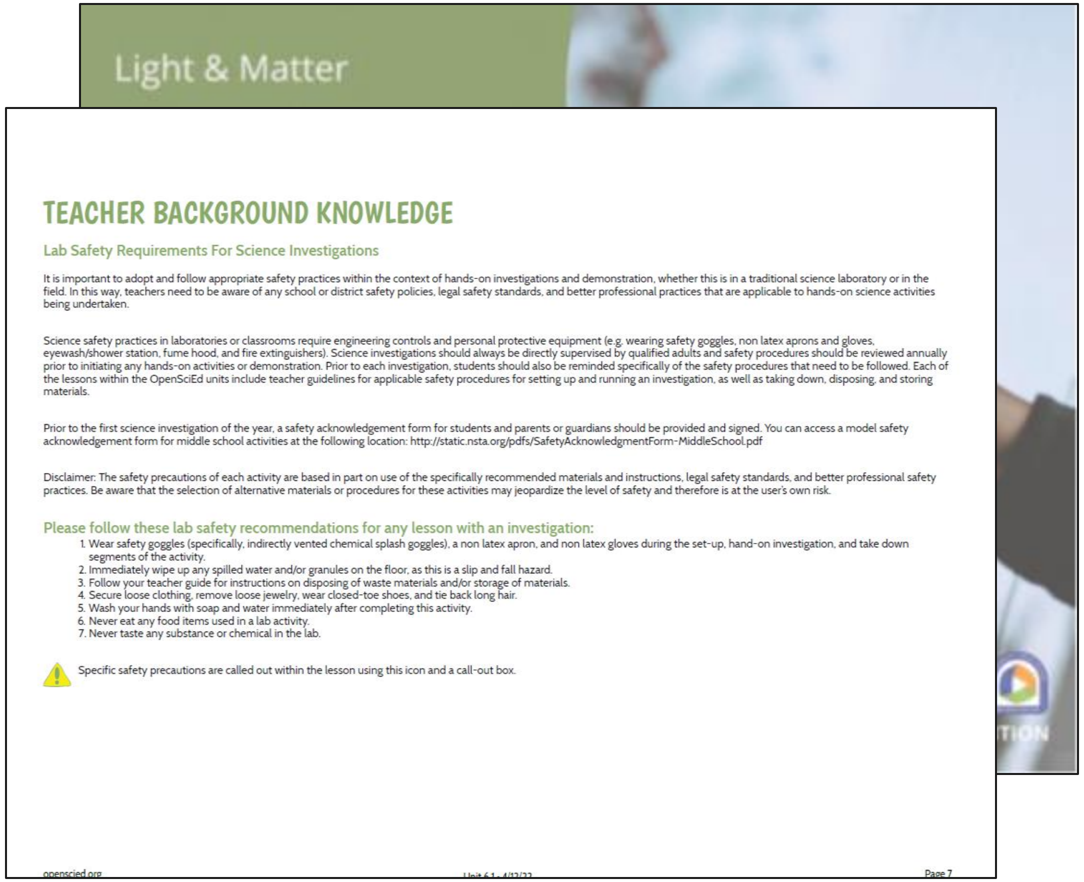
Unit 6.1 Light & Matte… 9

Reorganized content
Chunked text

Redesigned Teacher Edition



Light & Matter

TEACHER BACKGROUND KNOWLEDGE

Lab Safety Requirements For Science Investigations

It is important to adopt and follow appropriate safety practices within the context of hands-on investigations and demonstration, whether this is in a traditional science laboratory or in the field. In this way, teachers need to be aware of any school or district safety policies, legal safety standards, and better professional practices that are applicable to hands-on science activities being undertaken.

Science safety practices in laboratories or classrooms require engineering controls and personal protective equipment (e.g. wearing safety goggles, non latex aprons and gloves, eyewash/shower station, fume hood, and fire extinguishers). Science investigations should always be directly supervised by qualified adults and safety procedures should be reviewed annually prior to initiating any hands-on activities or demonstration. Prior to each investigation, students should also be reminded specifically of the safety procedures that need to be followed. Each of the lessons within the OpenSciEd units include teacher guidelines for applicable safety procedures for setting up and running an investigation, as well as taking down, disposing, and storing materials.

Prior to the first science investigation of the year, a safety acknowledgement form for students and parents or guardians should be provided and signed. You can access a model safety acknowledgement form for middle school activities at the following location: http://static.nsta.org/pdfs/SafetyAcknowledgmentForm-MiddleSchool.pdf

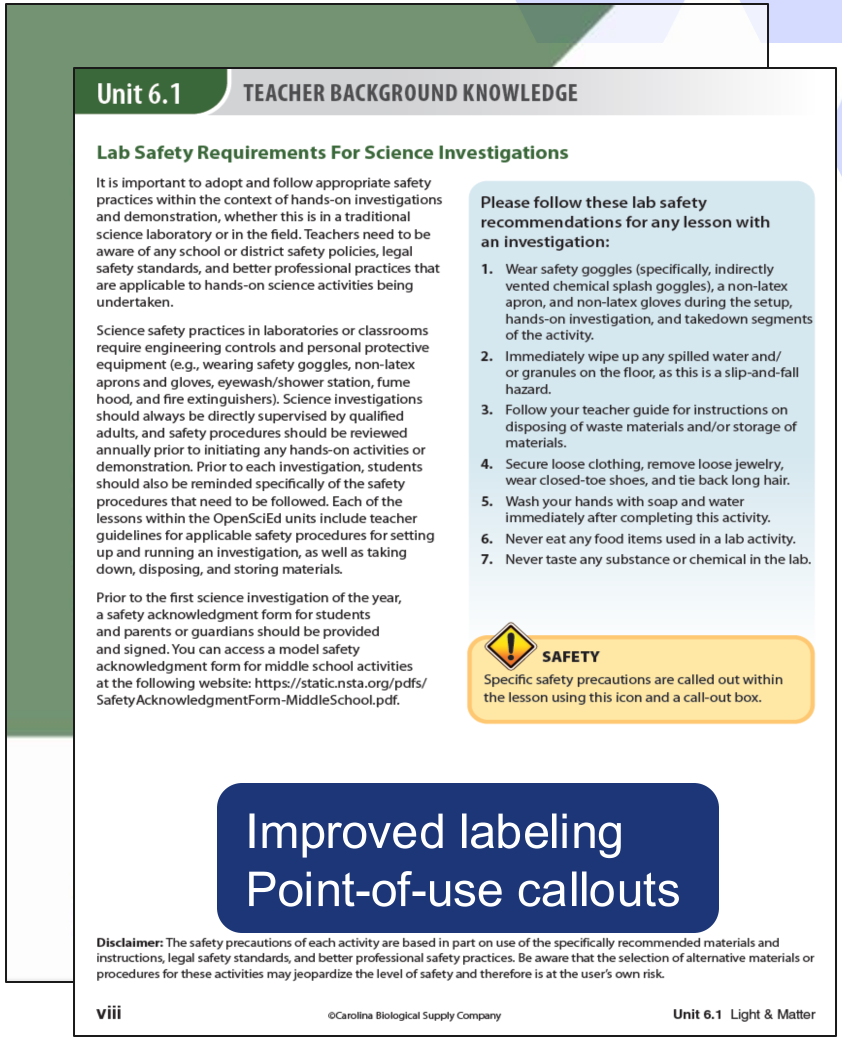
Disclaimer: The safety precautions of each activity are based in part on use of the specifically recommended materials and instructions, legal safety standards, and better professional safety practices. Be aware that the selection of alternative materials or procedures for these activities may jeopardize the level of safety and therefore is at the user's own risk.

