EQuIP RUBRIC FOR SCIENCE EVALUATION

Why do some surfaces get hot and how can we make them less hot?

Developer: OpenSciEd

Grade K | July 2024

equip
Educators Evaluating Quality Instructional Products

nsta
National Science Teaching Association

CATEGORY I Rating			CATEGORY II Rating			CATEGORY III Rating		
A.	Explaining Phenomena/ Designing Solutions	**Extensive**	**A.**	Relevance and Authenticity	**Extensive**	**A.**	Monitoring 3D Student Performance	**Extensive**
B.	Three Dimensions	**Extensive**	**B.**	Student Ideas	**Extensive**	**B.**	Formative	**Extensive**
C.	Integrating the Three Dimensions	**Extensive**	**C.**	Building Progressions	**Extensive**	**C.**	Scoring Guidance	**Adequate**
D.	Unit Coherence	**Extensive**	**D.**	Scientific Accuracy	**Extensive**	**D.**	Unbiased Tasks/ Items	**Extensive**
E.	Multiple Science Domains	**Extensive**	**E.**	Differentiated Instruction	**Adequate**	**E.**	Coherent Assessment System	**Extensive**
F.	Math and ELA	**Extensive**	**F.**	Teacher Support for Unit Coherence	**Extensive**	**F.**	Opportunity to Learn	**Extensive**
			G.	Scaffolded Differentiation Over Time	**Adequate**			
	SCORE CAT I	**3**		**SCORE CAT II**	**3**		**SCORE CAT III**	**3**
				SUM CATEGORIES	**9**			
				RATING	**E**			

Summary Comments

This unit exemplifies the criteria necessary for units with high-quality design for the *NGSS*. The unit is particularly strong in the following areas:

1.A Explaining Phenomena/Designing Solutions: Making sense of phenomena and/or designing solutions to a problem drive student learning; and II.A Relevance and Authenticity: Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world.

This unit's strengths in this area include the following:

- Returning consistently to the phenomenon students experience firsthand in Lesson 1: Different surfaces outdoors feel warmer or less warm than other surfaces outdoors. In Lessons 2–5, students gather observations to use as evidence to explain what might cause different surfaces outdoors to feel warmer or less warm than other surfaces outdoors. Students use the science ideas they build about what causes this phenomenon in Lesson 6 to identify and define problems they can solve about hot surfaces in the schoolyard. To solve the problem, students select hot blacktop or another relevant hot surface. In Lessons 7–10, students plan, build, test, and share their designs. In Lesson 10, students create a consensus design for making the blacktop less hot.
- The materials use student questions to connect to the unit and lesson questions and connect the phenomenon to students' own questions or problems in their own homes, neighborhoods, communities, and/or cultures.

I.C Integrating the Three Dimensions in service of Explaining Phenomena/Designing Solutions. Student sensemaking of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.

This unit's strengths in this area include the following:

- Integrating the use of the three dimensions supports student sensemaking throughout the unit. The K.1 Energy Sunlight SEP-DCI-CCC-ELA-Math Matrix shows that students have opportunities to use parts of the element CE-P1—Events have causes that generate observable patterns—and DCI K-PS3.B1—Conservation of Energy and Energy Transfer: Sunlight warms Earth's surface (K-PS3-1), (K-PS3-2)—in every lesson. These two elements are used with a variety of practices over the course of the unit. For example, in Lessons 2–5, students integrate the use of CE-P1 and K-PS3.B1 with INV-P4—Make observations (firsthand or from media) to collect data that can be used to make comparisons—in Lesson 2; DATA-P1—Record information (observations, thoughts, and ideas) in Lesson 3; DATA-P2—Use and share pictures, drawings, and/or writings of observations—in Lesson 4; and MOD-P3—Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s)—in Lesson 5 to make sense of the phenomenon.

II.B Student Ideas—Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.

This unit's strengths in this area include the following:

- Students have regular opportunities to express, clarify, justify, interpret, or represent their ideas.
- Student artifacts show evidence of students' reasoning and changes in their thinking over time—or example, in Lesson 9, Explore, Step 3, "Is there any part of your design or materials that you used that you would change? (Lesson 9, Teacher Edition)

II.F Teacher Support for Unit Coherence—Supports teachers in facilitating coherent student learning experiences over time.

This unit's strengths in this area include these:

- Teachers are well supported in facilitating coherent experiences for students. For example, Lessons 1–10 start and finish with a Navigation Section. In most cases, these sections start by guiding teachers to "Briefly recall where we left off" and finish by guiding teachers to consider where to go next: "Ask students if we have answered that (yes) and have them tell the answer to a partner. Ask students what they are now trying to figure out about the blacktop." (Lesson 6, Teacher Edition)
- Lessons 1–10 use one or more charts to help students track what they have figured out and what they need to figure out next. For example, they use a Notice and Wonder Chart to track observations and questions, an Our Growing Ideas Chart to track Disciplinary Core Ideas and how these ideas are built, a Designs and Materials Chart to track possible solutions to a problem and questions, and a Design Features and Materials chart to track possible solutions that work and don't work. (Lessons 1–10, Teacher Edition, Lesson Materials and Preparation Sections)

During revisions, the reviewers recommend paying close attention to the following areas:

- II.E Differentiated Instruction is strong, especially for emerging multilingual students, learners with special needs, and struggling students. During revisions, add extensions for students who have already met the performance expectation or who are highly interested in the subject matter.
- II.G Scaffolded Differentiation Over Time–There is sufficient evidence that this criterion is met for SEP elements claimed as intentionally developed that occur in more than two lessons. For elements claimed as intentionally developed but only occurring in one or two lessons, students do not have sufficient experiences to gradually take increasing responsibility for using these practice elements with fewer supports over time. Consider clarifying which elements are intentionally developed in the unit to proficiency and which are partially developed in this unit.
- III.C Scoring Guidance–Student work samples with criteria of Secure with Prompting and Developing levels of performance are provided. No examples of Secure performance are included in Summative Guidance 1 or 2. Consider providing examples of Secure performance in the Summative Guidance documents.

Please note that in the feedback provided in this report, black text indicates either neutral comments or evidence that the criterion was met. Purple text signifies evidence that does not support the claim that the criterion was met. The purple text in these reports is specifically related to the criteria and aims to highlight areas with potential for improvements. It is important to note that *not all purple text affects the score or rating*; much of it is too minor to impact the overall rating. For instance, even criteria rated as "Extensive" may contain purple text intended to aid in continuous improvement processes. In such cases, the criterion was indeed met, and the purple text is simply not part of the justification for the "Extensive" rating.

CATEGORY I
NGSS 3D Design

I.A. Explaining Phenomena/Designing Solutions

I.B. Three Dimensions

I.C. Integrating the Three Dimensions

I.D. Unit Coherence

I.E. Multiple Science Domains

I.F. Math and ELA

I.A. EXPLAINING PHENOMENA / DESIGNING SOLUTIONS — Extensive

Making sense of phenomena and/or designing solutions to a problem drive student learning.

i. Student questions and prior experiences related to the phenomenon or problem motivate sense-making and/or problem solving.
ii. The focus of the lesson is to support students in making sense of phenomena and/or designing solutions to problems.
iii. When engineering is a learning focus, it is integrated with developing disciplinary core ideas from physical, life, and/or earth and space sciences.

The reviewers found extensive evidence that making sense of phenomena and designing solutions to a problem drive student learning. Materials are organized so that students are figuring out the central phenomenon: Some outdoor surfaces are hotter or less hot than others. Student questions and prior experiences related to the phenomenon or problem extensively motivate sensemaking and problem solving. When engineering is a learning focus, it is integrated with developing Disciplinary Core Ideas from physical sciences.

i. Student questions and prior experiences related to the phenomenon or problem motivate sense-making and/or problem-solving.

There is a student-centered focus on phenomena or problems. Student questions and prior experiences relate to the phenomenon that some surfaces around the schoolyard feel hot and others feel less hot. This phenomenon motivates sense-making and problem-solving related to how students can make the blacktop less hot.

- Lesson 1, Explore, Step 1 "Go outside to make observations. Pair students with a partner and distribute the Schoolyard Observations handout to each student, along with a writing utensil and clipboard (if using). Bring students outside and have them work with their partner to notice how different things or places feel compared to the comparison object (refer to slide E).." (Lesson 1, Teacher Edition)
- Lesson 1, Synthesize, Step 2: "Remind students that we are scientists who are exploring the world around us and we get to share what we noticed about how things felt outside. Explain that it will be interesting to see if others noticed the same or different feelings, but there are no right or wrong answers because things might have felt different to different people, and we are sharing how it felt to us." (Lesson 1, Teacher Edition)
- Lesson 4, Connect, Step 4: "Can you think of any other surfaces around your house or community that felt the same? Why? What made the water and other surfaces feel warm?" (Lesson 4, Teacher Edition).
- Lesson 6, Explore, Step 3: "Ask students whether there is a surface near the school that we noticed got hot in the sun. Display the Sunny Shady surfaces T-chart (or photo) from Lesson 2 and use it to talk about where we had the most red check marks indicating that a surface was hot. Blacktop will likely come up as a surface that many students noticed was hotter than other surfaces." (Lesson 6, Teacher Edition).
- Lesson 8, Explore Section, Step 3 "Remind students that while engineering we work together to solve problems. While gathered in a Scientist Circle, organize students into their engineering partnerships to get directions for how we will build our designs. Remind students they will take their ideas from their drawings and build one design with their partner to share what they have figured out about how to make the blacktop less hot. While deciding what parts of their designs will go in their shared design, engineers listen to each other's ideas, they take turns, and they help each other make their designs better. Refer back to the classroom agreements and the importance of sharing ideas with each other even when we aren't sure about those ideas because we know our ideas are always growing." (Lesson 8, Teacher Edition)

- Lesson 10, Navigate Section, Step 1: "Turn and talk to a partner about our test results. Display the Designs and Materials chart (refer to slide A) and have students turn and talk about which design parts and materials worked to block the sun and cause the paper "blacktop" to feel less hot." (Lesson 10, Teacher Edition)

There is consistent student-driven learning over time.

- Lesson 1, Synthesize Section, Step 2 "Develop our Unit Question. Remind students that scientists ask questions about the world around them and then work to figure out the answers to their questions. Explain that we will work to figure out the questions we have on the Notice and Wonder chart. Point out that many of our questions are about why the surfaces we felt were hot or less hot. Summarize students' main questions into one that will drive the work of this unit, such as: *Why are some surfaces hot and others are less hot?* Use wording that captures how your class has been talking about this phenomenon, and add the question you develop to the top of the Notice and Wonder chart (refer to slide I)."
- Lesson 6, Navigate, Step 1: "Develop the lesson question with students. Point out that we are wondering about surfaces that are too hot. That sounds like it could be a problem in our schoolyard. Suggest that we try to figure out more about this, so our lesson question can be something like, What problems can we solve about hot surfaces on the schoolyard?" (Lesson 6, Teacher's Edition)
- Lesson 9, Synthesize, Step 5 "Connect to the anchoring phenomenon and unit question. Re-read the unit question, *How can we make the hot blacktop less hot?* and invite students to talk with a classmate other than their engineering partner about how their designs helped make the blacktop less hot. Follow up by asking if their ideas have grown and changed after testing their designs today. These ideas do not need to be recorded on the chart." (Lesson 9, Teacher Edition)

ii. The focus of the unit is to support students in making sense of phenomena and/or designing solutions to problems.

There is a close match between the phenomena/problems and the student learning objectives throughout the materials.

- Lesson 3, Lesson Front Matter Lesson Learning Goal "Make and record observations of the sun causing surfaces (dirt and sand) in sunny places to feel warmer compared with surfaces in shady places" matches the first part of the unit phenomenon/question, "Why do some surfaces get hot and how can we make them less hot?" (Lesson 3, Teacher Edition)
- Lesson 5, Explore, Step 3, "Give directions for how to draw to explain. While students are at their tables, display slide D and explain to the class that they will each draw their own pictures that accurately show *why* some surfaces outside are hot and others are less hot." (Lesson 5, Teacher Edition)
- Lesson 6, Lesson Front Matter: "In this Anchoring Phenomenon lesson, we think back to the questions and ideas we had about surfaces getting hot, and we wonder about solving a problem about that." (Lesson 6, Teacher Edition)
- Lesson 10, Lesson Front Matter, Lesson Assessment Guidance "Learning objective is: Develop a model based on evidence to represent a proposed object to reduce the warming effect of sunlight on the blacktop." In this lesson, students plan (Synthesize Section, Step 3) and develop (Synthesize Section, Step 4) a shade structure based on what worked well in previous tests to reduce the heat from the sun, designing a solution to the playground problem. (Lesson 10, Teacher Edition)

iii. When engineering is a learning focus, it is integrated with developing disciplinary core ideas from physical science, life, and/or earth and space sciences.

- Lesson 6, Navigate Section, Step 1 "What questions did we have about how to make hot surfaces less hot? What is causing these surfaces to get hot? What do you think we could do to find answers to our

questions about making surfaces less hot? Develop the lesson question with students. Point out that we are wondering about surfaces that are too hot. That sounds like it could be a problem in our schoolyard. Suggest that we try to figure out more about this, so our lesson question can be something like, *What problems can we solve about hot surfaces on the schoolyard?"* The engineering design challenge is connected to the physical science idea developed in Lessons 1-5 about sunlight warming the Earth's surface. (Lesson 6, Teacher Edition)

- Lesson 8, Explore Section, Step 3 "Remind students that while engineering we work together to solve problems. While gathered in a Scientist Circle, organize students into their engineering partnerships to get directions for how we will build our designs. Remind students they will take their ideas from their drawings and build one design with their partner to share what they have figured out about how to make the blacktop less hot." Engineering task is connected to the physical science ideas about sunlight warming the Earth's surface. (Lesson 8, Teacher Edition)
- Lesson 10, Navigate Section, Step 5 "Connect to the unit question. Re-read the unit question, *How can we make the hot blacktop less hot?* and invite students to talk with a classmate other than their engineering partner about how they solved that problem. Revisit our Ideas and Wonders chart. Refer students back to our Ideas and Wonders chart (refer to slide J) and read off the questions we had there. Ask students if they can answer any of those questions based on what they figured out from making designs to make the blacktop less hot." (Lesson 10, Teacher Edition)

Suggestions for Improvement: NA

I.B. Three Dimensions

(All 3 dimensions must be rated at least "adequate" to mark "adequate" overall)

Extensive

Builds understanding of multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs) *that are deliberately selected to aid student sense-making of phenomena and/or designing of solutions.*

Document evidence and reasoning, and evaluate whether or not there is sufficient evidence of quality for each dimension separately.

Evidence needs to be at the *element level* of the dimensions (see rubric introduction for a description of what is meant by "element")

The reviewers found extensive evidence that the materials allow students to build an understanding of grade-appropriate elements of the three dimensions because students regularly engage in elements of all three dimensions to make sense of the anchoring or lesson-level phenomenon.

The unit centers on students using targeted Science and Engineering Practices to build an understanding of targeted Disciplinary Core Idea elements and use part of the targeted Crosscutting Concept element to explain why some surfaces outside are hot or less hot than others. Students use this new science idea they build in lessons 1–5 to solve a problem related to making the blacktop outside less hot in lessons 6–10.

Rating for Criterion: SEP Extensive	i. Provides opportunities to *develop and use* specific elements of the SEP(s).

The reviewers found extensive evidence that the materials provide opportunities to develop and use specific elements of the SEPs.

The use of the claimed SEP elements below is evident in the materials because students make firsthand observations regularly and compare their observations in lessons 1–5. In lessons 6–10, they define a problem and use the science idea they built to design and compare solutions to the hot blacktop problem. The following claimed elements provide strong examples because students have multiple opportunities to develop and use these specific elements of the SEPs throughout the unit:

Claimed Element: INV-P1: With guidance, plan and conduct an investigation in collaboration with peers (for K).
Claimed Element: INV-P4: Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
Claimed Element: DATA-P1: Record information (observations, thoughts, and ideas).
Claimed Element: DATA-P5: Analyze data from tests of an object or tool to determine if it works as intended.
Claimed Element: CEDS-P3: Generate and/or compare multiple solutions to a problem.

INV: Planning and Carrying Out Investigations

Claimed Element: INV-P1: With guidance, plan and conduct an investigation in collaboration with peers (for K).
Claimed in Lesson 2. Evidence was found in lessons 1, 2, and 9, examples include

- Unit Summary, "Since this is the first time students formally use this practice, the teacher guides students in the planning and carrying out of their investigations in Lessons 1-3, and students always collaborate with the class or a partner." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 1, Explore, Step 1 "Introduce outside observations. Display slide A and explain to students that scientists often explore the world around them to make sense of how it works. Tell students that today they will be scientists and go outside the school building and notice how different things feel." (Lesson 1, Teacher Edition)
- Lesson 1, Explore, Step 1 "Ask students how we could find out for ourselves how things feel. After hearing a few ideas, agree that today we will explore the world around us, and like the kids in these pictures, we will go outside to figure out how things feel." (Lesson 1, Teacher Edition)
- Lesson 1, Explore, Step 1: "Demonstrate how to record observations of surfaces outside. Refer to slide C and show how to draw/label in a box on the Schoolyard Observations handout using the comparison object for your example." (Lesson 1, Teacher Edition)
- Lesson 2, Explore, Step 3 Planning and Carrying Out Investigations Sidebar: "As you are demonstrating how to record observations, it helps to elicit students' ideas about why they should record their observations and why their observations should be accurate. You are supporting students in using this practice by demonstrating how to record observations before students go work with partners to make observations of their own. Students will continue to practice making observations with the support of teacher directions and student partnerships throughout this unit." (Lesson 3, Teacher Edition)
- Lesson 2, Explore, Step 3 "Demonstrate how to record observations. Display slide D and discuss with students how they will record their observations on the Sunny Shady Observations handout (without giving away whether the surface will be hot or less hot)." (Lesson 3, Teacher Edition)

- Lesson 2, Explore, Step 3 "Go outside and record observations in sunny and shady locations. Display slide E and explain that students will 1) touch a surface in a sunny or shady place, 2) record their observations, and 3) talk with a partner. They will repeat this process for several other surfaces in sunny and shady places." (Lesson 2, Teacher Edition)
- Lesson 9, Explore, Step 3 "Have students explain how they will test their design. Building from students' suggestions, ask students to tell you the plan for testing designs. Display slide E and let students know that you already took their designs outside in a sunny area and that they will use their hot and less hot cards to record their data. As students tell you each step, demonstrate for them what this will look like:..." (Lesson 9, Teacher Edition)

Claimed Element: INV-P4: Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.
Claimed in Lessons 1, 2, 3 and 9. Evidence was found in all claimed lessons, examples include

- Unit Summary, "In Lesson 2, the class reads a book about making observations and frequently discusses how scientists record accurate observations and then use their observations to answer their questions.... Students use the relative scale of hot and less hot to investigate surfaces throughout the unit and repeatedly use their observations to make comparisons to find patterns in why some surfaces are hot and others are less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 1, Synthesize, Step 2 "Use a movement activity to share and compare observations. Redistribute students' Schoolyard Observations handouts if needed, and display slide F." (Lesson 1, Teacher Edition)
- Lesson 2, Explore, Step 3 "Go outside and record observations in sunny and shady locations. Display slide E and explain that students will 1) touch a surface in a sunny or shady place, 2) record their observations, and 3) talk with a partner. They will repeat this process for several other surfaces in sunny and shady places." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 3 "Upon coming back inside, plan for what's next. Point out that students have collected lots of observations. Ask students how they think we could figure out what our classmates observed. Briefly discuss a few ideas students have for sharing their observations in order to navigate to the next step." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 3 "Suggest that we read to find out if other kids notice the same patterns we observed." (Lesson 3, Teacher Edition)
- Lesson 3, Synthesize, Step 5: The teacher is instructed to work with the class using provided prompts to ask questions about what patterns they, their partners, or the kids in the book observed.
- Lesson 9, Explore, Step 3 "Bring students outside to make observations and record them. Take students outside to test whether the black construction paper under the designs is less hot than the black construction paper in the sun with no design. While students are testing, circulate to pairs and support their investigation as needed." (Lesson 9, Teacher Edition)

Claimed Element: INV-P5: Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.
Claimed in Lesson 9. Evidence was found in the claimed lesson, examples include

- Unit Summary, "In Lesson 9, they also use that relative scale when making observations to determine if their design solutions met the goal of keeping the blacktop less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 9, Explore, Step 3: "As students finish recording their observation by placing their card, ask them to talk about why the "blacktop" was hot or less hot under their design." (Lesson 9, Teacher Edition)
- Lesson 9, Explore, Step 4 "Explain that we want to look at all the designs that kept the blacktop less hot to see what design parts and materials worked best. Tell students that while they share ideas, you will record what you're hearing and seeing on the chart. Have students stand (or sit) by someone other than their

partner but near enough to the designs so that students can see the designs and materials to discuss what they notice." (Lesson 9, Teacher Edition)

Claimed Element: INV-P6: Make predictions based on prior experiences.
Claimed in Lesson 3. Evidence was found in the claimed lesson, examples include

- Unit Summary, "In Lesson 3, students make predictions based on their prior experiences." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 3, Explore, Step 2: "Take 1-2 minutes to have students share what they think they might observe in this investigation." (Lesson 3, Teacher Edition)
- Lesson 3, Connect, Step 4 Literacy Supports Sidebar: "This explicit identification of the book's front and back covers and title page helps students make connections between their prior knowledge of surfaces and make predictions about what surfaces might be in the book." (Lesson 3, Teacher Edition)

DATA: Analyzing and Interpreting Data

Claimed Element: DATA-P1: Record information (observations, thoughts, and ideas).
Claimed in Lessons 1, 2, and 4. Evidence was found in all claimed lessons, examples include

- Unit Summary, "This unit explicitly supports students as they record, share, and use their observations. Students are provided with ready-made tables to record their observations for each investigation and they share their drawings and writings with partners and the whole class, such as when they use their observations to identify patterns about surfaces in sunny and shady places." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 2, Explore, Step 3 "Go outside and record observations in sunny and shady locations. Display slide E and explain that students will 1) touch a surface in a sunny or shady place, 2) record their observations, and 3) talk with a partner. They will repeat this process for several other surfaces in sunny and shady places." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 2, Analyzing and Interpreting Data Sidebar: "An important element of this practice is to record observations. After reading about making accurate observations in Lesson 2, students now have a chance to record observations on their handouts to share with a partner. Then, in Lesson 4, they will refer to their records again as they compare their observations with the whole class." (Lesson 3, Teacher Edition)
- Lesson 3, Explore, Step 2: "Work with students to recall what observations are and how we can record accurate observations (drawing/marking only what we see and feel, not adding things that are not there, etc.)." (Lesson 3, Teacher Edition)
- Lesson 3, Explore, Step 2 "Model how to record observations. Using the handout image shown on slide C or a copy displayed under a document camera, briefly discuss with students how they will record their observations on the Sand and Dirt Observations handout without giving away whether the surfaces will be hot or less hot." (Lesson 3, Teacher Edition)
- Lesson 3, Explore, Step 2 "Go outside and record observations of the dirt. Display slide D and explain that the whole class will 1) go touch the sand in the sunny place (and then the shady place), 2) record their observations on their handout, and 3) share their observations with a partner. The class will then repeat these steps for the dirt in both places (sunny and shady)." (Lesson 3, Teacher Edition)

Claimed Element: DATA-P2: Use and share pictures, drawings, and/or writings of observations.
Claimed in Lesson 4. Evidence was found in the claimed lesson, examples include

- Unit Summary, "This unit explicitly supports students as they record, share, and use their observations." (K.1 Energy Sunlight Unit Front Matter)

- Lesson 4, Explore, Step 3 "Facilitate a discussion to begin to analyze and interpret the data. Once you have gathered all of the data, have students turn and talk to discuss what they notice about the surfaces in sunny places and what they notice about the surfaces in shady places. Have students share what their partner thought." (Lesson 4, Teacher Edition)

Claimed Element: DATA-P3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.
Claimed in Lessons 2 and 4. Evidence was found in all claimed lessons, examples include

- Unit Summary, "The teacher supports students as they use those patterns to answer their question about why some surfaces are hot and others are less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 2, Explore, Step 4: "Have a few more kids (and then the class) share observations about another sunny surface or two, then repeat the process to collect observations about surfaces in the shade. You need not collect every observation from every student (you would have more checks and Xs than most early kindergarten students can count), but collect a sample large enough to see more red checks in sunny places and more blue Xs in shady places." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4: "Lead a discussion to analyze and interpret the data. Once you have gathered a significant sampling of students' observations, have them turn and talk about what they notice is similar about the surfaces in sunny places, and then what is similar about the surfaces in shady places (refer to slide H). Encourage students to speak in complete sentences when they share ideas with their partner by starting with the phrases, *Sunny places have more _____ surfaces,* or *Shady places have more _____ surfaces*, and prompt them to share details about how they know." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4: "Have students share what their partners thought. Then count the number of checks or Xs for each place together as a class, pointing to the marks as you count. Use prompts such as those below to help students figure out that surfaces in sunny places are usually hotter than surfaces in shady places." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4: "Introduce the term "pattern". Point out that students noticed lots of hot surfaces/red checks in sunny places and lots of less hot surfaces/blue checks in shady places. Point out that when students were thinking of other places in the sun, they thought those places would be hot, and other places in the shade would be less hot. Explain that *something that happens over and over again and can help us know what will happen next* is called a pattern." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4: "Think aloud about our observations as a pattern. Consider pointing to the red checks on the Sunny Shady Surfaces T-chart and saying something like, In our observations, this surface felt hot, this surface felt hot, and this surface felt hot. Using this pattern, how would another surface in the sunny place likely feel? (Allow students to fill in hot.) Ask, Does someone want to help us talk about the pattern of shady surfaces?" (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4: "Save the Sunny Shady Surfaces chart for future reference. Either save or take a photo of your chart with your observations recorded so the class can refer back to it in Lesson 6 when discussing why it is a problem for the blacktop to be hot and to inform design solutions for making it less hot." (Lesson 2, Teacher Edition)
- Lesson 4, Explore, Step 3: "After having the students discuss their interpretations of the data, they can confirm their ideas by counting in each category on the Sand and Dirt Observation charts. Ask students how many tallies there are and then sort each category by number of tallies. As a class, count by 1s to determine how many tally marks are in each category (i.e., how many tallies there are representing "hot" for dirt in sunny places) and record the total number of tallies on the chart. Repeat this process for the tally marks collected for the sand in sunny and shady places." (Lesson 4, Teacher Edition)

Claimed Element: DATA-P5: Analyze data from tests of an object or tool to determine if it works as intended.

Claimed in Lessons 1, 9, and 10. Evidence was found in all claimed lessons, examples include

- Unit Summary, "Then when students test their engineering designs, they work as a class to use data to determine if their solutions worked as intended to make the blacktop less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 9, Explore, Step 4 "Ask students to look with their new partner over all the designs that caused the blacktop to be less hot and share with that partner about why those *designs* all caused the blacktop to be *less hot* (remind students to ask each other questions to make sure they understand). As students share what they notice about the designs that were less hot, circulate to assist and to listen in so that you can record their observations on the Designs and Materials chart. After about a minute, ask students to discuss what they noticed about the *designs* that caused the blacktop to feel *hot*. Remind students to ask each other questions to make sure they understand how the parts of those designs make the blacktop hot. Circulate to assist and listen." (Lesson 9, Teacher Edition)
- Lesson 10, Synthesize, Step 3: "Tell their partner what part(s) of their design are most important to solving the problem of the hot blacktop.
- Tell their partner how the materials in their design help solve the problem of the hot blacktop. Use a green colored pencil to circle parts of their designs that they agree are very important to making the blacktop less hot." (Lesson 10, Teacher Edition)

CEDS: Constructing Explanations and Designing Solutions

Claimed Element: CEDS-P2: Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.
Claimed in Lessons 7 and 8. Evidence was found in all claimed lessons, examples include

- Unit Summary, "Those pairs of students work in Lesson 8 to select from materials provided by their teacher to build their designs. Then after testing in Lesson 9, they compare all of their solutions as a class to consider which design features and materials worked best to keep the blacktop less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 7, Explore, Step 4: "Individually draw design plans." (Lesson 7, Teacher Edition)
- Lesson 8, Explore, Step 3: "Revisit My Design Plan handout with a partner. Ask students what would be a good first step in building our designs (such as what the engineering book discussed). Decide that using our drawn designs to inform what we will build is a good place to start. Have students turn and talk about their designs and what parts they circled to include when building their designs, as well as anything else they think they should add to their designs." (Lesson 8, Teacher Edition)
- Lesson 8, Explore, Step 3: "Have students work with their partner to build their shared design. While students are working, circulate to see how they are using materials to inform their designs for blocking sun to make the blacktop less hot." (Lesson 8, Teacher Edition)
- Lesson 8, Explore, Step 3: "Tell students that these questions are for them to think about themselves, and not worry about what other people are thinking, so they can close their eyes while they respond. Show a thumb up or down…Did you and your partner combine your ideas? Do you think your design will help solve the problem of the hot blacktop?." (Lesson 8, Teacher Edition)

Claimed Element: CEDS-P3: Generate and/or compare multiple solutions to a problem.
Claimed in Lessons 6, 7, 10. Evidence was found in all claimed lessons, examples include

- Unit Summary, "Students begin brainstorming possible solutions to the problem of the blacktop being too hot in the sun as a class in Lesson 6, then they individually generate solutions in Lesson 7. Students compare their individual solutions with a partner in Lesson 7 to make a combined design plan…. Then after testing in Lesson 9, they compare all of their solutions as a class to consider which design features and

materials worked best to keep the blacktop less hot. In Lesson 10, the class uses the ideas generated from their comparisons to generate a class consensus design." (K.1 Energy Sunlight Unit Front Matter)

- Lesson 6, Explore, Step 4 Constructing Explanations and Designing Solutions Sidebar: "This is students' first opportunity to generate multiple solutions for the problem of the blacktop getting hot when the Sun shines on it. Encourage students to propose a variety of ideas, reminding them that scientists do not work alone, and rely on others to build ideas together. Students will continue to generate ideas (possibly based on shade structures they have seen in their neighborhood) in Lesson 7, and then in Lesson 10 they will compare their solutions after testing." (Lesson 6, Teacher Edition)
- Lesson 6, Explore, Step 5: "Facilitate an Initial Ideas Discussion to brainstorm possible solutions. Gather students in a Scientists Circle in view of the Ideas and Wonders chart, and invite students to share their ideas or their group's ideas and questions with the whole class (refer to slide N). As students share, invite them up to the chart to help you record ideas and questions, as time allows. Encourage students to record their ideas and questions through whatever form of expression makes most sense to them, which could include drawing, especially since you will reference this chart again in Lessons 7 and 8 when they create specific design plans." (Lesson 6, Teacher Edition)
- Lesson 7, Synthesize, Step 5: "Share and compare designs with a partner. Organize students into the partnerships they'll keep through Lesson 9. Refer to slide L and guide student pairs to compare and combine design ideas on their My Design Plan handout using the suggested prompts. Remind students that asking and answering questions helps us include important information and details that improve our designs." (Lesson 7, Teacher Edition)
- Lesson 10, Synthesize, Step 4: "So we will use the ideas we collected on the pages from around the room and what we have figured out from our science work and our design testing to make a consensus design we all agree will work the best to make the blacktop less hot (refer to slide G)." (Lesson 10, Teacher Edition)
- Lesson 10, Synthesize, Step 4: "Facilitate creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design." (Lesson 10, Teacher Edition)

Criterion-Based Suggestions for Improvement: NA

Rating for Criterion: DCI Extensive	ii. Provides opportunities to develop and use specific elements of the DCI(s).

The reviewers found extensive evidence that the materials provide opportunities to develop and use specific elements of the DCIs. Students are actively engaged in figuring out which surfaces are hot or less hot. Students show their understanding of the effect of the Sun on different surfaces in the Schoolyard Drawings model. Students look at what they've learned to define a problem, draw design solution plans for the blacktop problem, build design solutions, and communicate their solutions. Students have multiple opportunities to build the following science ideas:

Claimed Element: PS3.B—Sunlight warms Earth's surface.

Claimed Element: ETS1.A—Defining Engineering Problems: A situation that people want to change or create can be approached as a problem to be solved through engineering.

Claimed Element: ETS1.A—Defining Engineering Problems: Asking questions, making observations, and gathering information are helpful in thinking about problems.

Claimed Element: ETS1.A—Defining Engineering Problems: Before beginning to design a solution, it is important to clearly understand the problem.