Please follow these lab safety recommendations for any lesson with an investigation:

1. Wear safety goggles (specifically, indirectly vented chemical splash goggles), a non latex apron, and non latex gloves during the set-up, hand-on investigation, and take down segments of the activity.
2. Immediately wipe up any spilled water and/or granules on the floor, as this is a slip and fall hazard.
3. Follow your teacher guide for instructions on disposing of waste materials and/or storage of materials.
4. Secure loose clothing, remove loose jewelry, wear closed-toe shoes, and tie back long hair.
5. Wash your hands with soap and water immediately after completing this activity.
6. Never eat any food items used in a lab activity.
7. Never taste any substance or chemical in the lab.

Specific safety precautions are called out within the lesson using this icon and a call-out box.

openscied.org Page 7



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SAFETY
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viii ©Carolina Biological Supply Company **Unit 6.1** Light & Matter

Improved labeling
Point-of-use callouts

Simplified Investigations and Materials

"How can we make this lesson easier, reduce cost, and enhance safety?"

- All materials are tested to ensure safety, quality, and accuracy of investigations
- Some materials have been changed to simplify lab setups
- High-quality videos or teacher demonstrations are available to save time or address safety concerns (e.g., open flame)

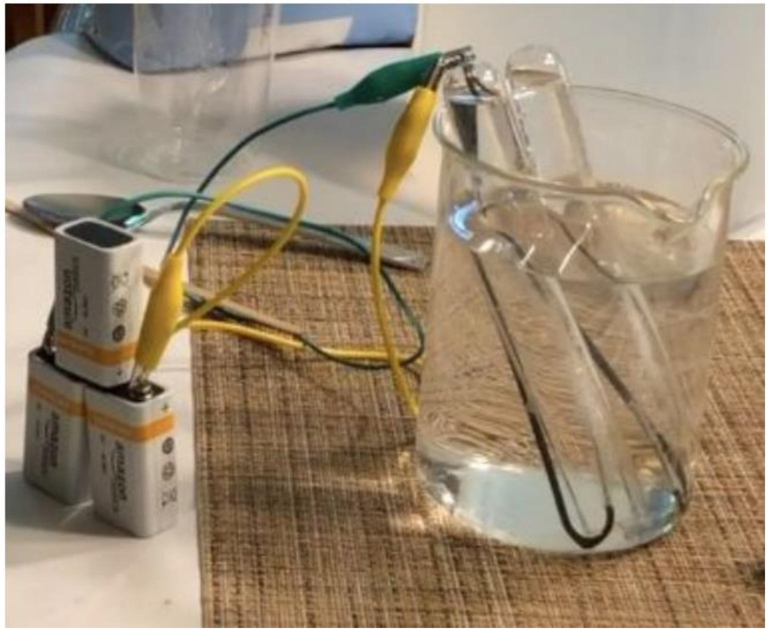
6.1 Light & Matter

OER Resources:
- Two banker boxes
- Teacher prep ~20 mins per group (2.5 to 3 hours total)

Carolina Resources:
- One cardboard box
- Teacher prep ~10 mins per group; recommend that students do setup

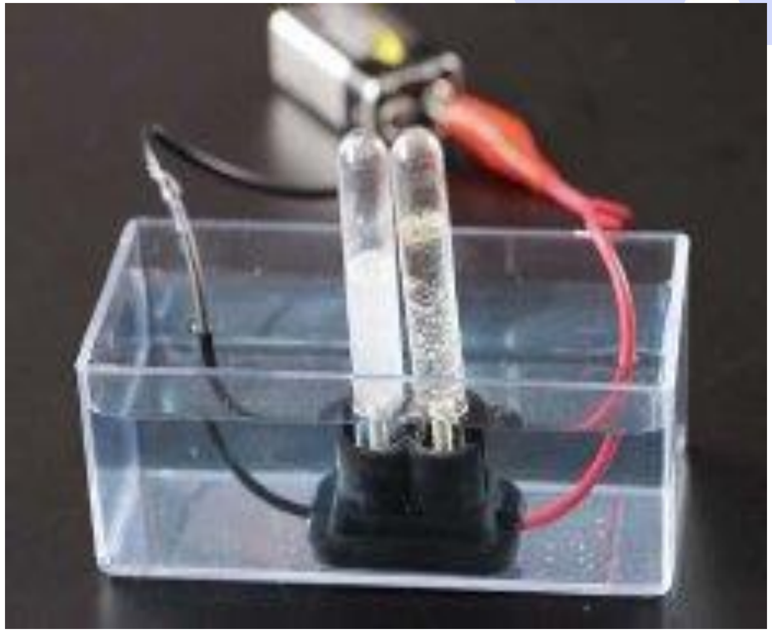
✓ Fewer materials
✓ Cut prep time in half or more
✓ Better storage option

7.1 Chemical Reactions



OER Resources:

- Electrolysis setup made of expensive individual materials
- Difficult and time-consuming to set up



Carolina Resources:

- Carolina® proprietary micro electrolysis apparatus

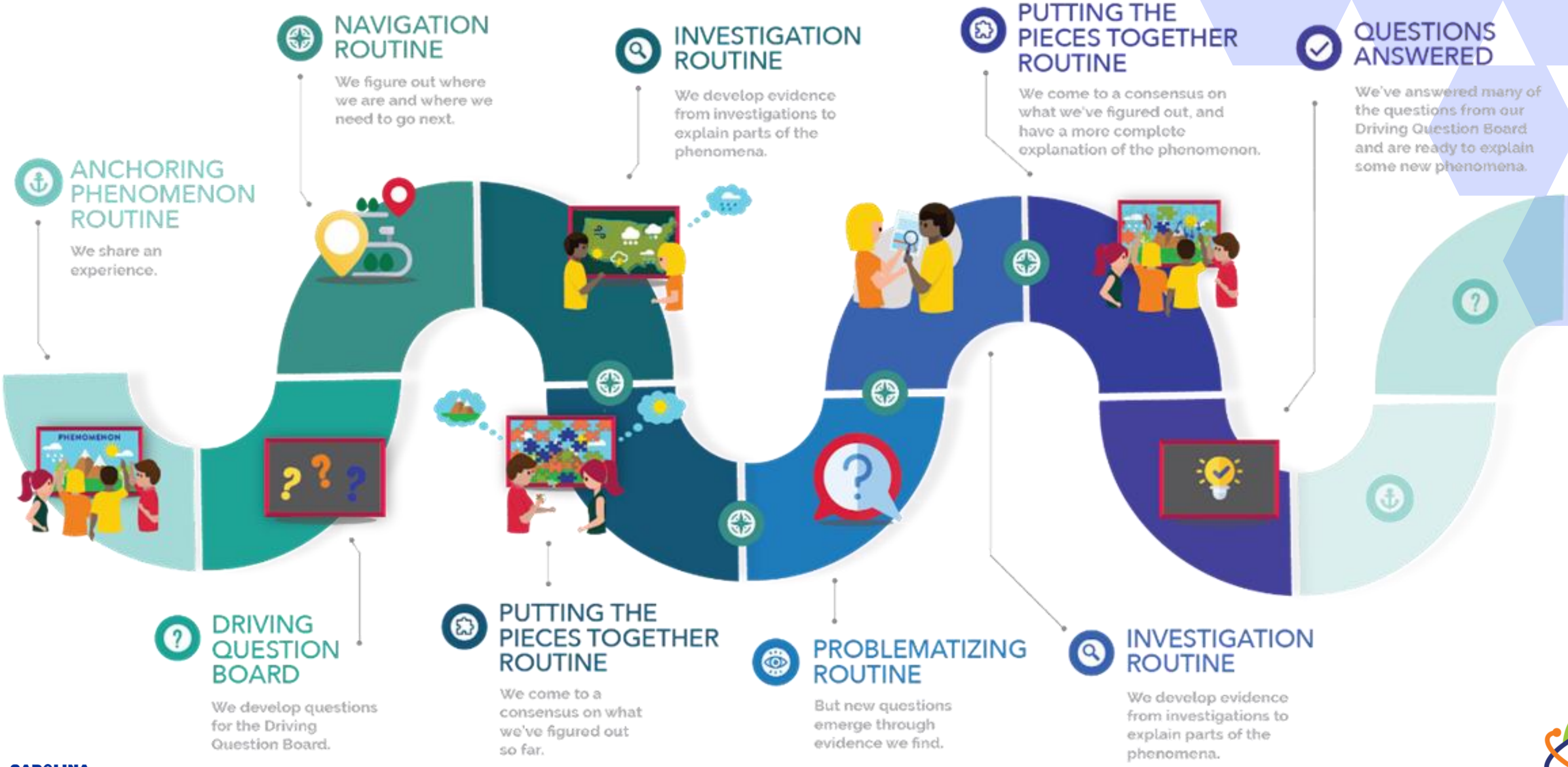
✓ Less expensive
✓ Set up in 5 mins

Instructional Routines

Each step is driven by student questions about the phenomenon.

Anchoring Phenomenon Routine	How do we kick off investigations in a unit?
Navigation Routine	How do we work with students to motivate the next step in an investigation?
Investigation Routine	How do we help students use practices to figure out pieces of the science ideas?
Putting the Pieces Together Routine	How do we help student put together pieces of the disciplinary core ideas and crosscutting concepts?
Problematizing Routine	How do we push students to go deeper and revise their science ideas?

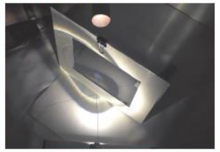
OpenSciEd Storyline Instructional Model



Unit Storyline

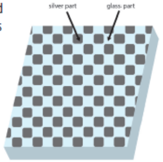
Why do we sometimes see different things when looking at the same object?

How students will engage with each of the phenomena: Hands-On/Lab Activities, Videos or Images, Data Sets, Readings, Computer Interactives

Lesson Question	Phenomena or Design Problem	What we do
LESSON 1 4 days ***How can something act like a mirror and a window at the same time?*** Anchoring Phenomenon	A piece of material looks like a mirror from one side and a window from the other side. 	We watch a puzzling video of a person who can see their reflection in what seems to be a mirror. The person doesn't see the people on the other side of the mirror, but those people can see through it like a window. We wonder how something can act like a mirror and window at the same time. We investigate the system using a box model that represents it. We develop an Initial Class Consensus Model, brainstorm related phenomena, and develop a Driving Question Board and an Ideas for Investigation chart.
Navigation to Next Lesson: We figure out that the light on the other side of the mirror-window is likely important to whether it acts like a mirror or a window. We make predictions about how switching the light from Room A to Room B will affect what is seen.		
LESSON 2 1 day ***What happens if we change the light?*** Investigation	The one-way mirror phenomenon happens when there is a difference in light between the two sides of the material. 	In this lesson, we observe the one-way mirror in and out of the box model. We move the flashlight to Room B, make both rooms light, and make both rooms dark.
Navigation to Next Lesson: We figure out that the difference in light between the rooms is causing us to see different things from either side of the one-way mirror in the box model.		
LESSON 3 3 days ***What happens when light shines on the one-way mirror?*** Investigation	Different materials reflect and transmit different amounts of light, as measured quantitatively by a light meter. 	We know that the one-way mirror acts like a mirror in a brightly lit room and acts like a window in a dark room. To figure out why it behaves this way, we compare what happens when light shines on the one-way mirror, a pane of glass, and a regular mirror. We record initial observations and then use a light meter to measure the amount of light transmitted through and reflected off each of those materials. We use a tool to develop an experimental question and then plan the investigation. We document our observations and analyze data to figure out what happens when light shines on the one-way mirror.
Navigation to Next Lesson: We think the one-way mirror acts like a regular mirror because the two materials have something in common. But, we know they are not exactly the same, since the one-way mirror lets some light transmit and the mirror doesn't.		

Why do we sometimes see different things when looking at the same object?

How students will engage with each of the phenomena: Hands-On/Lab Activities, Videos or Images, Data Sets, Readings, Computer Interactives

Lesson Question	Phenomena or Design Problem	What we do
LESSON 4 1 day ***How do similar amounts of light transmit through and reflect off the one-way mirror?*** Investigation	A one-way mirror has a thin silver layer compared to a regular mirror that is fully silvered and glass that is not silvered. 	We wonder how similar amounts of light transmit through and reflect off the one-way mirror. We think it has something to do with how the one-way mirror is made. We read more about regular mirrors and one-way mirrors and find out that regular mirrors have a thick layer of silver on the glass, and one-way mirrors have a thin layer of silver embedded in a plastic film on the glass. We modify a model to explain what happens when light shines on the different structures in each material.
Navigation to Next Lesson: In this lesson, we figured out that the one-way mirror is structured to transmit and reflect about the same amount of light due to half-silvering.		
LESSON 5 1 day ***How do light and the one-way mirror interact to cause the one-way mirror phenomenon?*** Putting Pieces Together, Problematizing	TThe one-way mirror acts as a mirror on the lit side and as a window on the dark side. 	In this lesson, we revisit the anchoring phenomenon and model interactions between light, the people, and the one-way mirror to explain why the music student and the teacher both see the music student. We realize that a little light reflects off the teacher and enters the student's eyes, which makes us wonder why the student doesn't see the teacher.
Navigation to Next Lesson: We figure out that there are two light inputs into the student's eyes: light that has reflected off the student and light that has reflected off the teacher. We wonder why the student doesn't see the teacher, and we share initial ideas.		
LESSON 6 2 days ***Why does the music student not see the teacher?*** Investigation	What we see is determined by the interactions between the light that enters the eye, the structures that make up the eye, and the brain, which processes the signals it receives from the eye through the optic nerve. 	In this lesson, we know that light has reflected off the teacher and enters the student's eyes. We wonder why the student can't see the teacher. To figure this out, we obtain more information about what happens when light enters the eye. We model how light inputs transform into signals that the brain processes to tell us what we see. We think about experiences from our everyday lives to help us explain why we see some inputs of light better than other inputs.
Navigation to Next Lesson: Now that we know how the eye and brain make sense of light inputs, we are ready to develop an explanation for the one-way mirror phenomenon.		

Why do we sometimes see different things when looking at the same object?

How students will engage with each of the phenomena: Hands-On/Lab Activities, Videos or Images, Data Sets, Readings, Computer Interactives

Lesson Question	Phenomena or Design Problem	What we do
LESSON 7 1 day ***Why do the music student and the teacher see the music student, but the music student can't see the teacher?*** Putting Pieces Together	The music student can see their reflection in the mirror on the lit side but cannot see the teacher. The teacher on the dark side can see the music student through the glass. 	In this lesson, we review the class models from Lessons 5 and 6, the class science ideas list, and our individual Progress Trackers. As a class, we develop a written explanation to answer the question: Why does the teacher see the music student? We individually draft an explanation to answer the question: Why does the music student see themself but not the teacher? We self-assess our explanations and give and receive peer feedback on them. We then revise a final explanation.
Navigation to Next Lesson: We developed an explanation for the anchoring phenomenon and celebrated our accomplishments. In the next lesson, we will apply our model to related phenomena to see what else we can explain.		
LESSON 8 3 days ***Why do we sometimes see different things when looking at the same object?*** Investigation, Putting Pieces Together	Materials like glass can act like one-way mirrors when there is a differential in light on both sides of the glass. 	We investigate the best light conditions for the one-way mirror phenomenon to occur and decide the effect is greatest when there is a large difference in light on both sides of the material. We use this idea to investigate related phenomena. We conclude that other materials, like glass, can act like one-way mirrors in situations in which there is a similar light differential on either side of the material. We use our model and science ideas to demonstrate what we have learned on an assessment. We revisit the DQB to document the questions we have answered in the unit and to reflect on our learning.

LESSONS 1–8: 18 days total

CAROLINA UNLEASH LEARNING

OpenSciEd

Teacher Edition

Lesson 2

What happens if we change the light?

Previous Lesson	We watched a video of a music student who could see their reflection in what seemed to be a mirror. The student couldn't see the teacher on the other side, but the teacher could see the student. We investigated the scenario using a box model and developed an Initial Class Consensus Model. We brainstormed related phenomena that might help us explain how the one-way mirror works. We developed our Driving Question Board and ideas for investigations to help answer our questions.
This Lesson Investigation 3 days	 In this lesson, we take the one-way mirror out of the box model and observe that it is partially reflective and partially see-through and looks the same from both sides. We wonder about the role of light in affecting what we see. We move the flashlight to Room B and investigate making both rooms light and both rooms dark. We agree that the one-way mirror phenomenon is strongest when there is a large difference in light between the rooms. We reach consensus that arrows in our models should represent the path of light rather than our line of sight. We document and share related phenomena from our lives.
Next Lesson	To figure out why the one-way mirror acts like a mirror and a window, we will observe what happens when light shines on three different materials. We will develop a testable question, plan an investigation, and use a light meter to measure the amount of light that transmits through and reflects off each material.

BUILDING TOWARD NGSS
MS-PS4-2, MS-LS1-8

What students will do

- 2.A Ask questions that can be investigated in the classroom and frame a hypothesis about what we will see from both sides of the box model if we change the amount of light on either side (structure).
- 2.B Modify a model based on evidence to match changes in what we see when we change the light in the box model (structure).

What students will figure out

- When we change the location of the light in the box system, the phenomenon reverses.
- Reflection happens on the side that is lit, while the side that is dark is see-through.
- The one-way mirror phenomenon is strongest when there is a large difference in light between the rooms.
- Light travels in straight lines (reinforce 4th-grade understanding).
- For us to see an object, light must leave a light source, bounce off the object, and travel in a direct path to enter our eyes (reinforce 4th-grade understanding).

Part	Duration	Summary	Slide	Materials
1	7 min	**NAVIGATION** Remind students about Lesson 1's home learning self-documentation assignment. Motivate taking the one-way mirror out of the box model to make observations.	A–B	None
2	6 min	**OBSERVE THE ONE-WAY MIRROR OUTSIDE THE BOX MODEL** Take the one-way mirror out of the box model to make and discuss observations.	C	1 picture mat set with one-way mirror film
3	10 min	**SWAP THE LIGHT AND MAKE OBSERVATIONS OF THE BOX MODEL** Move the light from Room A to Room B and make observations.	D–E	*Light Swap Investigation*, in *Lesson 2 Student Procedure*
4	10 min	**IDENTIFY QUESTIONS ABOUT LIGHT THAT WE CAN INVESTIGATE IN THE CLASSROOM** Discuss related phenomena involving a light difference. Identify new questions about changing the light to test using the box model.	F–G	Related Phenomena list (from Lesson 1), Driving Question Board (from Lesson 1)
5	12 min	**TEST DIFFERENT LIGHTING SCENARIOS IN THE BOX MODEL** Investigate what we see when there are lights on in both rooms and lights off in both rooms.	H–J	Testing Light Scenarios Investigation, in *Lesson 2 Student Procedure*

End of Day 1

Teacher Edition

2 Observe the One-Way Mirror Outside the Box Model 6 min.

Materials
- 1 picture mat set with one-way mirror film

Remove the one-way mirror and make observations.

C Display slide C.

Demonstrate how to slide the one-way mirror out of the box model. Assign students to small groups, and then give them time to remove their mirror and make observations of the material.

Discuss observations as a class.[1] Come to consensus about observations when the one-way mirror material is out of the box model in the classroom:

- Outside the box model, you can see your reflection and see through it at the same time.
- It doesn't have the same effect of being a mirror and window when it's outside the box model. No matter which direction the material is facing, it looks the same.
- The material looks different in different lighting situations.
- The light difference between the sides in the box model is important for causing the one-way mirror phenomenon.

[1] **ATTENDING TO EQUITY**

Supporting Emerging Multilingual Learners: Scaffolds such as the Communicating in Scientific Ways sentence starters can model and facilitate oral or written language production skills. Remind all students that they have this tool and can use the sentence starters to help them communicate. Such scaffolds may be of particular benefit for emerging multilingual students to help them develop language skills to write or communicate their ideas to peers. It is important that scaffolds be used purposefully and removed when no longer needed.

Suggested prompt	Sample student response	Follow-up question
What did you observe?	*The material is flimsy, grayish, and seems to only have one layer.* *I could see my reflection and could see through it at the same time*	*Does it look the same or different from either side?*
How is this similar to, and different from, what you observed when the one-way mirror was in the box model?	*It's acting like a mirror and a window at the same time rather than one or the other.* *When it's out of the box, you can see through it and see your reflection at the same time.*	*What about the classroom is different from the box model setup that might be causing the phenomenon to change?*

3 Swap the Light and Make Observations of the Box Model 10 min.

Materials
- Light Swap Investigation
- science notebook

Motivate investigating the light further. Emphasize that our observations with the one-way mirror in the classroom did not involve any differences between the amount of light on the two sides of the one-way mirror, whereas all of our previous observations in the box model had one side dark and one side light. Remind students of the light-related questions we posted on the DQB.

Introduce the lesson question.

D Display slide D.

Remind students that many of them wondered whether light causes the one-way mirror phenomenon. Introduce the lesson question: "What would happen if we changed the light?"[2]

Establish the purpose of moving the light. Ask students to consider how moving the light to Room B would help us investigate our idea that having the light on one side matters for the one-way mirror effect. Have a few students share.