Claimed Element: ETS1.B—Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

K-PS3.B.1: Conservation of Energy and Energy Transfer

Claimed Element: K-PS3.B.1 PS3.B Conservation of Energy and Energy Transfer: Sunlight warms the earth's surface. ((K-PS3-1), (K-PS3-2)

Claimed in Lessons: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. Evidence was found in all claimed lessons, examples include:

- Lesson 1, Synthesize, Step 2: "We just named a lot of things that felt hot (refer to the chart). Where were the hot things? Were they all in the same place? We also noticed several things that felt less hot. Where did you usually feel the less-hot things? Were all the less-hot things in the same place?" and later, "Briefly propose possible reasons. In order to help students see that we have work to do to figure this out, ask them to turn and talk with a partner and propose possible reasons why some surfaces might be hot or less hot. Reassure students that we do not expect to know the answer right now, but scientists like to try to explain why things happen. Consider asking questions such as: What ideas do you have right now about why some surfaces are hot and others are less hot? We are not sure of the answer yet, but why do you think some surfaces are hot and others are less hot?" (Lesson 1, Teacher Edition)
- Lesson 2, Explore, Step 4: "Lead a discussion to analyze and interpret the data. Once you have gathered a significant sampling of students' observations, have them turn and talk about what they notice is similar about the surfaces in sunny places, and then what is similar about the surfaces in shady places (refer to slide H). Encourage students to speak in complete sentences when they share ideas with their partner by starting with the phrases, *Sunny places have more _____ surfaces,* or *Shady places have more _____ surfaces*, and prompt them to share details about how they know." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 2: "Go outside and record observations of the dirt. Display slide D and explain that the whole class will 1) go touch the sand in the sunny place (and then the shady place), 2) record their observations on their handout, and 3) share their observations with a partner. The class will then repeat these steps for the dirt in both places (sunny and shady). Explain that you set out the sand pans in one location and the dirt pans in a different location so we can investigate sand and dirt separately, comparing sand to sand and dirt to dirt." (Lesson 3, Teacher Edition)
- Lesson 4, Explore, Step 3: "Use the following discussion prompts to continue the discussion to help students figure out that the sun is shining on the sand, dirt, and other surfaces in sunny places, causing them to get hot and that the sun is not shining on the sand, dirt, and other surfaces in shady places, causing them to be less hot." (Lesson 4, Teacher Edition)
- Lesson 5, Synthesize, Step 4: "Lead a discussion using our drawings about what we have figured out about cause and effect. Display slide F and gather students in a Scientists Circle for a Consensus Discussion with their models, clipboards and writing utensils. Explain to students that our goal in this discussion is to use the evidence we have found from our investigations to agree together about what causes surfaces in our schoolyard to be hot or less hot (consider referring to Our Growing Ideas chart for examples of evidence from our investigations). We will use the drawings we made to share our ideas and help each other agree about what we figured out." (Lesson 5, Teacher Edition)
- Lesson 6, Explore, Step 3: "Frame blacktop as a surface we could focus on. Spend just a few minutes to discuss a specific problem we could solve about surfaces that get too hot. Ask students whether there is a surface near the school that we noticed got hot in the sun. Display the Sunny Shady surfaces T-chart (or photo) from Lesson 2 and use it to talk about where we had the most red check marks indicating that a

surface was hot. Blacktop will likely come up as a surface that many students noticed was hotter than other surfaces." (Lesson 6, Teacher Edition)

- Lesson 7, Navigate, Step 1: "Turn and talk to a partner about the previous lesson. Show students the image of a blacktop in sun on slide A. Give students a minute to turn and talk to a partner about the problem we are working on, what we learned about hot and less hot surfaces from our investigations, and the ideas we had about starting to solve it." (Lesson 7, Teacher Edition)
- Lesson 8, Synthesize, Step 4: "Lead a Building Understandings Discussion. Display Our Growing Ideas chart (refer to slide F) and lead a discussion about what we have figured out about building designs and how those designs might make the blacktop less hot using evidence from our work in this lesson. Add student responses to the column titled, "What did we figure out?" using both words and drawings. Ask students what they did to figure that out and add their ideas to the column titled, "How did we figure it out?". Consider including students in updating the chart by calling on individual students to add either photographs from your classroom or the provided printable images to the chart." (Lesson 8, Teacher Edition)
- Lesson 9, Explore, Step 3: "Remind partners to record their data by placing the hot or less hot card on their design. You may decide to collect the card they do not use after they have decided which card to use. As students finish recording their observation by placing their card, ask them to talk about why the "blacktop" was hot or less hot under their design." (Lesson 9, Teacher Edition)
- Lesson 10, Synthesize, Step 4: "Facilitate the creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design. What is the problem we are trying to solve with this design? *Why is the cover important?* If our design works and causes the sun not to shine on the blacktop, what pattern will we observe with the blacktop under our design?" (Lesson 10, Teacher Edition)

K-2-ETS1.A.1: Defining Engineering Problems

Claimed Element: ETS1.A .Defining Engineering problems: A Situation that people want to change or create can be approached as a problem to be solved through engineering. (K-2-ETS1-1)
Claimed in Lessons 6 and 7. Evidence was found in all claimed lessons, examples include:

- Lesson 6, Explore, Step 3 Broadening Access Sidebar: "Students will likely have different understandings of what a "problem" is based on their prior experiences. It is important to help all students recognize that problems in engineering are challenges or things we need to solve and that problems are not inherently "bad things" as young children may currently understand them to be. For example, in engineering a problem might include designing a faster form of transportation, or a way to carry materials long distances." and after a conversation and listing of problems in our lives, "After a minute of partner talk, summarize ideas you heard, such as with broken items, lost objects, sibling conflicts, friends not sharing, etc. Elicit ideas from students about their experiences and communities outside the classroom. Then ask partners to talk again about how they (or others) solved those problems." (Lesson 6, Teacher Edition)
- Lesson 7, Explore, Step 3: "Share ways we have seen people block the sun. Explain that when engineers design solutions to problems, they often get ideas by looking at ways other people have solved similar problems. Point out that we have already mentioned some ways we know people can block the sun or make shade (refer to Ideas and Wonders chart). Ask students if they know of other ways people have blocked the sun or created shady places." (Lesson 7, Teacher Edition)
- Lesson 7, Explore, Step 4: "Individually draw design plans. Display slide H and remind students that we read about planning designs, and look back at the *Meet the Playground Designer: Lisa DeShano* book, especially pages 5 and 6. Ask students how Lisa used drawings on paper. Ask how drawing our plans could

help us. Establish together that drawing our plans can help us figure out what we want to build and help us share our ideas with other people." (Lesson 7, Teacher Edition)

K-2-ETS1.A.3: Defining Engineering Problems

Claimed Element: ETS1.A .Defining Engineering problems: Before beginning to design a solution, it is important to clearly understand the problem
Claimed in Lesson 6. Evidence was found in all claimed lessons, examples include:

- Lesson 6, Explore, Step 3 "Start to define our problem. Display slide J and summarize the comments you heard from students by saying something like, I hear us saying that the hot blacktop is a problem for many people because it's uncomfortable or even unsafe to touch or play on." (Lesson 6, Teacher Edition)

K-2-ETS1.B.1: Developing Possible Solutions

Claimed Element: ETS1.B .Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people: (secondary to 2-LS2-2), (K-2-ETS1-2)
Claimed in Lessons 7, 8, 9, and 10. Evidence was found in all claimed lessons, examples include:

- Lesson 7, Explore, Step 4: "Individually draw design plans. Display slide H and remind students that we read about planning designs, and look back at the Meet the Playground Designer: Lisa DeShano book, especially pages 5 and 6. Ask students how Lisa used drawings on paper. Ask how drawing our plans could help us. Establish together that drawing our plans can help us figure out what we want to build and help us share our ideas with other people." (Lesson 7, Teacher Edition)
- Lesson 8, Explore, Step 3: "Have students work with their partner to build their shared design. While students are working, circulate to see how they are using materials to inform their designs for blocking sun to make the blacktop less hot. As you circulate, use the following prompts below to support students in their work together. How are you using your materials to make the design? I hear you saying your material is round/wide/long. How will that help your design? I hear you saying your material is a triangle/square/circle. How will that help your design? I hear you saying your (material) should be under/next to/beside _____. How will that help your design?" (Lesson 8, Teacher Edition)
- Lesson 9, Explore, Step 3: "Make a plan for testing designs. Ask students if they remember another time they have tested surfaces outside. If students need help remembering, show them slide D and have a discussion about how they tested sand and dirt in sunny and shady places and how that experience might help them test their built designs now. Have students explain how they will test their design. Building from students' suggestions, ask students to tell you the plan for testing designs. Display slide E and let students know that you already took their designs outside in a sunny area and that they will use their hot and less hot cards to record their data. As students tell you each step, demonstrate for them what this will look like. Show students the prepared large T on the gathering area, and explain that after they test their designs, they will record their data (hot or less hot) by placing their design on the appropriate side of the T-chart." (Lesson 9, Teacher Edition)
- Lesson 10, Synthesize, Step 4: "Set the purpose for creating a consensus design. Gather the class in a Scientists Circle so they can all see the chart paper or digital chart space, as well as the building materials in the center of the circle so students can reference them to help share their ideas. Remind students that we have had a chance to use our test results to plan new designs by ourselves and share our ideas with partners, so now we are ready to decide together as a class what parts of designs and materials will best solve the problem of the hot blacktop. Explain that we will create a consensus design drawing; consensus

means agree together. So we will use the ideas we collected on the pages from around the room and what we have figured out from our science work and our design testing to make a consensus design we all agree will work the best to make the blacktop less hot (refer to slide G). Facilitate creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design." (Lesson 10, Teacher Edition)

Criterion-Based Suggestions for Improvement: NA

Rating for Criterion: CCC Extensive	iii. Provides opportunities to *develop and use* specific elements of the CCC(s).

The reviewers found extensive evidence that the materials provide opportunities to develop and use specific elements of the CCCs because student use of the claimed CCC elements below is evident in the materials. Students are actively engaged in using cause and effect and patterns to figure out which surfaces are hot or less hot and to plan, build, test, and evaluate solutions to the blacktop problem. Students have multiple opportunities to build the following Crosscutting Concepts:
Claimed Element: PAT-P1—Patterns in the natural and human-designed world can be observed, used to describe phenomena, and used as evidence.
Claimed Element: CE-P1—Events have causes that generate observable patterns.

PAT: Patterns

Claimed Element: PAT-P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.
Claimed in Lessons 2, 3, 4 and 6. Evidence was found in all lessons claimed, examples include

- Unit Summary, "The word "pattern" is defined explicitly with students in Lesson 2 to help them talk about how they are observing the same thing over and over again. After observing the same pattern in several instances, students describe the phenomenon of surfaces in sunny places usually feeling hot and surfaces in shady places usually feeling less hot. Students use this pattern as evidence when they explain that the sun causes surfaces to feel hot. Students also use the pattern of shady places feeling less hot to inform the engineering designs they build to solve the problem of the blacktop getting too hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 2, Explore, Step 4: "Introduce the term 'pattern'. Point out that students noticed lots of hot surfaces/red checks in sunny places and lots of less hot surfaces/blue checks in shady places." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 3: "Direct these new pairs to briefly turn and talk to share whether they found *dirt* to be hot or less hot in the sunny place compared with the shady place and why. Remind students to reference the observations they recorded on their handout when sharing with their partner." (Lesson 3, Teacher Edition)
- Lesson 4, Navigate, Step 1: "If needed, revisit the term pattern, which is something that happens over and over again and can help us know what will happen next. What patterns did we notice?" (Lesson 4, Teacher Edition)
- Lesson 4, Navigate, Step 1: "Summarize that it sounds like we want to continue to find patterns by looking at all of our observations all together." (Lesson 4, Teacher Edition)

- Lesson 6, Explore, Step 3: "Frame blacktop as a surface we could focus on. Spend just a few minutes to discuss a specific problem we could solve about surfaces that get too hot. Ask students whether there is a surface near the school that we noticed got hot in the sun. Display the Sunny Shady surfaces T-chart (or photo) from Lesson 2 and use it to talk about where we had the most red check marks indicating that a surface was hot. Blacktop will likely come up as a surface that many students noticed was hotter than other surfaces." (Lesson 6, Teacher Edition). This use of patterns is very subtle and may be missed by educators. There is little evidence that this idea is being intentionally developed in Lesson 6.

CE: Cause and Effect

Claimed Element: CE-P1: Events have causes that generate observable patterns.
Claimed in Lessons 1-10. Evidence was found in all lessons claimed, examples include

- Unit Summary, "Students begin this unit by observing patterns in how different surfaces feel in sunny and shady places around their schoolyard (Lessons 1-3). In Lessons 4 and 5, when students make the connection between the patterns they observe and the cause of those patterns, they celebrate having answered their question about *why* some surfaces feel hot and others feel less hot. The words "cause" and "effect" are explicitly defined with students in Lesson 5 to help them explain what they figured out about why something happens. Students do a card sort using patterns they know from their experiences, and they have an optional Community Connection to help them identify other cause and effect relationships around them. Then, in Lessons 6-8, students use their understanding of the cause-effect relationship between sunlight and warmer surfaces to design structures that will generate the observable pattern of a surface (the blacktop) feeling less hot if the sun is not shining on it. In Lessons 9 and 10, when they test their designs, students find additional evidence of events causing observable patterns: blocking the sun from shining on a surface keeps that surface less hot." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 1, Synthesize, Step 2: "We just named a lot of things that felt hot (refer to the chart). Where were the hot things? Were they all in the same place?" (Lesson 1, Teacher Edition)
- Lesson 2, Synthesize, Step 5: "Using the images of what we did in this lesson, have a few students explain how what we did helped us figure out the patterns in how surfaces feel." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 3: "Motivate reading a book to look for patterns in other kids' experiences. Point out that we have made observations of surfaces around our schoolyard, but there are lots of different surfaces people could investigate in other areas. Explain that you have a book about kids in other communities investigating surfaces near them. Suggest that we read to find out if other kids notice the same patterns we observed." (Lesson 3, Teacher Edition)
- Lesson 4, Explore, Step 3: "Move the discussion to considering causes. What makes the sand, dirt, and other surfaces in sunny places hot?" (Lesson 4, Teacher Edition)
- Lesson 5, Connect, Step 2: "Name "cause" and "effect". Remind students that we have figured out a lot by noticing patterns about surfaces in our schoolyard and in books we have read. Consider saying something like, We have even answered our question, Why are some surfaces hot and others are less hot? We have been talking a lot about WHY things happen. Figuring out WHY something happens is really important in science. Scientists have special words to talk about why things happen, they are "cause" and "effect" (Lesson 5, Teacher Edition)
- Lesson 5, Connect, Step 2: "Describe the card sort activity. Refer to slide B and explain that we have some more examples of causes and effects to help us understand and use these words. Hold up a few cards from the Cause and Effect Cards and tell students that they will sort the cards to show the different causes and effects. Point out that the cards include both images and words, and students should ask questions if they are unsure about the words." (Lesson 5, Teacher Edition)

- Lesson 5, Connect, Step 2: "As students work in pairs matching the cards and discussing their matches, listen in on their conversations and support students by asking these prompts. I see you have some matches already. Can you tell me about them? Support students with sentence stems to explain as needed. The picture of _____ is the cause because _____. The picture of _____ is the effect because_____. What pattern of things happening in your own life helped you match these pictures? Has this happened to you? Do you think this pattern will happen every time? Will _____ always cause _____? Will _____ always be the effect?" (Lesson 5, Teacher Edition)
- Lesson 5, Synthesize, Step 4: "First, as Partner A, use your drawing to explain what caused the surface you drew to feel hot. Then, as Partner B, using the Gotta Have It Checklist handout, circle all the things that are on the drawing. Point out anything that is not circled (is missing) and needs to be added." (Lesson 5, Teacher Edition)
- Lesson 5, Synthesize, Step 4: "As a whole class again, find consensus around hot drawings. Use prompts with the whole class to emphasize use of the words "cause" and "effect" to explain what's happening in our "hot" drawings." (Lesson 5, Teacher Edition)
- Lesson 6, Navigate, Step 1: "Briefly recall where we left off. Display the Our Growing Ideas chart (refer to slide A) and have students turn and talk with a partner about what they previously figured out about what causes surfaces to feel hot or less hot." (Lesson 6, Teacher Edition)
- Lesson 6, Navigate, Step 1: "Briefly recall where we left off. Display the Our Growing Ideas chart (refer to slide A) and have students turn and talk with a partner about what they previously figured out about what causes surfaces to feel hot or less hot." (Lesson 6, Teacher Edition). This use of cause and effect is subtle and may be missed by educators. There is little evidence that this idea is being intentionally developed in lesson 6.
- Lesson 7, Explore, Step 3: "Recall our initial ideas for making the blacktop less hot. Refer to slide E and use the Ideas and Wonders chart to revisit ideas students brainstormed in Lesson 6 and connect back to what students learned in previous investigations about why surfaces in shady places were less hot." (Lesson 7, Teacher Edition). There is little evidence that this idea is intentionally developed during this group discussion.
- Lesson 8, Explore, Step 3: "What causes the blacktop to get hot? How will our designs keep the blacktop from getting too hot?" (Lesson 8, Teacher Edition) There is little evidence that this idea is intentionally developed during this group discussion.
- Lesson 9, Explore, Step 4: "New partners discuss the designs. Ask students to look with their new partner over all the designs that caused the blacktop to be less hot and share with that partner about why those *designs* all caused the blacktop to be *less hot* (remind students to ask each other questions to make sure they understand)." (Lesson 9, Teacher Edition)
- Lesson 10, Synthesize, Step 4: "If our design works and causes the sun not to shine on the blacktop, what pattern will we observe with the blacktop under our design?" (Lesson 10, Teacher Edition)

Criterion-Based Suggestions for Improvement

- Consider distinguishing between lessons in which cause and effect is developed and when it is used.
- Consider specifically suggesting the use of comparative language as students compare designs in Lesson 8.

I.C. Integrating the Three Dimensions — Extensive

Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.

The reviewers found extensive evidence that student sensemaking of phenomena and designing solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs. In the unit, students are expected to gather and use observations as data. Students use patterns in the data and observations to build science ideas that explain what causes some surfaces in the schoolyard to feel hot and others less hot. This requires students to use grade-appropriate elements of the three dimensions simultaneously. The three dimensions are not used in isolation. In most activities in the unit, students are expected to figure out something that requires an integrated use of the three dimensions at grade level.

The learning is integrated.

- Lesson 2, Explore, Step 3, students integrate the use of the elements when the teacher is instructed to: "Bring students outside. While they are outside, ask questions to help them begin to make sense of what they are observing. Possible questions include: *Do all the surfaces feel the same: all hot or all less hot? What is different about how the surfaces feel in sunny places compared with shady places? Why do you think that might be?*" in the three dimensions, CE-P1 Events have causes ~~that generate observable patterns~~. DCI K-PS3.B1PS3.B Conservation of Energy and Energy Transfer: Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2), and INV-P4 Make observations (firsthand or from media) to collect data that can be used to make comparisons. (Lesson 2, Teacher Edition)
- In Lesson 4, Explore Step 3, students integrate the use of the elements when they participate in the discussion: "Discuss patterns in their observations. Use the following discussion prompts to continue the discussion to help students figure out that the sun is shining on the sand, dirt, and other surfaces in sunny places, causing them to get hot and that the sun is not shining on the sand, dirt, and other surfaces in shady places, causing them to be less hot." CE-P1 Events have causes that generate observable patterns. DCI K-PS3.B1 Conservation of Energy and Energy Transfer: Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2), and DATA-P3 Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems. (Lesson 4, Teacher Edition)
- In Lesson 5, Explore, Step 3, students integrate the use of the elements when they "Individually draw to explain. Give the Schoolyard Drawings handout and colored writing utensils to each student. Have them make their drawings. As they are drawing, circulate and ask questions about their drawings. What can you tell me about your drawing for a hot surface? What can you tell me about your drawing for a less hot surface? Why are you including that in the space for the hot surface/less hot surface? What is causing the hot surface to feel hot?" CE-P1 Events have causes that generate observable patterns. DCI K-PS3. B1 Conservation of Energy and Energy Transfer: Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2), and MOD-P3 Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). (Lesson 5, Teacher Edition)
- In Lesson 7, Explore, Step 4, Students integrate the use of the elements as they plan a design for a structure that will cause the blacktop to be less hot(effect) when the sun is shining on it, integrating the three dimensions: CCC Events have causes that generate observable patterns. DCI ETS1.B1 Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. CEDS-P1:

Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem. (Lesson 7, Teacher's Edition)

- Lesson 10, Synthesize, Step 4 Students integrate the use of the elements as they design a structure (model) to block the sun and cause the playground to feel less hot, integrating the three dimensions: CCC CCC: CE-P1 Events have causes that generate observable patterns. DCI ETS1.B1 Developing Possible Solutions: Designs can be conveyed through sketches, drawings, or physical models. DCI K-PS3.B.1 Sunlight warms Earth's surface SEP MOD-P4 Develop a simple model based on evidence to represent a proposed object or tool. (Lesson 10, Teacher's Edition)

Integration supports student sense-making over time.

- K.1 Energy Sunlight SEP-DCI-CCC-ELA-Math Matrix, Students have opportunities to use parts of the element CE-P1 Events have causes that generate observable patterns and DCI K-PS3.B1 Conservation of Energy and Energy Transfer: Sunlight warms Earth's surface. (K-PS3-1), (K-PS3-2) in every lesson. These two elements are used in a variety of practices over the course of the unit. For example, in lessons 2-5, students integrate use of CE-P1 and K-PS3.B1 with INV-P4 Make observations (firsthand or from media) to collect data that can be used to make comparisons in lesson 2, DATA-P1 Record information (observations, thoughts, and ideas) in lesson 3, DATA-P2 Use and share pictures, drawings, and/or writings of observations in lesson 4, and MOD-P3 Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s) in lesson 5 to make sense of the phenomenon.

Suggestions for Improvement: NA

I.D. Unit Coherence — Extensive

Lessons fit together to target a set of performance expectations.

i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences.
ii. The lessons help students develop toward proficiency in a targeted set of performance expectations.

The reviewers found extensive evidence that the lessons fit together coherently to target a set of performance expectations because each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences. The materials present a coherent unit, with each lesson building on one another, resulting in an evolving understanding of science ideas and concepts motivated by student questions and learning experiences. The lessons help students develop toward proficiency in a targeted set of performance expectations.

K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface.

K-PS3-2: Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area.

K-2 ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences.

- Lesson 1, Navigate, Step 5, "As a class, discuss what to investigate next. Using the Notice and Wonder chart and slide J, facilitate a discussion about what students could investigate next based on their observations and questions. Point out to students that scientists like us plan what they might be able to do to answer their questions." (Lesson 1, Teacher Edition)
- Lesson 3, Navigate Step 6, "Discuss what we should do next time. Remind the class that we had a chance to share our sand and dirt observations with only a couple of classmates and we still want to figure out (or confirm) the answer to our Unit Question (refer to slide I and the Notice and Wonder chart) about why some surfaces feel hot (or less hot). Prompt students to discuss what we might do next." (Lesson 3, Teacher Edition)
- Lesson 5, Navigate, Step 5, "Revisit the Notice and Wonder chart and add questions. Refer students back to the Notice and Wonder chart (refer to slide J) and read off the posted questions related to answering about sharing what we have figured out about why surfaces are hot and less hot. Ask students if they could answer any of those questions based on what they have figured out." (Lesson 5, Teacher Edition)
- Lesson 7, Navigate, Step 1, "Recall together where we left off. Ask a few students to share what they discussed with their partner and use the prompts below to facilitate a class discussion (refer to slides B and C). If possible, have students point to Our Growing Ideas chart and the Ideas and Wonders chart to support the ideas they share." (Lesson 7, Teacher Edition)
- Lesson 9, Navigate, Step 1, "Develop the lesson question with students. Summarize that it sounds like students want to test our designs today. Connect back to students' questions on the Ideas and Wonders chart and establish a lesson question that's something like, *How can we test our designs to see how they can make the blacktop less hot?* Add this question to the next row of Our Growing Ideas chart (refer to slide B)." (Lesson 9, Teacher Edition)
- Lesson 10, Navigate Section, Step 6: "Consider other questions we still have. Remind students that scientists and engineers continue to ask questions even after they have figured things out. Ask students what other questions they have about surfaces getting hot or less hot and why. Celebrate those questions and explain that we will not be able to answer them all now, or even this year, but it is important in science and engineering to keep asking questions and continuing to figure things out as we work together in science." (Lesson 10, Teacher Edition)

ii. The lessons help students develop toward proficiency in a targeted set of performance expectations.

The lessons help students develop toward proficiency in a targeted set of performance expectations.

- Two target Performance Expectations are identified in the K-1 Lesson Unit Overview as being "built toward":
  - **K-PS3-1:** Make observations to determine the effect of sunlight on Earth's surface
  - **K-PS3-2:** Use tools and materials provided to design and build a structure that will reduce the warming effect of sunlight on an area
- The K-1 Lesson Unit Overview infographic identifies two additional performance expectations under the question, "Where does this unit fall within the OpenSciEd Scope and Sequence?"

  - **K-2 ETS1-1:** Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
  - **K-2-ETS1-2:** Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.
- Lessons 1-5 help students develop toward proficiency as they collect and analyze data about the effects of sunlight on the Earth's surface. In Lesson 1, they explore how things feel outside, learning that some surfaces are hot and others are less hot in the schoolyard, and that they have questions they'd like to investigate about hot and less hot surfaces. In Lesson 2, students observe differences in sunny and shady places, and figure out that making observations and recording data can help them share those observations with others. They discover that surfaces in sunny places feel hot and surfaces in shady places feel less hot. In Lesson 3, students look for patterns in their observations of sunny and shady places. They learn that sand and dirt in sunny places feel hot, and those materials in shady places feel less hot. In Lesson 4, they work to find out why surfaces in sunny and shady places feel hot and less hot. They learn that the Sun shining on surfaces makes them feel hot, and surfaces in shady places feel less hot. In Lesson 5, students explore how they can share with others why surfaces are hot and less hot. They figure out that they can draw pictures that show their thinking and help explain how the Sun shining on surfaces can make them feel hot, and in shady places, they feel less hot. K-PS3-1. Make observations to determine the effect of sunlight on Earth's surface. (Unit Storyline)
- Lessons 6-10 help students develop toward proficiency as they engage in an engineering task to solve a playground problem. In Lesson 6, students explore problems with hot surfaces on their playground and determine they have many ideas and questions about how to solve the hot blacktop problem. In Lesson 7, the children start to make a plan for making the blacktop less hot. They learn they can draw a design to solve the hot blacktop problem and that drawing our designs helps us think carefully about how we plan to solve our problems, such as what materials we should use. Drawing our designs also helps us share ideas with others. In Lesson 8, students learn that they can build designs to make the blacktop less hot. They find some materials work better than others. In Lesson 9, students test their designs, like engineers. They find that designs that stay up and have a roof that is thick enough and large enough to cover the blacktop help make the blacktop less hot. In Lesson 10, students learn that by sharing their ideas, they can come up with a consensus design. They find out that they could use materials to make a cover to stop the sun from shining on the blacktop which would cause the blacktop to be less hot. They can compare test results and design ideas to create a class consensus design. K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming. (Unit Storyline)

Suggestions for Improvement: NA

I.E. Multiple Science Domains — Extensive

When appropriate, links are made across the science domains of life science, physical science, and Earth and space science.

i. Disciplinary core ideas from different disciplines are used together to explain phenomena.
ii. The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems across science domains is highlighted.

The reviewers found extensive evidence that links are made across the science domains when appropriate because the identified phenomenon driving the unit can be fully addressed within the physical science domain. Because this is the first unit of kindergarten, there can be no expectation that CCCs will have been introduced and used within the context of another domain. Consequently, it is reasonable to accept that CCC connections across multiple science domains do not need to be made to support student sensemaking.

i. Disciplinary core ideas from different disciplines are used together to explain phenomena.

- In Lessons 1-10, only the physical science domain is necessary to explain the phenomenon.K-PS3.B.1: Conservation of Energy and Energy Transfer K-PS3.B.1 PS3.B Conservation of Energy and Energy Transfer: Sunlight warms the earth's surface.

ii. The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems across science domains is highlighted.

- In Lessons 1-10, the CCC elements identified are used to make sense of phenomena related to the physical science domain. (See I.C. for evidence of CE-P1: Events have causes that generate observable patterns.)

Suggestions for Improvement: NA

I.F. Math and ELA — Extensive

Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.

The reviewers found extensive evidence that the materials provide grade-appropriate connections to the Common Core State Standards in Mathematics and/or English Language Arts (ELA) and Literacy in History/Social Studies, Science, and Technical Subjects because the materials explicitly state the mathematics and ELA standards that are used in the unit and support students to see the connections between content areas.

ELA

Language

CCSS-ELA-LITERACY.L.K.1B Use frequently occurring nouns and verbs. Claimed in Lesson 9.

- Lesson 9, Connect Section, Step 2 Literacy Supports Sidebar "Identify or clarify the two meanings of the word "test" and help students begin to use this word as a noun and a verb. (L.K.1B)" and "Clarify the word "test" for students. Explain to students that the word "test" can be used in different ways and mean different things. A test can be a thing, like if you take a spelling test. Or a test can be an action you do, like how we are going to test our designs." (Lesson 9, Teacher Edition)

CCSS-ELA-LITERACY.L.K.1F Produce and expand complete sentences in shared language activities. Claimed in Lesson 2.

- Lesson 2, Explore Section, Broadening Access Sidebar Step 4 "Consider supporting students' language development by writing the suggested sentence starters on sentence strips and putting them in a pocket chart for students to reference. Read the sentences aloud and invite students up to fill in the blanks with their Hot and Less Hot Cards. Keep the sentences available for students to reference when they talk with a partner, again using their Hot and Less Hot Cards. Continue this routine as is helpful throughout the unit." (Lesson 2, Teacher Edition)

CCSS-ELA-LITERACY.L.K.4A Identify new meanings for familiar words and apply them accurately (e.g., knowing duck is a bird and learning the verb to duck). Claimed in Lesson 1.

- Lesson 1, Synthesize Section, Step 2 "Begin using "surface" to name the things students explored. Explain that scientists often use words that help them talk about exactly what they saw or did, and we can use a new science word," and Literacy Supports Sidebar "Help students identify or clarify this new meaning for a familiar word (outside) and begin to use both accurately. Since the class will go outside to feel surfaces again in upcoming lessons, they will have many opportunities to practice with this word's meanings. (L.K.4A)" (Lesson 1, Teacher Edition)

Reading: Informational Text

CCSS.ELA-LITERACY.RI.K.2 With prompting and support, identify the main topic and retell key details of a text. Claimed in Lessons 4 and 8.

- Lesson 4, Connect Section, Step 4 Literacy Supports Sidebar "The prompts are designed to help students identify the main topic of the book and retell the key details." (RI.K.2) (Lesson 4, Teacher Edition)
- Lesson 8, Connect Section, Step 2 "Engage students in the interactive read aloud. Before beginning the interactive read aloud, have students share ideas of why they think designs are used in engineering. Explain that this is the main topic, or what the part of the book we are reading is all about. Tell students they will need to pay close attention to how engineers use their designs. Read pages 1-11 of the Engineers Plan, Build, and Test Designs book. "(Lesson 8, Teacher Edition)
- Lesson 8, Connect Section, Step 2 Literacy Connections Sidebar "Giving students an opportunity to retell the main topic of the text, how engineers use their designs assists students in the Explore to be engineers and use materials to build their models based on their own designs. (RI.K.2)" (Lesson 8, Teacher Edition)

CCSS-ELA-LITERACY.RI.K.5 Identify the front cover, back cover, and title page of a book. Claimed in Lesson 3.

- Lesson 3, Connect Section, Step 4 "Explore the book's structure. Point out that like other books we read at other times of our day, this book has a front cover, back cover, and title page. Briefly comment about how these parts of the book help us as readers (e.g., to make guesses as to what the book will be about, see who wrote the book)." (Lesson 3, Teacher Edition)

Speaking and Listening

CCSS-ELA-LITERACY.SL.K.1A Follow agreed-upon rules for discussions (e.g., listening to others and taking turns speaking about the topics and texts under discussion). Claimed in Lessons 1, 3, 10.

- Lesson 1, Explore Section, Step 1 "You will engage students in science discussions by forming a Scientists Circle in this and many future lessons. If your students do not already meet in a circle in your classroom, take time during this lesson to plan and practice logistics for forming, equitably participating in, and exiting that space so students can do it quickly and smoothly in the future. As students get more comfortable with a Scientists Circle, they can move between it and other activity structures more quickly. Ideally, they should be able to see one another, as well as the slides and the class whiteboard or chart paper. If that is not possible, seeing each other and the whiteboard or chart paper will be more critical for these discussions than the slides." "If this is your first science unit of the year, plan to spend about 30 minutes building classroom agreements for how we figure things out in science before engaging in the next component of this lesson. Establishing agreements for your classroom community now will allow students to practice them during the upcoming discussion. If you have already established classroom agreements for science, take this opportunity to review them with the class and add examples of how the agreements look, sound, and feel in our class." (Lesson 1, Teacher Edition)
- Lesson 3, Synthesize Section, Step 5 Community Connections Sidebar "Refer back to the classroom agreements and ask students how we will look, listen, and respond to each other's ideas and/or let our ideas change and grow while we share our ideas in this discussion." (Lesson 3, Teacher Edition)
- Lesson 10, "Connect to classroom agreements. Ask which of our classroom agreements will be most helpful as we create our consensus design, and take a few minutes to review how those agreements look and sound in our classroom. Facilitate creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design." (Lesson 10, Teacher Edition)

CCSS-ELA-LITERACY.SL.K.5 Add drawings or other visual displays to descriptions as desired to provide additional detail. Claimed in Lesson 7.

- Lesson 7, Synthesize Section, Step 5: "Share and compare designs with a partner. Organize students into the partnerships they'll keep through Lesson 9. Refer to slide L and guide student pairs to compare and combine design ideas on their My Design Plan handout using the suggested prompts. Remind students that asking and answering questions helps us include important information and details that improve our designs." (Lesson 7, Teacher Edition)

Writing

CCSS-ELA-LITERACY.W.K.5 With guidance and support from adults, respond to questions and suggestions from peers and add details to strengthen writing as needed and claimed in Lessons 7 and 10.