[2] **SUPPORTING STUDENTS IN ENGAGING IN ASKING QUESTIONS AND DEFINING PROBLEMS**

The lesson question is a "what would happen if" question, which is open-ended because it does not have a simple yes or no answer, yet prompts little explanation from students. "What would happen if" questions lead students to do two important things:

- to discover new aspects of the phenomenon that students may not have noticed before
- to generate and record new how or why explanatory questions about the phenomenon

To press students to explain the phenomenon, we often follow "what would happen if" questions with how and why explanatory questions.

Suggested prompt[3]	Sample student response
If we move the light to the other side of the box model and make observations, how would that help us support our claim that light on one side is important for the one-way mirror phenomenon?	*If we see the same thing as before, but reversed, then having light on one side of the one-way mirror is what's important for causing the one-way mirror phenomenon, no matter which side it's on.* *If we see something different when we move the light, then it matters which side the light is on.*

Show the modified box models for investigation. Describe the following modifications you made to the box models:

- Cover the opening in Room A's ceiling.
- Move the flashlight to the hole in Room B's ceiling.

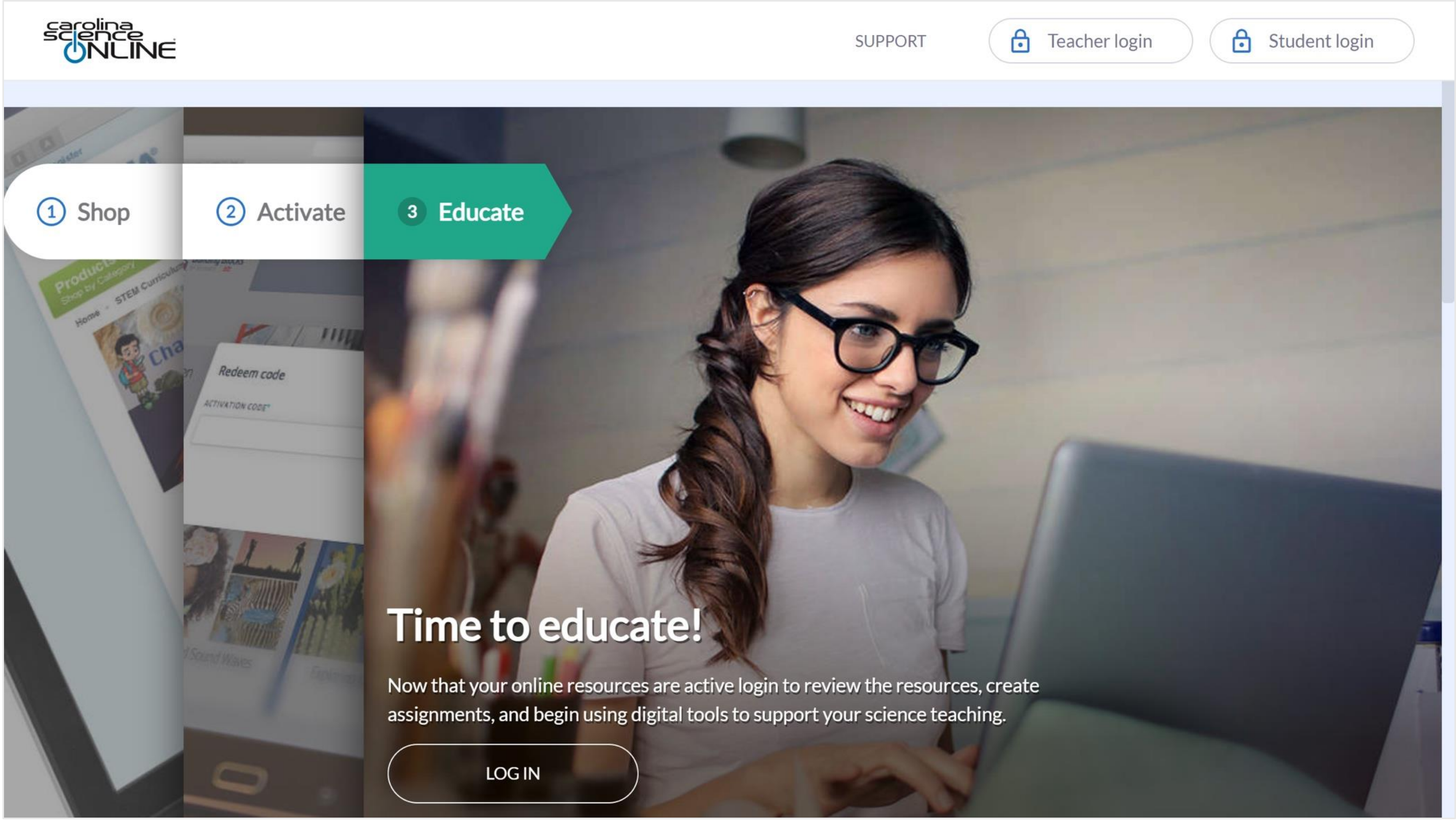
Swap the light and make observations.

E Display slide E.

[3] **ATTENDING TO EQUITY**

Supporting Emerging Multilingual Learners: This is an opportunity to talk about how language is used to construct different types of scientific questions, such as (1) *what is happening* or *what would happen if* and (2) *how or why is something happening*. This kind of talk supports emerging multilingual students in understanding that how a question is phrased changes the meaning of the question and how to approach answering it.

Enhanced Digital Content



Print and Digital Materials

Compatible with most learning management systems:

Clever
(1,320 Schools)

ONEROSTER
(250 Schools)

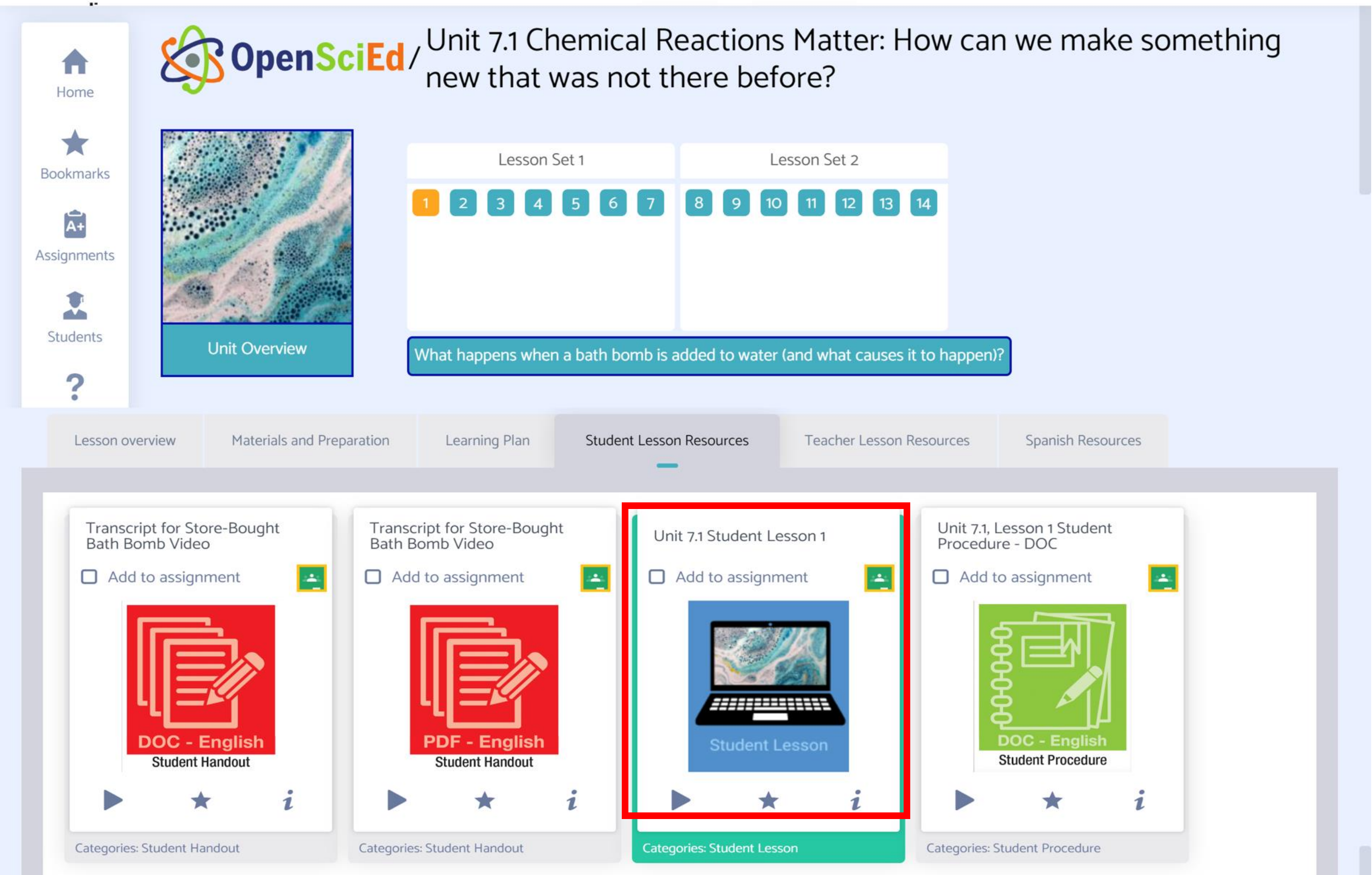
carolina science ONLINE
(12,903 Schools)