- Lesson 7, Explore Section, Step 4 "Display slide K and show students the materials you have available for them to build with. Encourage students to add details like they do in other writing, such as additional drawing and/or labels (such as using the first letter/sound if they are not writing words yet). Explain that adding details about the materials they might use will help students share their design plans with others." (Lesson 7, Teacher Edition)
- Lesson 10, Explore Section, Step 2: "Distribute colored writing utensils and the My Revised Design Plan handout to each student and give students a few minutes to draw their new designs." Note: My Revised Design Plan has a space where students answer the question, "How will your new design make the blacktop less hot?" (Lesson 10, Teacher Edition)

Mathematics

CCSS-MATH-Practice.MP2 Reason abstractly and quantitatively.
Claimed in Lesson 2 and 4. Evidence was found in both claimed lessons, examples include:

- Lesson 2, Explore, Step 3 Math Supports Sidebar: "As students finish recording their data, ask them to count the number of marks in each category, hot and less hot, to figure out how many are in each. Students can use finger counting as a support. As they practice counting, students should touch each mark to support one-to-one correspondence. After the students have completed their counts, connect it back to the question 'how many hot and how many less hot surfaces are in your data?' to support students in understanding the context. (K.CC.B.4.A, K.CC.B.5, and MP2)." (Lesson 2, Teacher Edition)
- Lesson 4, Explore, Step 3 Math Supports Sidebar: "As students sort the categories, ask them to use the terms "greater than", "less than", or "equal to" to compare the different surface types. After each count, connect the quantity counted to its contextual meaning, such as saying, Nine people observed the sand in the sun felt hot." (Lesson 4, Teacher Edition)

CCSS-MATH-Practice.MP3 Construct viable arguments and critique the reasoning of others.
Claimed in Lesson 2 and 9. Evidence was found in both claimed lessons, examples include:

- Lesson 2, Explore, Step 4 Math Supports Sidebar: "Have the students use the sentence strips and cards to compare amounts, using data to justify their conclusions and develop their mathematical communication skills. (MP3)." (Lesson 2, Teacher Edition)
- Lesson 9, Explore, Step 5 Math Supports Sidebar: "While students discuss the similarities and differences in the designs and why they did or did not make the blacktop less hot, have students use evidence from their tests, such as the qualitative measurement of the temperature of the blacktop, the number of designs that blocked the sun, shapes that were used within the designs, etc. to support their arguments and to critique the arguments of others.(MP3)." (Lesson 9, Teacher Edition)

CCSS-MATH-Practice.MP4 Model with mathematics.
Claimed in Lesson 4 and 9. Evidence was found in both claimed lesson and lesson 2, examples include:

- Lesson 2, Explore, Step 4 Math Supports Sidebar: "Modeling the data mathematically will support students in drawing conclusions through visual and concrete representations of their observations. (MP4)." (Lesson 2, Teacher Edition)
- Lesson 4, Explore, Step 2 Math Supports Sidebar: "In Lesson 2, students recorded their observations using checkmarks. To progress students in their representation of data, students will use tally marks to model their observation data. (MP4)." (Lesson 4, Teacher Edition)
- Lesson 9, Explore, Step 4 Math Support Sidebar "Students create a T-chart, or picture graph, to model and organize which designs were hot/less hot in their investigation. To support students in their analysis of the patterns in their data, construct the T-chart so each design can be placed in a square or on a floor tile so that comparisons and counts can be made easily. (MP4)" (Lesson 9, Teacher Edition)

CCSS-MATH-Practice.MP6 Attend to precision.
Claimed in Lesson 8. Evidence was found in the claimed lessons, examples include:

- Lesson 8, Explore, Step 3 Math Supports Sidebar "As students build their designs, support partners in communicating about the construction of their shared design by identifying shapes and describing the relative position of the materials (such as above, below, beside, in front of, behind, and next to). Acknowledge with students that using precise mathematical language helps them communicate clearly about their ideas. (K.G.A.1, MP6)." (Lesson 8, Teacher Edition)

CCSS-MATH-Practice.MP7 Look for and make use of structure.
Claimed in Lesson 8 and 10. Evidence was found in the claimed lessons, examples include:

- Lesson 8, Explore, Step 3 Math Supports Sidebar "Have students look for and make use of the structure of each shape (e.g. number of sides, number of corners) within their drawn design to help name and identify the shapes regardless of their orientation or overall size. Extend this conversation with their partner by choosing which materials match their design. (K.G.A.2 and MP7)." (Lesson 8, Teacher Edition)
- Lesson 10, Explore, Step 3 Math Supports Sidebar "As you circulate, ask students to look for and make use of the structure of shapes they are including in their designs regardless of their orientation or overall size (e.g. How do you know that's a triangle?), using the shapes on optional slide K as a support. Ask students why they think that shape will work better in their design than a different one. (K.G.A.2 and MP7)." (Lesson 10, Teacher Edition)

K.CC.B.4.A CCSS-MATH-K.CC.B.4a When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.
Claimed in Lesson 4. Evidence was found in the claimed lesson, examples include:

- Lesson 4, Explore, Step 2 Math Supports Sidebar: "Explicitly explain to the students that the 5th tally in each group is a slash to support one-to-one correspondence. Ask how many in total and have students count the tally marks connecting each number name with one tally mark when counting. (K.CC.B.4a)." (Lesson 4, Teacher Edition)

CCSS-MATH-K.CC.B.5 Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.
Claimed in Lesson 2 and 4. Evidence was found in both claimed lessons, examples include:

- Lesson 2, Explore, Step 3 Math Supports Sidebar: "As students finish recording their data, ask them to count the number of marks in each category, hot and less hot, to figure out how many are in each. Students can use finger counting as a support. As they practice counting, students should touch each mark to support one-to-one correspondence. (K.CC.B.5)." (Lesson 2, Teacher Edition)
- Lesson 4, Explore, Step 2 Math Supports Sidebar: "Modeling the data with tally marks builds on subitizing skills and supports counting and comparison more easily than scattered checkmarks, as well as supports counting by and number recognition building off 1s, 5s, and 10s. (K.CC.B.5)." (Lesson 4, Teacher Edition)

CCSS-MATH-K.CC.C.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.* (*Include groups with up to ten objects.)
Claimed in Lesson 2 and 4. Evidence was found in the claimed lessons, examples include:

- Lesson 2, Explore, Step 4 Math Supports Sidebar: "Ask students to share what counting strategies they used to show how the number of marks in one group is greater than, less than, or equal to the number of marks in another group. In Lesson 4, when students gather data in a similar way, support students in a progression in their representation of data by having them use tallies instead of checks and Xs to support counting by 1s, 5s, and 10s. (K.CC.C.6)." (Lesson 2, Teacher Edition)
- Lesson 4, Explore, Step 2 Math Supports Sidebar: "..ask them to use the terms "greater than", "less than", or "equal to" to compare the different surface types. (K.CC.C.6)." (Lesson 4, Teacher Edition)

CCSS-MATH-K.G.A.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.
Claimed in Lessons 7, 8, and 9. Evidence was found in the claimed lessons, examples include:

- Lesson 7, Synthesize, Step 5 Math Supports Sidebar "Shape is an important element of design as it impacts appearance and function. During the turn and talk, encourage students to describe their design using shape names and attributes with a shape poster or optional slide O as support. To support students in sharing the overall design, have them describe the objects in their designs using relative positions such as above, below, beside, in front of, behind, and next to. (K.G.A.1)." (Lesson 7, Teacher Edition)
- Lesson 8, Explore, Step 3 Math Supports Sidebar "As students build their designs, support partners in communicating about the construction of their shared design by identifying shapes and describing the relative position of the materials (such as above, below, beside, in front of, behind, and next to). Acknowledge with students that using precise mathematical language helps them communicate clearly about their ideas. (K.G.A.1, MP6)." (Lesson 8, Teacher Edition)

CCSS-MATH-K.G.A.2 Correctly name shapes regardless of their orientations or overall size.
Claimed in Lessons 8 and 10. Evidence was found in the claimed lessons, examples include:

- Lesson 8, Explore, Step 3 Math Supports Sidebar "Have students look for and make use of the structure of each shape (e.g. number of sides, number of corners) within their drawn design to help name and identify the shapes regardless of their orientation or overall size. Extend this conversation with their partner by choosing which materials match their design. (K.G.A.2 and MP7)." (Lesson 8, Teacher Edition)
- Lesson 10, Explore, Step 3 Math Supports Sidebar "As you circulate, ask students to look for and make use of the structure of shapes they are including in their designs regardless of their orientation or overall size (e.g. How do you know that's a triangle?), using the shapes on optional slide K as a support. Ask students why they think that shape will work better in their design than a different one. (K.G.A.2 and MP7)." (Lesson 10, Teacher Edition)

CCSS-MATH-K.G.A.1 Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").
Claimed in Lessons 7, 8, and 9. Evidence was found in the claimed lessons, examples include:

- Lesson 7, Synthesize, Step 5 Math Supports Sidebar "Shape is an important element of design as it impacts appearance and function. During the turn and talk, encourage students to describe their design using shape names and attributes with a shape poster or optional slide O as support. To support students in sharing the overall design, have them describe the objects in their designs using relative positions such as above, below, beside, in front of, behind, and next to. (K.G.A.1)." (Lesson 7, Teacher Edition)
- Lesson 8, Explore, Step 3: "If you hear students using shape words (round, wide, long, circle, square, rectangle, etc.) or position words (under, beside, etc.) while building, bring attention to this in the moment and ask students to think about how the shape of the materials impacts the design." (Lesson 8, Teacher Edition)
- Lesson 9, Explore, Step 3 Math Support Sidebar "As they compare and discuss design features and materials, support students' descriptions by helping them name the shapes used (circle, rectangle, square) and attributes of those shapes (straight or curved sides, number of sides/corners). Refer to a shapes poster or optional slide L as needed. (part of K.G.A.1)" (Lesson 9, Teacher Edition)

CCSS-MATH-K.G.B.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
Claimed in Lesson 8. Evidence was found in the claimed lessons, examples include:

- Lesson 8, Explore, Step 3: "If students need differentiated support in building their designs, refer them to images of designs in the world that provide shade and have them use the shapes in those designs as a model to replicate with their building materials. (K.G.B.5)." (Lesson 8, Teacher Edition)

CCSS-MATH-K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
Claimed in Lesson 3, 5, and 9. Evidence was found in the claimed lessons, examples include:

- Lesson 3, Explore, Step 2 Math Support Sidebar "Students will qualitatively measure the relative temperature of sand or dirt in sunny and shady places by describing the difference between them as "hot" or "less hot". Have students name other examples where they have directly compared and described other measurable attributes, such as block towers being taller or shorter, to help them make these comparisons in science. (part of K.MD.A.1 and K.MD.A.2)" (Lesson 3, Teacher Edition)
- Lesson 5, Navigate, Step 1 Math Support Sidebar "Throughout this lesson, students will describe and qualitatively measure one attribute (temperature) of different surfaces (part of K.MD.A.1)." (Lesson 5, Teacher Edition)
- Lesson 9, Explore, Step 4 Math Support Sidebar "As students discuss designs as a class, support them in describing measurable attributes of the designs using comparison language, such as taller, shorter, wider, bigger, smaller, and less hot. (K.MD.A.2 and part of K.MD.A.1)" (Lesson 9, Teacher Edition)

CCSS-MATH-K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has "more of"/"less of" the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.
Claimed in Lesson 3, 5, and 9. Evidence was found in the claimed lessons, examples include:

- Lesson 3, Explore, Step 2 Math Support Sidebar "Students will qualitatively measure the relative temperature of sand or dirt in sunny and shady places by describing the difference between them as "hot" or "less hot". Have students name other examples where they have directly compared and described other measurable attributes, such as block towers being taller or shorter, to help them make these comparisons in science. (part of K.MD.A.1 and K.MD.A.2)" (Lesson 3, Teacher Edition)
- Lesson 5, Navigate, Step 1 Math Support Sidebar "During discussion, have students directly compare the temperature for two slides and describe the difference by naming one slide as more hot than the other. (K.MD.A.2)" (Lesson 5, Teacher Edition)
- Lesson 9, Explore, Step 4 Math Support Sidebar "As students discuss designs as a class, support them in describing measurable attributes of the designs using comparison language, such as taller, shorter, wider, bigger, smaller, and less hot. (K.MD.A.2 and part of K.MD.A.1)" (Lesson 9, Teacher Edition)

CCSS-MATH-K.MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.* (*Limit category counts to be less than or equal to 10.)
Claimed in Lesson 4. Evidence was found in the claimed lesson, examples include:

- Lesson 4, Explore, Step 2 Math Supports Sidebar: "After each count, connect the quantity counted to its contextual meaning, such as saying, Nine people observed the sand in the sun felt hot. (K.MD.B.3)." (Lesson 4, Teacher Edition)

Suggestions for Improvement

- In lessons with mathematics connections, consider adding additional prompts to help students see the connections between content areas.

CATEGORY II
NGSS Instructional Supports

II.A. Relevance and Authenticity

II.B. Student Ideas

II.C. Building Progressions

II.D. Scientific Accuracy

II.E. Differentiated Instruction

II.F. Teacher Support for Unit Coherence

II.G. Scaffolded Differentiation Over Time

II.A. Relevance and Authenticity — Extensive

Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world.

i. Students experience phenomena or design problems as directly as possible (firsthand or through media representations).
ii. Includes suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate.
iii. Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience.

The reviewers found extensive evidence that the materials engage students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world because students experience phenomena or design problems as directly as possible by feeling different surfaces outdoors and investigating a variety of surfaces in sunny and shady areas. This phenomenon is place-based and accessible for young children to experience and wonder about within their schoolyard and community. The materials include suggestions for how to connect instruction to the students' home and community by providing sidebars for teachers called "Broadening Access" and "Community Connections" to suggest ways to connect instruction to students' home experiences and provide opportunities for students to share stories and problems related to the phenomenon. The materials do provide opportunities for students to connect their explanation of a phenomenon and/or their design solution to questions from their own experiences when they consider possible problems related to hot blacktop in their own lives and community.

i. Students experience phenomena or design problems as directly as possible (firsthand or through media representations)

- Lesson 1, Explore, Step 1 "Go outside to make observations. Pair students with a partner and distribute the Schoolyard Observations handout to each student, along with a writing utensil and clipboard (if using). Bring students outside and have them work with their partner to notice how different things or places feel compared to the comparison object ." (Lesson 1, Teacher Edition).
- Lesson 9, Explore, Step 3 "Bring students outside to make observations and record them. Take students outside to test whether the black construction paper under the designs is less hot than the black construction paper in the sun with no design." (Lesson 9, Teacher Edition).

ii. Includes suggestions for how to connect instruction to the students' home, neighborhood, community, and/or culture as appropriate.

- Lesson 1, Explore, Step 1 Broadening Access Sidebar: "To help students make more connections between the observations they will make and the surfaces in their schoolyard, you can change the images on slide A to be photos of objects with different surfaces around your own schoolyard" (Lesson 1, Teacher Edition).
- Lesson 2, Explore, Step 4 Prompts to use: "What are other surfaces in sunny places at home or in your neighborhood?" (Lesson 2, Teacher Edition).
- Lesson 6, Lesson Front Matter: "To support students in the planning they will do in Lesson 7, consider taking a school tour to look for objects or structures that block the sun and/or send home the What blocks sun? Community Connection page." (Lesson 6, Teacher Edition)

- Lesson 6 Navigate, Step 1: "Tell students you have something we can read about another community that had a problem to solve, and ask how reading about another community's problem might help us figure out more about problems we could solve." (Lesson 6, Teacher Edition).

iii. Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience.

- Lesson 1, Synthesize, Step 2 Broadening Access Sidebar: "It is important to allow space for all students to share their own experiences and stories of how they experience and connect with science in their everyday lives. Even if students' ideas do not seem related, use follow-up responses to giving all students space and time to be included and valued in the discussion." (Lesson 1, Teacher Edition)
- Lesson 7, Connect Section, Step 2: "Engage students in the interactive read aloud. Read pages 1-12 in the *Meet the Playground Designer: Lisa DeShano* book. Make sure to pause and ask the question prompts connecting students' own experiences and the blacktop problem to what they are reading in the book." (Lesson 7, Teacher Edition)
- In Lesson 10, Connect, Step 5: *How Playgrounds are Engineered,* "Page 18: When you have solved a problem at home or around your community, how did you share your ideas?" (Lesson 10, Teacher's Edition)

Suggestions for Improvement: NA

II.B. Student Ideas — Extensive

Student Ideas: Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.

The reviewers found extensive evidence that the materials give students opportunities to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.

Student ideas are expressed, clarified, justified, and built upon.

- Lesson 2, Synthesize Section, Step 5 "Teaching Tip: A Building Understandings Discussion is a useful kind of discussion following an investigation because the purpose is to help students focus on identifying what this new evidence means for us: What conclusions can we draw from it? Your role during the discussion is to invite students to share their claims and to push them to support their claims with evidence." (Lesson 2, Teacher Edition)
- Lesson 7, Synthesize, Step 6 Possible follow-up responses are provided to the teacher to encourage students to interpret, justify, and build upon others' ideas: "Can anyone say or show that idea in another way to help us all understand? Do you agree or disagree with what _____ said? What makes you think that? Who can add on to what _____ said?" (Lesson 7, Teacher Edition)
- Lesson 10, Navigate, Step 1 Broadening Access Sidebar: "Asking students to agree or disagree provides an opportunity for all students to engage in a science talk and all ideas to be heard, which is an important part of science and engineering. Ensuring there are multiple opportunities for student voices to be heard is

one way of demonstrating that science is a social enterprise. It's important to plan time for that to happen." (Lesson 10, Teacher Edition)

Artifacts show evidence of students' reasoning and changes in their thinking over time.

- Lesson 8, Explore Section, Step 3 "Have students work with their partner to build their shared design. While students are working, circulate to see how they are using materials to inform their designs for blocking sun to make the blacktop less hot. As you circulate, use the following prompts below to support students in their work together. What changes are you making to your design while building it? Why?" (Lesson 8, Teacher Edition)
- Lesson 9, Explore, Step 3 "Is there any part of your design or materials that you used that you would change? (Lesson 9, Teacher Edition)
- Lesson 10, Explore Section, Step 2 "Individually draw new designs. Display slide C and explain to students that they can each use the information we collected from our tests (listed on the Designs and Materials chart) and the materials shown on slide D (if helpful) to create a revised design for making the blacktop less hot. Explain that revised means changed or different to make it better. After we plan our revised designs, we will have a chance to share our ideas with our partners and the whole class. Distribute colored writing utensils and the My Revised Design Plan handout to each student and give students a few minutes to draw their new designs." (Lesson 10, Teacher Edition)

Students receive feedback and revise their thinking accordingly.

- K.1 Lesson 3 Teacher Assessment Tool Instructional Guidance "Possible Next Steps- Problematize students' existing thinking by posing a question that could help students identify a gap in their own thinking, such as: Do you think it always works that way? Consider an alternative point of view that would lead students to pose new investigative questions, such as: Do you think it is a problem for anyone that this surface is hot? Who?" (Lesson 3, Assessment Tool Instructional Guidance)
- Lesson 5, Synthesize, Step 5 "Establish purpose for peer feedback. Explain to students that they will give their partner feedback on their drawings so that they can make sure there is nothing missing and that our drawings show all that they have figured out so far. Encourage students that this is an important part of science and part of our classroom agreement to let our ideas change and grow." (Lesson 5, Teacher Edition)
- Lesson 9, Synthesize, Step 5 "... invite students to talk with a classmate other than their engineering partner about how their designs helped make the blacktop less hot. Follow up by asking if their ideas have grown and changed after testing their designs today. These ideas do not need to be recorded on the chart." (Lesson 9, Teacher Edition)

Suggestions for Improvement: NA

II.C. Building Progressions — Extensive

Identifies and builds on students' prior learning in all three dimensions, including providing the following support to teachers:

i. Explicitly identifying prior student learning expected for all three dimensions
ii. Clearly explaining how the prior learning will be built upon.

The reviewers found extensive evidence that the materials identify and build upon students' prior learning in all three dimensions because the materials do explicitly identify prior learning expected for all three dimensions. The teacher support clearly explains how the prior learning will be built upon. In the K.1 Lesson Unit Overview, a DCI table, SEP table, and CCC table describe the elements of the dimensions that are intentionally developed in the lessons and describe how and when they are developed, as well as how and when they are assessed. (K.1 EnergySunlight Unit Front Matter)

i. Explicitly identifying prior student learning expected for all three dimensions

- In K.1 Lesson Unit Overview, "Cause and Effect: Almost as soon as children can talk, they begin to ask "why?" Prior to entering kindergarten, children will have already noticed patterns in their world and sought explanations for why they happen. Sometimes those explanations will be imaginative and sometimes they will be based on experiences (single or multiple)." (K.1EnergySunlight Unit Front Matter)
- In K.1 Lesson Unit Overview, "Solving Problems: Young children come to school having many experiences of solving everyday problems. For example, they may solve problems related to sharing (e.g., what to do when they want a toy that a friend is using), communicating (e.g., how to respond when someone's feelings are hurt), or physical needs (e.g., they are getting dressed and cannot find their socks). Many of their everyday problems may not be engineering problems or problems solved using the engineering design process, but they still focus on the importance of solving a relatable problem." (K.1EnergySunlight Unit Front Matter)
- In K.1 Lesson Unit Overview, Making Observations: In kindergarten, students make and record observations of surfaces in sunny and shady places. They will build on their own experiences prior to entering kindergarten of noticing the world around them and questioning what they experience. Though kindergarteners are new to school science, they have been experiencing and interacting with the natural world throughout their lives. They come to school with many experiences of observing things around them, including how they feel (e.g., hot, cold, warm, cool, smooth, bumpy, soft, hard) and where they are located." (K.1EnergySunlight Unit Front Matter)

ii. Clearly explaining how the prior learning will be built upon.

- K.1 Energy Sunlight Unit Front Matter "This unit explicitly supports students as they record, share, and use their observations. Students are provided with ready-made tables to record their observations for each investigation and they share their drawings and writings with partners and the whole class, such as when they use their observations to identify patterns about surfaces in sunny and shady places. The teacher supports students as they use those patterns to answer their question about why some surfaces are hot and others are less hot. Then when students test their engineering designs, they work as a class to use data to determine if their solutions worked as intended to make the blacktop less hot." (K.1 Energy Sunlight Unit Front Matter)

- Lesson 2, Explore Section, Step 3, Teacher Tip sidebar: "It may be helpful to point out to students that the word "feel" can be used to talk about our sense of touch (like when we are feeling surfaces in our investigations) and also to talk about emotions (like feeling happy or sad)." (Lesson 2, Teacher Edition)
- Lesson 6, Explore, Step 3, Broadening Access Sidebar: "Students will likely have different understandings of what a "problem" is based on their prior experiences. It is important to help all students recognize that problems in engineering are challenges or things we need to solve and that problems are not inherently "bad things" as young children may currently understand them to be. For example, in engineering a problem might include designing a faster form of transportation, or a way to carry materials long distances." (Lesson 6, Teacher Edition)

Suggestions for Improvement

- Consider including sidebars with possible alternative conceptions related to the targeted DCI elements.

II.D. Scientific Accuracy — Extensive

Scientific Accuracy: Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.

The reviewers found extensive evidence that students use scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support their three-dimensional learning. The K.1 Energy About the Science section and various sidebars explain why particular terms and representations are used to describe and represent scientific ideas accurately.

- Lesson 1, Explore Section, Step 1 Teaching Tip Sidebar "This unit uses the terms "hot/hotter" and "less hot" (rather than "cold/colder/cooler") because this language more accurately conveys the idea that how warm something feels is related to an amount of energy. However, describing temperatures related to energy is beyond grade band; see the About the Science section of the unit for details. It is reasonable if students continue to use "cooler" or "cold" to describe how surfaces feel. On charts and handouts and in class discussions, continue to use "hot" and "less hot"." (Lesson 1, Teacher Edition)
- K.1 Energy About The Science, "Students do not investigate or attempt to explain this transfer of energy, they only observe its effect." (About the Science, Teacher Edition)
- K.1 Energy About The Science, "Instead, the unit designers intend these icons as support for students who are not yet reading English words. Field test teachers appreciated the use of different colors to support students in collecting and sharing their data for hot and less hot surfaces. The colors red and blue (as opposed to other colors) can be differentiated by people with various types of color blindness. In addition, the blue "less hot" icon is significantly less filled-in so it can also be differentiated from the red more-filled-in "hot" icon even when printed in grayscale. For this reason, the levels shown on the hot and less hot thermometer icon scales are relatively higher and lower than they likely would be if actual thermometers were used to measure the difference between the same type of surface in sunny and shady places." (About the Science, Teacher Edition)
- K.1 Lesson 1 Infographic Surfaces "Notice and Wonder chart and ask where students touched on those things; did we touch the inside or the outside? Establish that we were usually touching the outside of

things. Tell students that a science word we can use to talk about *the outside of something* is the word **surface**. Read an infographic. Display slide H, tell students that this type of text is called an infographic, and read the entire Surfaces Infographic aloud, from top to bottom. Use the following prompts to briefly discuss what you read, referring back to the infographic as needed." (Lesson 1, Teacher Edition)

- Lesson 3 uses the term "dirt" instead of the word "soil" to describe the earth materials that students observe.

Suggestions for Improvement

- Consider using the term *soil* instead of *dirt* in all teacher and student materials. Consider including guidance about revoicing student language; if students use the term *dirt,* teachers do not need to correct them directly. Instead, teachers can revoice the students' ideas using the scientifically accurate term *soil.* For example, if a student says, "This dirt is wet," the teacher can respond, "Yes, this soil is wet."

II.E. Differentiated Instruction — Adequate

Provides guidance for teachers to support differentiated instruction by including:

i. Supportive ways to access instruction, including appropriate linguistic, visual, and kinesthetic engagement opportunities that are essential for effective science and engineering learning and particularly beneficial for multilingual learners and students with disabilities.
ii. Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations.
iii. Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.

The reviewers found adequate evidence for teachers to support differentiated instruction because the materials include a variety of suggestions in most lessons in the Broadening Access sidebars and the Additional Accessibility document. However, the materials provide limited opportunities for teachers to provide suggestions for how to support students with high interest or who have already met the performance expectations.

i. Supportive ways to access instruction, including appropriate linguistic, visual, and kinesthetic engagement opportunities are essential for effective science and engineering learning and particularly beneficial for multilingual learners and students with disabilities.

- Lesson 1, Explore Section, Step 1 "Broadening Access: Children who have tactile challenges or specific sensory needs may feel uncomfortable touching different surfaces. They can still make observations of whether something feels hot or less hot by holding their hands over it without touching it. They could also see how their hands feel in different places outside (such as sunny and shady places) without touching anything." (Lesson 1, Teacher Edition)
- Lesson 1, Explore, Step 1, Broadening Access Sidebar: "Encourage students to record and share about their observations using multiple modalities, such as drawing, pointing/gesturing, and speaking in languages they are most comfortable with." (Lesson 1, Teacher Edition)

- Lesson 2, Explore, Step 4, Broadening Access Sidebar: "Consider supporting students' language development by writing the suggested sentence starters on sentence strips and putting them in a pocket chart for students to reference. Read the sentences aloud and invite students up to fill in the blanks with their Hot and Less Hot Cards. Keep the sentences available for students to reference when they talk with a partner, again using their Hot and Less Hot Cards. Continue this routine as it is helpful throughout the unit." Similar guidance is provided in Lesson 4 as well. (Lesson 2/4, Teacher Edition)
- Lesson 5, Explore, Step 2, Broadening Access Sidebar: "If students are not yet writing independently, they can write the first letter they hear in a word, or an approximation of a letter if they are still working on letter formation. Transcribing their response may also be helpful. Refer to the Teacher Handbook for additional strategies you can use to support emerging writers." (Lesson 5, Teacher Edition)
- Lesson 8, Explore Section, Step 3 Broadening Access Sidebar "To support students' acquisition of new science terminology, it can be helpful for students, especially multilingual students, to incorporate their home language by sharing translations and/or looking for cognates. Multilingual students can make connections between the new terminology and their home language to foster a deeper understanding of the newly encountered vocabulary. In addition, noticing and valuing students' rich language resources sends the message that all students' language resources and practices are valuable for the classroom community's sensemaking work. If students share a shape word in a language other than English (e.g., in Spanish, Arabic, Mandarin, etc.), record this on the shape slide next to the English text." (Lesson 8, Teacher Edition)
- Lesson 10, Lesson Assessment Guidance, Lesson Front Matter Summative assessment guidance states, "What to look and listen for: Designs (models) which include a structure to block the sun and cause the blacktop to feel less hot. Students can explain that their designs (models) cause less sunlight to reach the blacktop, which will make the blacktop less hot. Evidence of students' ideas may be expressed in words, drawings, written or spoken descriptions, movement and/or gestures." (Lesson 10, Teacher Edition)

ii. Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations.

- Open Sci Ed Elementary & Accessibility, Making Open Sci Ed Accessible Educator Guidance "If there is a need for assistive technologies and additional modes of access, please see the Additional Accessibility Resources for further strategies and resources. Importantly, we encourage you to follow the guidance of students' IEPs/504s and to seek out assistance from members of your school team who specialize in different aspects of equitable and accessible learning, such as your special education team members, multilingual education staff, assistive and/or district technology specialists, reading and math specialists, and any other education team member who can get to know your students, your classrooms, and your unique needs from unit to unit. It is critical that any differentiations and/or accommodations made do not lessen or take away from the sensemaking work that students engage in throughout this unit" (Open Sci Ed Elementary & Accessibility)
- Open Sci Ed Elementary & Accessibility Additional Accessibility Resources, "OpenSciEd elementary lessons have been designed in a way to allow for students to provide multiple ways to engage, represent, and communicate their learning. While these opportunities exist within the current materials, there may be needs in your classroom that will require additional customized adaptation to make them more accessible for learner needs. It is not uncommon for elementary students who require adaptations to get pulled from their science classes for interventions. However, we hope that these guidelines will give you ideas for how to include all of your students meaningfully in your science lessons. In fact, many of these strategies will just be good teaching strategies for all of your students." Sections in this document share "Accessible Learning Strategies," which include Multiple Ways to Communicate Learning. Extended Time, Repeat orally words that are written on shared representations, Utilize text-to-speech and speech-to-text technologies,

Utilize Descriptive Transcripts, Alt Text, and Closed Captioning, and Adjusting Color within Materials." (OpenSciEd Elementary & Accessibility)

- Lesson 5, Connect, Step 2, Teacher Tip Sidebar: "Extension Opportunity: Provide blank index cards and invite students to create their own pairs of cause-effect cards from situations they notice throughout their day. Allow students to trade cards with partners or collect them in a set to play with at centers or during free choice time." (Lesson 5, Teacher Edition)
- Lesson 7, Synthesize, Step 5, Teacher Tip Sidebar: "Extension Opportunity: If students would benefit from seeing multiple designs in addition to their partners, you could organize a gallery tour by posting all student designs on the walls and inviting students to notice similarities and differences among them. Student pairs may or may not choose to incorporate additional details from the gallery tour into their own plans, but seeing everyone's designs can foster a sense of collaboration around solving the same problem." (Lesson 7, Teacher Edition)
- Lesson 7, Synthesize Section, Step 5 "Extension Opportunity: If students would benefit from seeing multiple designs in addition to their partners, you could organize a gallery tour by posting all student designs on the walls and inviting students to notice similarities and differences among them. Student pairs may or may not choose to incorporate additional details from the gallery tour into their own plans, but seeing everyone's designs can foster a sense of collaboration around solving the same problem." (Lesson 7, Teacher Edition)

iii. Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.

- Lesson 2, Synthesize, Step 2, Teacher Tip Sidebar: "Extension Opportunity: Consider making this book (and others from the unit after to read them) available to students in the print version or on devices so they can read it again during other times of the day." (Lesson 2, Teacher Edition) It is not clear if this extension opportunity is intended to target students with high interest or who have already met the performance expectations to develop deeper understandings.
- Lesson 3, Explore, Step 2, Teacher Tip Sidebar: "Extension Opportunity: For students who finish recording and sharing ideas earlier than others, or if you have down time between the Explore and Connect, ask them to draw/write on the back of their handout *why* they think some surfaces are hot and others are less hot. The class will begin to discuss causes related to the patterns they are noticing at the end of this lesson and in Lesson 4." (Lesson 3, Teacher Edition). It is not clear if this extension opportunity is intended to target students with high interest or who have already met the performance expectations to develop deeper understandings.
- Lesson 3, Explore, Step 3, Teacher Tip Sidebar: "Extension Opportunity: If you have evidence that a few, many, or most of your students are already identifying the sun as the reason why surfaces are hot and less hot, the Instructional Guidance 1 tool includes several ideas for how to differentiate for those students." (Lesson 3, Teacher Edition)

Suggestions for Improvement

- Consider making clear which sidebars labeled extension opportunities can be aimed at students needing extra support or those who have already met the performance expectations.
- Consider adding a teaching tip sidebar to direct teachers to Instructional Guidance 2 for extensions similar to what is provided for Lesson 3 while also making the extensions in Instructional Guidance 2 more robust.

II.F. Teacher Support for Unit Coherence — Extensive

Supports teachers in facilitating coherent student learning experiences over time by:

i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.).

ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions.

The reviewers found extensive evidence of teacher support for unit coherence. The materials support teachers in facilitating coherent learning experiences over time by providing Navigation sections for each lesson. Lessons 1–10 begin and end with a Navigation section. In most cases, these sections begin by guiding teachers to "Briefly recall where we left off," and "Revisit questions that we could investigate next" (Lesson 6, Teacher Edition), and finish by guiding teachers to "Take stock of our ideas and add new questions" (Lesson 6, Teacher Edition).

Strategies for linking student engagement across lessons and ensuring student sensemaking are provided through multiple charts that track student ideas over time. Lessons 1–10 use one or more of the following charts: "Notice and Wonder Chart" to track observations and questions, "Our Growing Ideas Chart" to track Disciplinary Core Ideas and how these ideas are built, and "Design Features and Materials" to track possible solutions that work and don't work. (Lessons 1–10, Teacher Edition, Lesson Materials, and Preparation Section)

i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.).

- Lesson 2, Navigate, Step 1 "Co-construct our question for today. To develop the lesson question with students, connect the questions they have asked with the direction of today's lesson. Consider saying something like, *We are wondering why surfaces feel different and we think it might have something to do with where those surfaces are. Let's try to figure out: What is different about surfaces in sunny and shady places?* (Rephrase as needed to use the language and wording of your students' questions.) (Lesson 2, Teacher Edition)
- Lesson 3, Navigate, Step 6 "Discuss what we should do next time. Remind the class that we had a chance to share our sand and dirt observations with only a couple of classmates and we still want to figure out (or confirm) the answer to our Unit Question (refer to slide I and the Notice and Wonder chart) about why some surfaces feel hot (or less hot). Prompt students to discuss what we might do next." (Lesson 3, Teacher Edition)
- Lesson 7, Navigate, Step 7 "Lead a discussion about what we could do next. Use the Ideas and Wonders chart (refer to slide N) to summarize ideas from students' design plans and add any new ideas or questions to help us figure out what to do next." (Lesson 7, Teacher Edition)
- Lesson 9, Navigate, Step 1 Develop the lesson question with students. Summarize that it sounds like students want to test our designs today. Connect back to students' questions on the Ideas and Wonders chart and establish a lesson question that's something like, *How can we test our designs to see how they can make the blacktop less hot?* Add this question to the next row of Our Growing Ideas chart (refer to slide B)." (Lesson 9, Teacher Edition)

ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions.