ClassLink
(370 Schools)

Google Classroom
(1,628 Schools)

Microsoft
Blackboard
schoology
brightspace
Google Classroom
CANVAS

Enhanced Digital Content



Enhanced Kits and Materials

EQUIPMENT KITS

- Kits include all **consumable and non-consumable** materials for **8 lab groups** per class to allow for maximum student participation
- Kits are available in two configurations
  - **1-class** for up to 32 students
  - **5-classes** for up to 160 students
- Kits are easily refurbished with 1-class or 5-class refurbishment sets
  - Prepaid vouchers are available for future refurbishments

Kits are packed and shipped in durable, stackable totes and cardboard boxes.

OpenSciEd Launch PD

Day 1: Phenomena and Questions

Introduction Session

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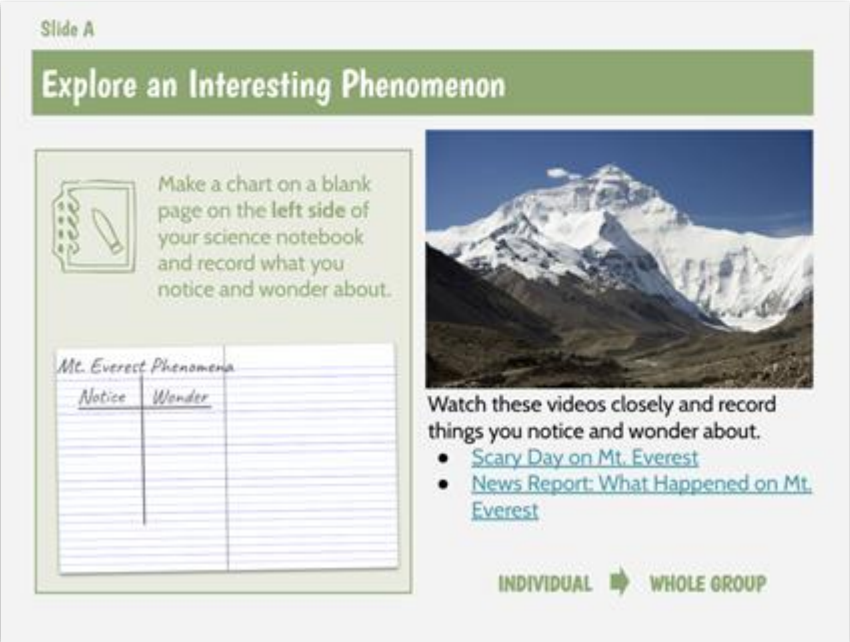
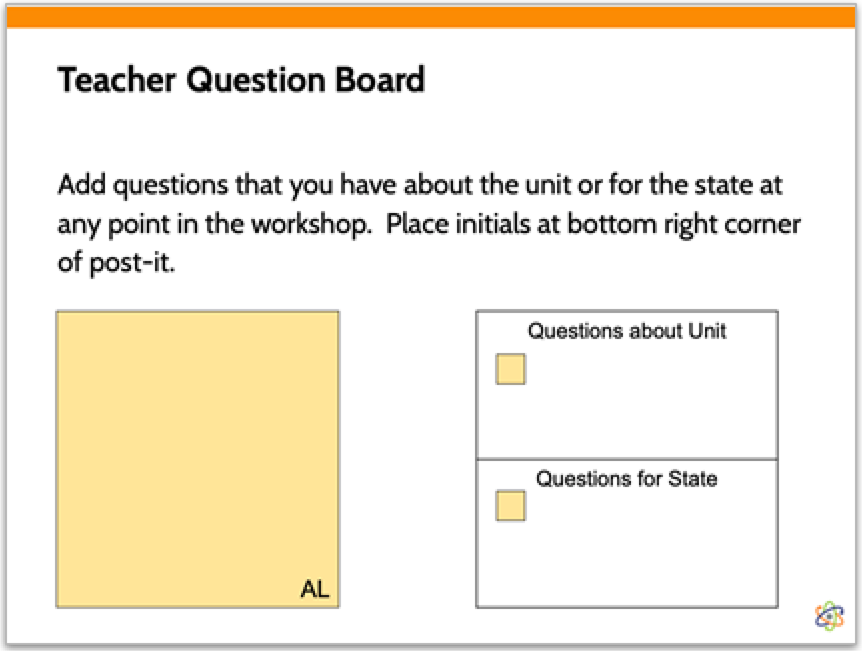
Switching Hats

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



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



Classroom Norms

Respectful Our classroom is a safe space to share.	• We provide each other with support and encouragement. • We share our time to talk. We do this by giving others time to think and share. • We critique the ***ideas*** we are working with but not the ***people*** we are working with.
Equitable Everyone's participation and ideas are valuable.	• We monitor our own time spent talking. • We encourage others' voices who we have not heard from yet. • We recognize and value that people think, share, and represent their ideas in different ways.
Committed to our community We learn together.	• We come prepared to work toward a common goal. • We share our own thinking to help us all learn. • We listen carefully and ask questions to help us understand everyone's ideas. • We speak clearly and loud enough so everyone can hear.
Moving our science thinking forward We work together to figure things out.	• We use and build on others' 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.

Welcome 6th Grade Students!

How can something act like a mirror and a window at the same time?

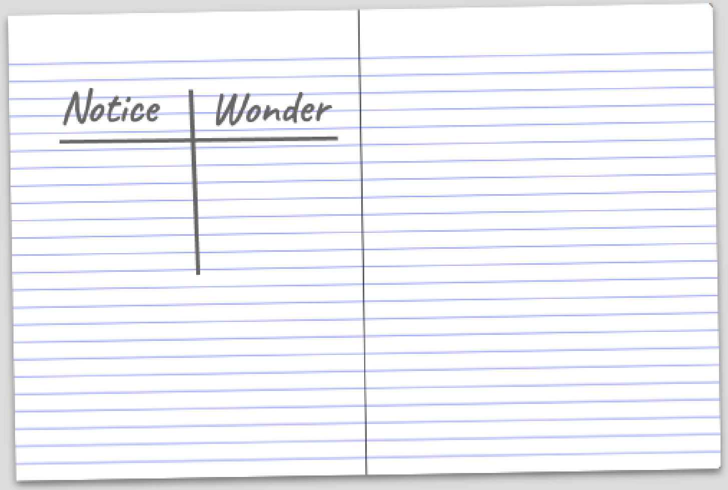
Lesson 1

Slide A

Explore an Interesting Phenomenon

Anchoring Phenomenon Routine

Make a 2-column chart on a blank page on the **left side** of your science notebook and record what you notice and wonder about.



Watch the video closely and record things you notice and wonder about.

INDIVIDUAL → WHOLE CLASS

Music Lesson

6_1_1_5_OSE_Music_Lesson_AP_VID

Press Esc to exit full screen

Unit 6.1

Light & Matter

Why do we sometimes see different things when looking at the same object?

Music Lesson

Lesson 1 and Lesson 5

OpenSciEd CAROLINA®

0:04 / 1:42

Exit Fullscreen

Share Noticings and Wonderings

With a Partner

What did you notice happening in the video?
What did you wonder about?

Slide C

What do we think is happening?

Turn and Talk

Why does the teacher see the music student?
Why does the music student see themself and not the teacher?

Initial Explanations

With a Group

What "parts" or "components" from the scene in the video do we think are important for explaining the phenomenon?

What's not important?

What are we not certain about?

Develop a Diagram

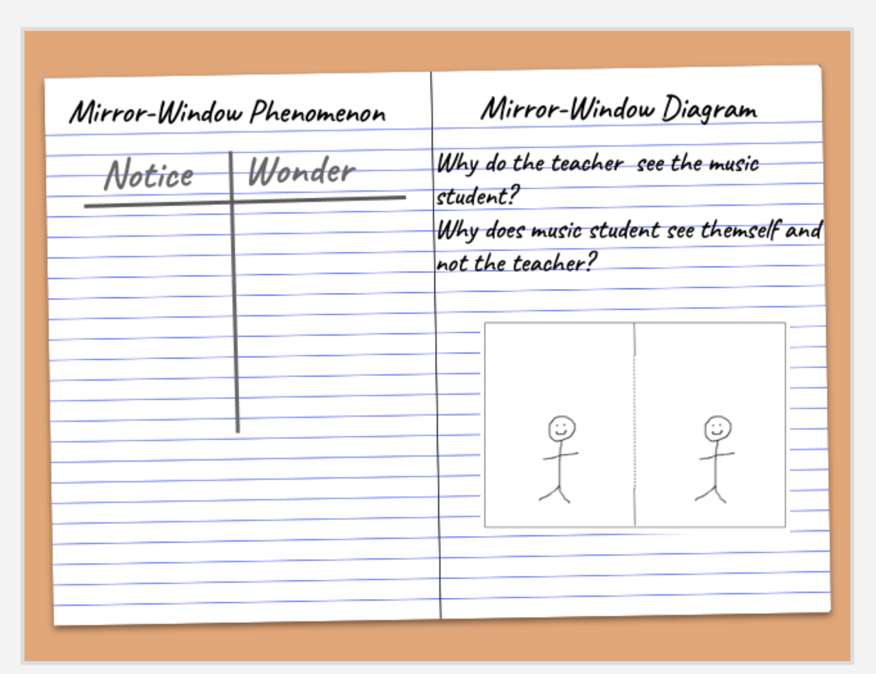
With a Partner

Write these two questions in your science notebook:

- Why does the teacher see the music student?
- Why does the student see themself and not the teacher?

Create a diagram to explain as much as you know about the two questions.

- ❏ Include all the important parts we agreed on and label them.
- ❏ Use pictures, symbols, and words to explain how the parts interact to cause the phenomenon.
- ❏ Record questions that you have if you become stuck.



Compare Diagrams

1. Each partner shares their diagram.
2. When it is your turn, turn your science notebook around so your diagram faces your partner.
3. As you notice things about each diagram, record the following:
   - ❑ Place a ✓ by parts of your diagrams that are similar.
   - ❑ Place a ? by parts of your diagrams that are different or where you are less certain.

Navigation

If we want to investigate the phenomenon using a **scale model**, what are the important parts we need to include in the scale model?

End of Day 1

Navigation

A **scale model** is a physical representation of something in the world. It can help us explain phenomena or solve problems.

With Your Class

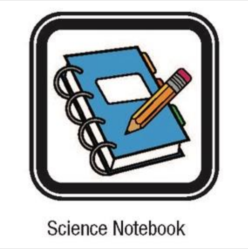
Where have you seen or used scale models in your life?

Slide I

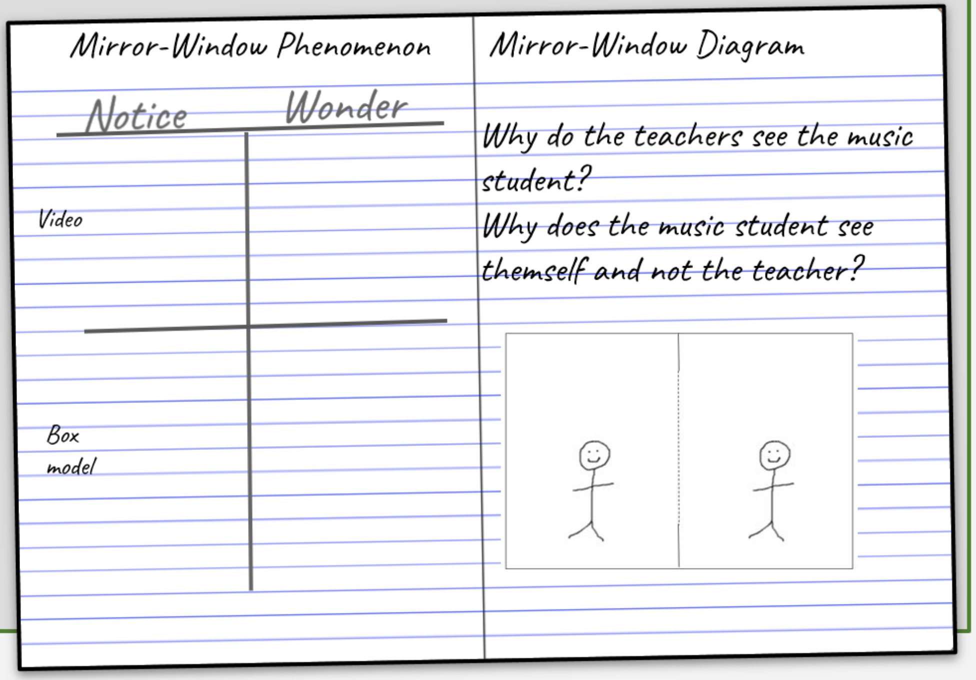
Mapping the Model to the ________

This part of the box model ...	is like this part of the real world ...	because ...	and is not like it because ...