- Lesson 5, Explore, Step 3 "Individually draw to explain. Give the Schoolyard Drawings handout and colored writing utensils to each student. Have them make their drawings. As they are drawing, circulate and ask questions about their drawings. What can you tell me about your drawing for a hot surface? What can you tell me about your drawing for a less hot surface? Why are you including that in the space for the hot surface/less hot surface? What is causing the hot surface to feel hot? What is causing the less hot surface to feel less hot?" K-PS3.B Sunlight warms Earth's surface. MOD-P3 Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s). CE-P1 Events have causes that generate observable patterns. (Lesson 5, Teacher Edition)
- Lesson 9, Explore, Step 4 "Prepare to compare and discuss designs. Have students carefully place their design on the correct section of the floor T-chart based on the observation they recorded with their hot/less hot card on the design. You may need to remind students that the designs that made the blacktop hot provide us very helpful information for engineering to solve our problem." (Lesson 9, Teacher Edition) K-2-ETS1.B.1 These representations are useful in communicating ideas for a problem's solutions to other people. SF-P1 The shape and stability of structures of natural and designed objects are related to their function(s). INV-P5 Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal

Suggestions for Improvement: NA

II.G. Scaffolded Differentiation Over Time — Adequate

Provides supports to help students engage in the practices as needed and gradually adjusts supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems.

The reviewers found adequate evidence that supports are provided to help students engage in the practices as needed and gradually adjust supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems for some of the intentionally developed SEP elements. For SEP elements that were only intentionally developed in one or two lessons, there are not enough opportunities for students to have gradually adjusted support over time.

INV: Planning and Carrying Out Investigations

INV-P1: With guidance, plan and conduct an investigation in collaboration with peers (for K).

- Unit Summary, "Since this is the first time students formally use this practice, the teacher guides students in the planning and carrying out of their investigations in Lessons 1-3 and students always collaborate with the class or a partner." (K.1 Energy Sunlight Unit Front Matter)

- Lesson 1, Explore, Step 1 "Demonstrate how to record observations of surfaces outside. Refer to slide C and show how to draw/label in a box on the Schoolyard Observations handout using the comparison object for your example." (Lesson 1, Teacher Edition)
- Lesson 2, Explore, Step 3 "Demonstrate how to record observations. Display slide D and discuss with students how they will record their observations on the Sunny Shady Observations handout (without giving away whether the surface will be hot or less hot)." (Lesson 3, Teacher Edition)
- Lesson 9, Explore, Step 3 "Have students explain how they will test their design. Building from students' suggestions, ask students to tell you the plan for testing designs. Display slide E and let students know that you already took their designs outside in a sunny area and that they will use their hot and less hot cards to record their data. As students tell you each step, demonstrate for them what this will look like:..." (Lesson 9, Teacher Edition)

INV-P4: Make observations (firsthand or from media) and/or measurements to collect data that can be used to make comparisons.

- Lesson 1, Synthesize, Step 2 "Use a movement activity to share and compare observations. Redistribute students' Schoolyard Observations handouts if needed, and display slide F." (Lesson 1, Teacher Edition)
- Lesson 2, Explore, Step 3 "Upon coming back inside, plan for what's next. Point out that students have collected lots of observations. Ask students how they think we could figure out what our classmates observed. Briefly discuss a few ideas students have for sharing their observations in order to navigate to the next step." (Lesson 2, Teacher Edition)
- Lesson 3, Synthesize, Step 5: The teacher is instructed to work with the class using provided prompts to ask questions about what patterns they, their partners, or the kids in the book observed.
- Lesson 9, Explore, Step 3 "Bring students outside to make observations and record them. Take students outside to test whether the black construction paper under the designs is less hot than the black construction paper in the sun with no design. While students are testing, circulate to pairs and support their investigation as needed." (Lesson 9, Teacher Edition)
- There is no evidence that scaffolds are customized to different student needs or guidance about when to remove scaffolds.

INV-P5: Make observations (firsthand or from media) and/or measurements of a proposed object or tool or solution to determine if it solves a problem or meets a goal.

- Lesson 9, Explore, Step 4 "Explain that we want to look at all the designs that kept the blacktop less hot to see what design parts and materials worked best. Tell students that while they share ideas, you will record what you're hearing and seeing on the chart. Have students stand (or sit) by someone other than their partner but near enough to the designs so that students can see the designs and materials to discuss what they notice." (Lesson 9, Teacher Edition)
- According to the SEP Matrix, this occurs once in lesson 9. Students are not given opportunities to take increasing responsibility for using the practice to make sense of phenomena.

INV-P6: Make predictions based on prior experiences.

- Unit Summary, "In Lesson 3, students make predictions based on their prior experiences." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 3, Explore, Step 2 "Take 1-2 minutes to have students share what they think they might observe in this investigation." (Lesson 3, Teacher Edition)
- Lesson 3, Connect, Step 4 Literacy Supports Sidebar: "This explicit identification of the book's front and back covers and title page helps students make connections between their prior knowledge of surfaces and make predictions about what surfaces might be in the book." (Lesson 3, Teacher Edition)

- According to the SEP Matrix, this occurs once in lesson 3. Students are not given opportunities to take increasing responsibility for using the practice to make sense of phenomena.

DATA: Analyzing and Interpreting Data

DATA-P1: Record information (observations, thoughts, and ideas).

- Unit Summary, "This unit explicitly supports students as they record, share, and use their observations. Students are provided with ready-made tables to record their observations for each investigation and they share their drawings and writings with partners and the whole class, such as when they use their observations to identify patterns about surfaces in sunny and shady places." (K.1 Energy Sunlight Unit Front Matter)
- Lesson 2, Explore, Step 3 "Go outside and record observations in sunny and shady locations. Display slide E and explain that students will 1) touch a surface in a sunny or shady place, 2) record their observations, and 3) talk with a partner. They will repeat this process for several other surfaces in sunny and shady places." (Lesson 2, Teacher Edition)
- Lesson 3, Explore, Step 2 "Work with students to recall what observations are and how we can record accurate observations (drawing/marking only what we see and feel, not adding things that are not there, etc.)." (Lesson 3, Teacher Edition)
- Lesson 3, Explore, Step 2 "Go outside and record observations of the dirt. Display slide D and explain that the whole class will 1) go touch the sand in the sunny place (and then the shady place), 2) record their observations on their handout, and 3) share their observations with a partner. The class will then repeat these steps for the dirt in both places (sunny and shady)." (Lesson 3, Teacher Edition)

DATA-P2: Use and share pictures, drawings, and/or writings of observations.

- Lesson 4, Explore, Step 3 "Facilitate a discussion to begin to analyze and interpret the data. Once you have gathered all of the data, have students turn and talk to discuss what they notice about the surfaces in sunny places and what they notice about the surfaces in shady places. Have students share what their partner thought." (Lesson 4, Teacher Edition)
- According to the SEP Matrix, this occurs once in lesson 4. Students are not given opportunities to take increasing responsibility for using the practice to make sense of phenomena.

DATA-P3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.

- Lesson 2, Explore, Step 4 "Lead a discussion to analyze and interpret the data. Once you have gathered a significant sampling of students' observations, have them turn and talk about what they notice is similar about the surfaces in sunny places, and then what is similar about the surfaces in shady places (refer to slide H). Encourage students to speak in complete sentences when they share ideas with their partner by starting with the phrases, *Sunny places have more _____ surfaces,* or *Shady places have more _____ surfaces*, and prompt them to share details about how they know." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4 "Introduce the term "pattern." Point out that students noticed lots of hot surfaces/red checks in sunny places and lots of less hot surfaces/blue checks in shady places. Point out that when students were thinking of other places in the sun, they thought those places would be hot, and other places in the shade would be less hot. Explain that *something that happens over and over again and can help us know what will happen next* is called a pattern." (Lesson 2, Teacher Edition)
- Lesson 2, Explore, Step 4 "Think aloud about our observations as a pattern. Consider pointing to the red checks on the Sunny Shady Surfaces T-chart and saying something like, In our observations, this surface

felt hot, this surface felt hot, and this surface felt hot. Using this pattern, how would another surface in the sunny place likely feel? (Allow students to fill in hot.) Ask, Does someone want to help us talk about the pattern of shady surfaces?" (Lesson 2, Teacher Edition)

- Lesson 4, Explore, Step 3 "After having the students discuss their interpretations of the data, they can confirm their ideas by counting in each category on the Sand and Dirt Observation charts. Ask students how many tallies there are and then sort each category by number of tallies. As a class, count by 1s to determine how many tally marks are in each category (i.e., how many tallies there are representing "hot" for dirt in sunny places) and record the total number of tallies on the chart. Repeat this process for the tally marks collected for the sand in sunny and shady places." (Lesson 4, Teacher Edition)

DATA-P5: Analyze data from tests of an object or tool to determine if it works as intended.

- Lesson 9, Explore, Step 4 "Ask students to look with their new partner over all the designs that caused the blacktop to be less hot and share with that partner about why those *designs* all caused the blacktop to be *less hot* (remind students to ask each other questions to make sure they understand). As students share what they notice about the designs that were less hot, circulate to assist and to listen in so that you can record their observations on the Designs and Materials chart. After about a minute, ask students to discuss what they noticed about the *designs* that caused the blacktop to feel *hot*. Remind students to ask each other questions to make sure they understand how the parts of those designs make the blacktop hot. Circulate to assist and listen." (Lesson 9, Teacher Edition)
- Lesson 10, Synthesize, Step 3 "Tell their partner what part(s) of their design are most important to solving the problem of the hot blacktop.
- Tell their partner how the materials in their design help solve the problem of the hot blacktop. Use a green colored pencil to circle parts of their designs that they agree are very important to making the blacktop less hot." (Lesson 10, Teacher Edition)

CEDS: Constructing Explanations and Designing Solutions

CEDS-P2: Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem.

- Lesson 7, Explore, Step 4 "Individually draw design plans." (Lesson 7, Teacher Edition)
- Lesson 8, Explore, Step 3 "Revisit My Design Plan handout with a partner. Ask students what would be a good first step in building our designs (such as what the engineering book discussed). Decide that using our drawn designs to inform what we will build is a good place to start. Have students turn and talk about their designs and what parts they circled to include when building their designs, as well as anything else they think they should add to their designs." (Lesson 8, Teacher Edition)
- Lesson 8, Explore, Step 3 "Have students work with their partner to build their shared design. While students are working, circulate to see how they are using materials to inform their designs for blocking sun to make the blacktop less hot." (Lesson 8, Teacher Edition)
- There is no evidence that scaffolds are customized to different student needs or guidance about when to remove scaffolds.

CEDS-P3: Generate and/or compare multiple solutions to a problem.

- Lesson 6, Explore, Step 4 Constructing Explanations and Designing Solutions Sidebar: "This is students' first opportunity to generate multiple solutions for the problem of the blacktop getting hot when the Sun shines on it. Encourage students to propose a variety of ideas, reminding them that scientists do not work alone, and rely on others to build ideas together. Students will continue to generate ideas (possibly based

on shade structures they have seen in their neighborhood) in Lesson 7, and then in Lesson 10 they will compare their solutions after testing." (Lesson 6, Teacher Edition)

- Lesson 9. Refer to slide L and guide student pairs to compare and combine design ideas on their My Design Plan handout using the suggested prompts. Remind students that asking and answering questions helps us include important information and details that improve our designs." (Lesson 7, Teacher Edition)
- Lesson 10, Synthesize, Step 4 "Facilitate creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design." (Lesson 10, Teacher Edition)

Suggestions for Improvement

- The focus of this criterion is on helping ensure that students have increasing ownership and proficiency in the claimed or targeted SEP over time, even if they struggle initially. It is recommended that educator-provided scaffolding for the use of nearly all targeted SEP learning goals undergoes a clear transition over the course of the unit. Consider explicit guidance for where and when to add and remove supports to move students toward independence in the use of the SEP element "Make observations (firsthand or from media) to collect data that can be used to make comparisons," and the SEP element "Use tools and/or materials to design and/or build a device that solves a specific problem or a solution to a specific problem."
- Consider further clarifying which elements are developed fully in the unit versus those that are only partially developed in this unit. For example, INV-P6—Make predictions based on prior experiences, Lesson 3, Explore Section, Step 2—"When we investigate outside today, how do you think sand and dirt will feel in sunny places? In shady places? Why do you think that?" (Lesson 3, Teacher Edition) This question is asked during group discussion, but does not include a request for everyone to make a prediction. Students all compare observations with a partner, but do not all compare their observations to predictions. This element is listed as "Intentionally Developed over the unit in the Energy Sunlight Unit Front Matter, p.14, yet it is only addressed in one lesson.

CATEGORY III
Monitoring NGSS Student Progress

III.A. Monitoring 3D Student Performance — Extensive

Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions.

The reviewers found extensive evidence that the materials elicit direct, observable evidence of three-dimensional learning and that students are using practices with core ideas and Crosscutting Concepts to make sense of phenomena and/or to design solutions. In Lessons 1–10, teachers are prompted to assess student performance by listening to student ideas and by using selected student sheets. Using the tools provided, teachers can record individual students' progress toward the lesson-level learning goal.

The materials' formal tasks are driven by well-crafted phenomena and problem-based scenarios that can elicit rich student performances.

- Lesson 3, Explore Section, Step 2 "Go outside and record observations of the dirt. Display slide D and explain that the whole class will 1) go touch the sand in the sunny place (and then the shady place), 2) record their observations on their handout, and 3) share their observations with a partner. The class will then repeat these steps for the dirt in both places (sunny and shady). Explain that you set out the sand pans in one location and the dirt pans in a different location so we can investigate sand and dirt separately, comparing sand to sand and dirt to dirt." (Lesson 3, Teacher Edition)
- Lesson 4, Synthesize Section, Step 5 Ideas to look for and listen for "After noticing the pattern of the surfaces, like sand, dirt and water being hot in sunny places, who can answer our lesson question about why surfaces in sunny places feel hot?" (Lesson 4, Teacher Edition).
- Lesson 9, Explore Section, Step 3 "Have students explain how they will test their design. Building from students' suggestions, ask students to tell you the plan for testing designs. Display slide E and let students know that you already took their designs outside in a sunny area and that they will use their hot and less hot cards to record their data. As students tell you each step, demonstrate for them what this will look like: Go outside and feel the blacktop (black construction paper) under our design, Feel the blacktop with no design, Talk with a partner about whether your design made the blacktop less hot. Put either a hot or less hot card on their design to record their observation." Then, "Show students the prepared large T on the gathering area, and explain that after they test their designs, they will record their data (hot or less hot) by placing their design on the appropriate side of the T-chart." (Lesson 9, Teacher Edition)

Student performances produce artifacts of integrating the three dimensions in service of sense-making or problem-solving.

- Lesson 4, Explore Section, Step 2: The Sand and Dirt Observations handout is an artifact that shows integration of "Make observations of the Sun causing sand in sunny places to be warm compared with sand in shady places.
- Lesson 7, Explore Section, Step 4: "Collect ideas from student design plans. As you are checking in with students, look and listen for ideas that emerge in their design plans. Be prepared to raise these ideas in the discussion in the Synthesize. Some common themes might include using materials to cover the blacktop or planning a way to hold those materials above the blacktop." (Lesson 7, Teacher Edition) SEP-MOD-P4: Develop a simple model based on evidence to represent a proposed object or tool. DCI-PS3.B-P1 Sunlight warms the earth. DCI-ETS1.B-P1: Designs can be conveyed through sketches, drawings, or physical models. CCC-CE-Events have causes that generate observable patterns.

- Lesson 5, Explore, Step 3, All students individually draw on the Schoolyard Drawings handout to show they can make observations and use them as comparisons to determine that the Sun causes the Earth's surface(s) to warm. (Lesson 5, Teacher Edition)
- Lesson 10, Explore, Step 2: All students individually draw new designs on the My Revised Design Plan handout to show they can connect why they used tools and materials to design and build a structure intended to reduce the warming effect of the sun on blacktop in a sunny area. (Lesson 10, Teacher Edition)

Students routinely produce artifacts with evidence of using the grade-appropriate elements of SEPs, CCCs, and DCIs that are targeted as learning objectives.

- Lessons 1-10, Assessment Opportunities: Each lesson includes one or more opportunities to use observations and artifacts as evidence of students using the grade-appropriate elements targeted as learning objectives.
- Lessons 2-10, L2-5 Following Students Sensemaking, and L6-10 Following Students Sensemaking provide guidance and space for teachers to record evidence of individual student three-dimensional performances.

Suggestions for Improvement: NA

III.B. Formative	Extensive
Embeds formative assessment processes throughout that evaluate student learning to inform instruction.	