Investigate Using the Box Model



Locate your **Notice and Wonder** chart. Draw a line below your last noticing from the video. Add noticings from the *Box Model Investigation* to your chart.



1. Turn on the flashlight for Room A.
2. Peek through the viewing hole for Room A. Record noticings to your Notice and Wonder chart.
3. Peek through the viewing hole for Room B. Record noticings.
4. Turn off the flashlight.
5. Add wonderings to your chart.

Slide K

Noticings from the Box Model Investigation

With a Group

What was similar between what you saw in the video and what you saw in the box model?

What was different?

What new things did you notice in the box model?

Limitations of the Box Model

If we use this box model to test ideas about the one-way mirror phenomenon, what *differences* between the box model and the real world shown in the video could be important to keep in mind?

Exit Ticket

Exit Ticket

Look at your **Notice and Wonder** chart and your diagram.

What is one idea you want to bring to our class discussion next time to help us explain the phenomenon?

End of Day 2

Initial Class Consensus Model to Explain the Phenomenon

Scientists Circle

The goal of this **discussion** is to figure out areas of agreement and disagreement in our diagrams.

We also want to practice our norms.

Questions to Consider

What do we all seem to agree on?

What do we disagree on?

What are some new ideas that we may want to consider?

Slide P

Initial Class Consensus Model to Explain the Phenomenon

Scientists Circle

Questions to Consider

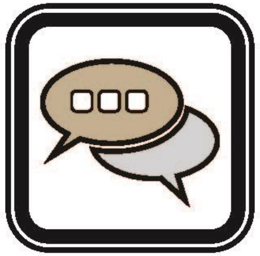
Why does the teacher see the student?

Why does the student see themself and not the teacher?

Norms Check-In

How did the norms help us talk together and come up with some ideas of what we think is happening?

Brainstorm Related Phenomena



Turn and Talk

Turn and Talk

What other experiences have you had, or what objects have you seen, that the video and the box model remind you of?

Home Learning: Self-Documentation

Home Learning Opportunity

Phenomenon: An object, like the one-way mirror, looks different in different conditions.

Where do you see a similar thing in your life? your home? your neighborhood or community?

Take a photo or hand-draw one example.

Bring your example to class to build a set of related phenomena.

End of Day 3

Types of Questions to Ask

All questions are welcomed!

As you write your question(s), ask yourself these questions:

- *If we answer this question, will it help us explain the phenomenon?*
- *Can we investigate this question to learn more about the phenomenon?*
- *Can it be answered with a yes or no? If so, can I write it in a different way?*

What questions do you have now?

Look back at

- ➔ our Notice and Wonder chart and initial models,
- ➔ our Initial Class Consensus Model, and
- ➔ our list of Related Phenomena.

Take a minute to review these to get ideas for questions to ask.

Then write one question per sticky note.

Write in marker--big and bold.

Put your initials on the back in pencil.

Driving Question Board (DQB)

How to build a Driving Question Board

1. The first student reads their question, then posts it to the DQB.
2. Students should raise their hand if one of their questions relates to the question that was just read aloud.
3. The first student selects the next student whose hand is raised.
4. The second student reads their question, says why or how it relates, and posts it near the question it most relates to.
5. The student selects the next student, who may have a related question or a new question.
6. We will continue until everyone has at least one question on the DQB.

Systems Thinking

When scientists try to develop an explanation for something that happens in the world, they often start by:

identifying the important parts,

investigating the ways the parts may be interacting, and

setting a boundary on what's important (carving out the part of the world they want to investigate and explain).

This type of thinking is called **systems thinking**. When have we done this kind of thinking already?

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Ideas for Investigations

Turn and Talk

Turn and Talk

You will be assigned one group of similar questions.

What kinds of investigations could we do to answer this set of questions?

What additional sources of data or information might we need?

Where to next?

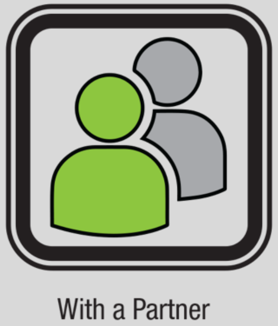
We have a mission to accomplish as a class!

- ❑ Our questions represent what we hope to figure out.
- ❑ Our ideas for investigations and sources of data will help us.

If we switch the light from Room A to Room B, what do we predict will happen?

Slide Z (Optional)

Norms Check-In



Turn to a partner.

Tell them what norm you worked on today and how you think you did on that norm.

End of Day 4

Welcome Back Educators!

Anchoring Phenomenon Routine

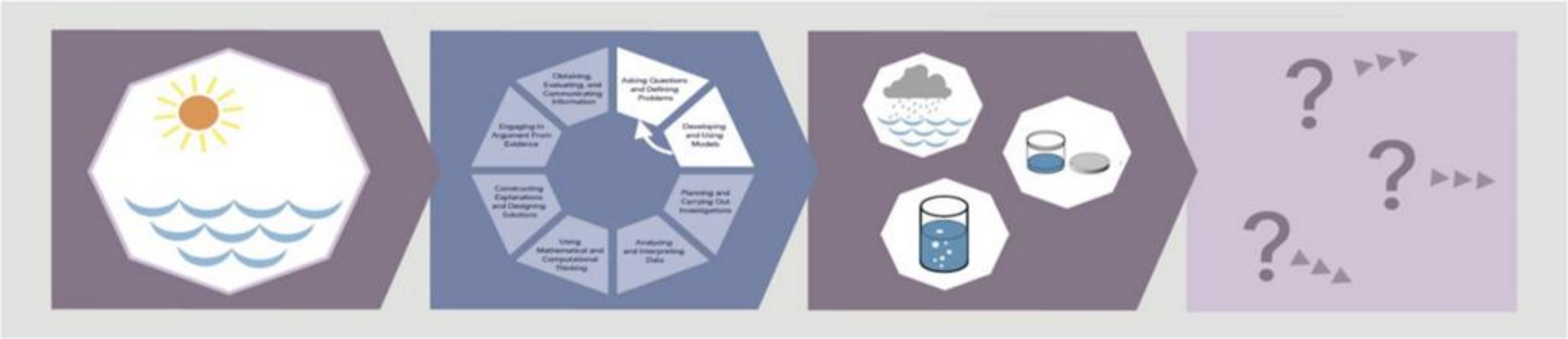
This is the first routine of the OpenSciEd curriculum to position students in making sense of a phenomenon, grounding all students in a common experience, and raising student questions.

Element #1: Explore the phenomenon

Element #2: Attempt to make sense

Element #3: Identify related phenomena

Element #4: Questions and next steps



Anchoring Phenomenon Routine Tracker

Anchoring Phenomena Routine Tracker

OpenSciEd

	Element 1: Explore the Phenomenon *What do we notice?*	**Element 2:** Attempt to Make Sense of the Phenomenon *How can we explain this? Do our explanations agree?*	**Element 3:** Identify Related Phenomena *Where else does something similar happen?*	**Element 4:** Develop Questions and Next Steps *What should we do to figure out how to explain this?*
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?***				

Student hat

Teacher hat

Reflection/Discussion

Why did we do the Anchoring Phenomenon Routine?

How is it different from current middle school science?

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