The reviewers found extensive evidence that formative assessment processes evaluate student learning to inform instruction. There are opportunities in every lesson for formative assessment information to be gathered, recorded, and used to inform future instruction.

Materials include explicit, frequent, and varied supports for formative assessment processes.

- Beginning with Lesson 2, K.1 Teacher Assessment Tool Following Student Sensemaking L2-5 and K.1 Teacher Assessment Tool Following Student Sensemaking L6-10 contain the Assessment Statement for the lesson, a checklist of look-fors and listen-fors, possible evidence of student sensemaking (including what students might say, how they might gesture or manipulate) and sometimes student examples of what students might draw or write, with possible lesson feedback. Lessons 2 and 3 have this guidance. Lessons 5 and 10 are considered summative. Lessons 4, 6, 7, 8, or 9 do not have feedback suggestions under student work samples.
- In the Lesson by Lesson Assessment Opportunities, there are a variety of methods for checking for understanding, including what students say during discussions, what students do in explore sections, and what students draw and write on handouts. (Assessment System Overview, Teacher Edition)

Formative assessment processes routinely provide varied support for student thinking across all three dimensions.

- Each lesson includes a Lesson Assessment Guidance chart with a three-dimensional learning target, suggestions for when and where to check for student understanding, and a description of how the educator can use the information gathered from the assessment.

Formative assessment processes routinely attend to multiple aspects of student equity.

- Instructional Guidance 1 tool provides next steps for students with a variety of needs. "To differentiate for individuals or a small group, consider the following extension options: Encourage students to make observations and try to notice whether or not the sun warms surfaces differently depending on a surface's material and color."(Lesson 3 Assessment Tool, Teacher Edition)
- Following Students Sensemaking 2 (Lessons 6-10), "Remember that students are often using multiple means of communication to express their sensemaking. As you are looking for evidence that students have a secure grasp of the assessment statement, look and listen for these examples." (Lesson 6, Teacher Edition)

Suggestions for Improvement

- Consider adding feedback suggestions under student work samples in Lessons 4, 6, 7, 8, and 9 in L2-5 Following Student Sensemaking 1 and L6-10 Following Student Sensemaking 2.

III.C. Scoring Guidance — Adequate

Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.

The reviewers found adequate evidence that the materials include scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students. The Summative Guidance 1 and 2 assessment tools (in Lessons 5 and 10) do not provide guidance for how to recognize "secure" performance and how to provide ongoing feedback to individual students. The guidance does not include examples of "secure" performance.

- Beginning with Lesson 2, K.1 Teacher Assessment Tool Following Student Sensemaking L2-5 and K.1 Teacher Assessment Tool Following Student Sensemaking L6-10 contain the Assessment Statement for the lesson, a checklist of look-fors and listen-fors, possible evidence of student sensemaking (including what students might say, how they might gesture or manipulate) and sometimes student examples of what students might draw or write, with possible lesson feedback. Lessons 2 and 3 have this guidance. Lessons 5 and 10 are considered summative.
- In the Lesson by Lesson Assessment Opportunities, there are a variety of methods for checking for understanding, including what students say during discussions, what students do in explore sections, and what students draw and write on handouts. (Assessment System Overview, Teacher Edition)
- Lesson 5 Assessment Tool Summative Guidance 1 provides two student samples of "not yet secure" performance and "secure with prompting performance" with suggested prompts for feedback (Lesson 5, Teacher Edition). However, there is no student sample or description of "secure" performance provided in Summative Guidance 1 or Following Student Sensemaking 1.
- Lesson 5 Assessment Tool, Summative Guidance 1 provides possible next steps if students do not yet have a secure understanding of each dimension of assessment statement 1: Students can make observations

and use them as comparisons to determine that the Sun causes the Earth's surface(s) to warm. (Lesson 5, Teacher Edition). However, in Summative Guidance 1, the scoring guidance is not explicit because it is unclear what is required in a student response to "check off both boxes". "If you have not yet checked off both boxes for certain students, make sure to talk individually with those students about their Schoolyard Drawings so they have an opportunity to explain their thinking and inform your summative assessment of their progress."

- Lesson 5 Assessment Tool, Summative Guidance 1, "Use the evidence you have gathered on the L2-5 Following Student Sensemaking tool from this and prior lessons to make a summative claim about students' understanding of Assessment Statement 1" (Lesson 5, Teacher Edition) There are many suggestions for possible next steps, but guidance is not provided for how to give individual feedback to students that support them in evaluating their own performance or tracking their progress.
- Lesson 10 Assessment Tool, Summative Guidance 2 provides one student samples of "not yet secure" performance and "secure with prompting performance" with suggested prompts for feedback. (Lesson 10, Teacher Edition)
- Lesson 10 Assessment Tool, Summative Guidance 2 provides possible next steps if students still need to have a secure understanding of some dimensions of assessment statement 2. Students can connect why they used tools and materials to design and build a structure intended to reduce the warming effect of the sun. (Lesson 10, Teacher Edition)
- Lesson 10 Assessment Tool, "If students don't yet have a secure understanding, make sure to talk individually with those students about their My Revised Design Plan so they have an opportunity to explain their thinking and inform your summative assessment of their progress. If that additional information does not provide evidence of secure understanding, students can be considered "not yet secure". See the instructional guidance below to help plan for how you will support these students as they continue to develop their ideas." (Lesson 10, Summative Guidance 2) There are many suggestions for possible next steps, but guidance is not provided on how to give feedback to individual students that supports them in evaluating their own performance or tracking their own progress.

Suggestions for Improvement

- Consider providing clear criteria with a student work sample for what counts as "secure," "secure with prompting," and "not yet secure" performances in each of the Summative Guidance documents.

III.D. Unbiased Tasks/Items	Extensive
Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.	

The reviewers found extensive evidence that tasks assess student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.

Multiple modes of communication

- Lesson 1, Explore Section, Step 1 "Broadening Access Sidebar - Encourage students to record and share about their observations using multiple modalities, such as drawing, pointing/gesturing, and speaking in languages they are most comfortable with."Teacher Assessment Tool L2-5 and Assessment Tool L6-10 provide examples of multiple models of communication that provide evidence of the assessment statements. "Possible evidence of student sensemaking: Remember that students are often using multiple means of communication to express their sensemaking. As you are looking for evidence that students have a secure grasp of the assessment statement, look and listen for these examples." (Following Students Sensemaking 1 and 2, Teacher Edition)
- Lesson 10, Synthesize, Step 4 "Facilitate creation of a consensus design. Use prompts to facilitate the Consensus Discussion, referring to the gallery tour pages you collected and recording students' ideas on the chart paper to create a consensus design." (Lesson 10, Teacher Edition). Only the mode of communication in this summative assessment opportunity for all students is speaking in this discussion.
- Lesson 5, Explore, Step 3 Broadening Access Sidebar: "If students are not yet writing independently, they can write the first letter they hear in a word, or an approximation of a letter if they are still working on letter formation. Transcribing their response may also be helpful. Refer to the Teacher Handbook for additional strategies you can use to support emerging writers." (Lesson 5, Teacher Edition)
- Lesson 10, Synthesize, Step 4 Broadening Access Sidebar: "As you engage in the Consensus Discussion, aim to notice and publicly recognize all of your students' ideas so everyone feels valued and seen in class. This is especially important for student groups typically left out from rich science learning experiences, such as multilingual students, students with disabilities, and students of color, etc. Do not feel the need for this kind of work to always be verbal; recognize students' contributions by sharing examples from their drawn designs, asking them to help count tallies on one of the gallery tour pages, elevating a gesture a student used while expressing an idea, etc." (Lesson 10, Teacher Edition)

Multiple modalities and student choice

- Lesson 1, Explore, Step 1, Broadening Access Sidebar: "Encourage students to record and share about their observations using multiple modalities, such as drawing, pointing/gesturing, and speaking in languages they are most comfortable with." (Lesson 1, Teacher Edition) However, there is limited evidence of teacher prompts in the body of the lesson to tell students that they can choose to respond using gestures, words, and/or drawings.
- Lesson 1, Synthesize Section, Step 2: "Because the Notice and Wonder chart serves as a public space for classroom members to see each other's ideas, all students must be able to make sense of the ideas recorded. As such, we encourage you to use the exact words and/or phrases that students share, and to record ideas in many ways (e.g., in drawings, using photographs). This will allow students to understand the ideas recorded when the class is engaging with the Notice and Wonder chart (e.g., adding ideas to it), as well as during other instances when students might want to refer to them, such as during a discussion." (Lesson 1, Teacher Edition)
- Lesson 7. Explore, Step 4 "Explain that students will have some choices about what materials to use in their designs to make the blacktop less hot (but they do not have to use all of the available materials)." (Lesson 7, Teacher Edition)

Suggestions for Improvement

- Consider adding prompts in the body of the lessons for teachers to remind students that they can express themselves using gestures, words, and/or drawings.

III.E. Coherent Assessment System — Extensive

Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.

The reviewers found adequate evidence that the materials include pre-, formative, summative, and self-assessment measures that assess three-dimensional learning. There is an assessment system that supports teachers in understanding how students' three-dimensional performances in each assessment fit together to reflect student learning related to the assessment statements across the unit.

Matches three-dimensional learning objectives

- In Lesson 2-5, the three-dimensional learning assessment statement 1 is: make observations and use them as comparisons to determine that the Sun causes the Earth's surface(s) to warm. (aligned to K-PS3-1). This statement is formatively assessed by what students draw or write on the Sunny Shade Observations handout, what they say, and gestures/manipulations. (K.1 Lesson 2 Teacher Assessment Tool L2-5 Following Student Sensemaking, Teacher Edition).
- In the K.1 Unit Overview, p16, the intentional development and assessment of patterns at the element level is described: "The word "pattern" is defined explicitly with students in Lesson 2 to help them talk about how they are observing the same thing over and over again. After observing the same pattern in several instances, students describe the phenomenon of surfaces in sunny places usually feeling hot and surfaces in shady places usually feeling less hot…Formative assessment opportunities for this crosscutting concept occur in Lessons 2, 3, 4, and 6." (K.1 Energy Sunlight Unit Front Matter, Teacher Edition) However, the claimed element related to patterns is not formatively assessed in Lesson 6.
- Teacher Assessment Tool L2-5, "Checklist of listen-/look-fors: Make (and record) observations to find patterns about surfaces in sunny places feeling hot and surfaces in shady places feeling less hot." (Lesson 2, Teacher Assessment Tool)
- Lesson 2, Lesson Assessment Guidance, "As you look and listen for students' ideas, notice how they depict or describe the different surfaces they feel in sunny and shady places. Provide feedback to students by probing for accurate observations and for evidence supporting their ideas about how the sun affects how different surfaces feel using questions such as: Tell me about what you observed. Let's work together to add some labels to your drawings. What word should we write here? What sound does that word begin with? How do you think surfaces in sunny (or shady) surfaces usually feel? Do you have any ideas about why it feels that way?" (Lesson 2, Teacher Edition) This assessment guidance is not provided for how to support individual students' use of patterns in lesson 2.
- Lesson 4, Explore, Step 3, "Discuss patterns in their observations. Use the following discussion prompts to continue the discussion to help students figure out that the sun is shining on the sand, dirt, and other surfaces in sunny places, causing them to get hot and that the sun is not shining on the sand, dirt, and other surfaces in shady places, causing them to be less hot. When asking students where the most tallies are, consider having students move to two corners of the room to answer the question (go to this side if you think sunny, go to the other side if you think shady). Additionally, you may decide to incorporate the Hot and Less Hot Cards for students to respond with when applicable." (Lessor 4, Teacher Edition) This is the last opportunity to individually assess students' use of patterns formatively. There is no guidance in the lesson to encourage the teacher to ensure they have recorded evidence for every student.
- Teacher Assessment Tool L6-10, "Checklist of listen-/look-fors: Design and/or build a structure intended to reduce the warming effect of sunlight on blacktop in a sunny area." (Lesson 6, Teacher Assessment Tool)

- Lesson 8, Lesson Front Matter, Three-Dimensional Learning Goal Section, "Use materials to build a design that causes the blacktop to feel less hot." Lesson 8, Explore Section, Step 3 "Remind students that while engineering we work together to solve problems. While gathered in a Scientist Circle, organize students into their engineering partnerships to get directions for how we will build our designs. Remind students they will take their ideas from their drawings and build one design with their partner to share what they have figured out about how to make the blacktop less hot." Students collect materials that they have drawn into their plans, and then, "Give students time to build their designs." (Lesson 8, Teacher Edition)

Pre-, formative, summative, and self-assessment
Pre-Assessment

- Lesson 1, Synthesize Section, Step 2 "Pre-assessment: When students are making sense of their ideas as you discuss what they notice and wonder, you have an opportunity to gather evidence for learning goal 1 with the purpose of determining support students may need in upcoming lessons around making and recording observations and figuring out a cause of surfaces feeling hot. Students will continue to develop these ideas and practices throughout this unit. Look and listen for students' words, gestures, and markings they reference on their handouts to see and hear their initial ideas. See the Lesson Assessment Guidance at the front of the lesson for more information."
- Lesson 6, Explore Section, Step 4 "Assessment Opportunity Pre-assessment: Students' discussions in small groups and with the whole class provide an opportunity to gather evidence about learning goal 6 (aligned with Assessment Statements 2), with the purpose of determining any support students may need in upcoming lessons as they design solutions for the hot blacktop problem. Accept all student ideas and refer to the K.1 Lesson 6 Teacher Assessment Tool L6-10 Following Student Sensemaking tool and the Assessment Guidance at the beginning of the lesson." (Lesson 6, Teacher Edition)

Formative Assessment

- Lesson 2, K.1 Teacher Assessment Tool L2-5 Following Student Sensemaking has a table for recording evidence of sensemaking and a checklist of listen-fors and look-fors for the three-dimensional learning objective. These look fors include things students might say, how they may gesture or manipulate items, etc. Pictures of example student work are included, as well as feedback questions for L2, L3, etc. (Lesson 2, K.1 Teacher Assessment Tool, L2-5 Following Student Sensemaking)
- Lesson 7, Explore, Step 4 "Assessment Opportunity Formative: While students are drawing and writing on their My Design Plan handout, you have an opportunity to gather evidence about learning goal 7, with the purpose of providing feedback to support students in planning and explaining their designs and clarifying and communicating their ideas about how they will solve the hot blacktop problem. Use the provided prompts to give students feedback they can act on right away, see the Assessment Guidance at the beginning of the lesson, and use the L6-10 Following Student Sensemaking to record evidence of students' developing ideas." (Lesson 7, Teacher Edition)
- Lesson 9, Explore, Step 3 Assessment Opportunity: "Formative: As students are testing their designs and discussing with partners, you have an opportunity to gather evidence about learning goal 9, with the purpose of providing feedback to support students in evaluating why the materials and the designs that they chose either did or did not solve the hot blacktop problem. Use the provided prompts to give students feedback they can act on right away, see the Assessment Guidance at the beginning of the lesson, and use the L6-10 Following Student Sensemaking to record evidence of students' developing ideas." (Lesson 9, Teacher Edition)

Summative Assessment

- Lesson 5 Lesson Assessment Guidance "For this lesson, you will use the evidence you have gathered on the L2-5 Following Student Sensemaking tool from this and prior lessons to make a summative claim about students' understanding of Assessment Statement 1. If you have not yet checked off both boxes for certain students, make sure to talk individually with those students about their Schoolyard Drawings so they have an opportunity to explain their thinking and inform your summative assessment of their progress. Refer to the Summative Guidance 1 for sample student work showing a range of student performance on this task and suggested feedback to offer." (Lesson 5, Teacher Edition)
- Lesson 10 Lesson Assessment Guidance "This assessment is a formal opportunity to gather individual summative information about your students' progress. After this lesson, you will use the evidence you have gathered on the L6-10 Following Student Sensemaking tool from this and prior lessons to make a summative claim about students' understanding of Assessment Statement 2. If you have not yet checked off both boxes for certain students, make sure to talk individually with those students about their My Revised Design Plan so they have an opportunity to explain their thinking and inform your summative assessment of their progress. Refer to the Summative Guidance 2 for sample student work showing a range of student performance on this task and suggested feedback to offer." (Lesson 10, Teacher Edition)

Self Assessment

- Lesson 7, Synthesize, Step 5 Assessment Opportunity, "Peer feedback: When students share their My Design Plan with their partner, they will provide feedback to support each other in creating a design they both think will solve the problem of the hot blacktop. Students should use this feedback to circle the parts of their designs that they will use together when they build in Lesson 8." (Lesson 7, Teacher Edition)
- Lesson 8, Explore Section, Step 3 "Self reflection: The discussion prompts suggested here offer an opportunity for students to consider their own engineering work, with the purpose of helping them celebrate what went well and find ways to improve. Students will have another opportunity for self-reflection when the class co-constructs a consensus design in Lesson 10." (Lesson 8, Teacher Edition)
- Lesson 10, "Assessment Opportunity Self reflection: The discussion prompts suggested here offer an opportunity for students to consider their own engineering work, with the purpose of helping them celebrate what went well and find ways to improve. They had a previous chance to self reflect in Lesson 8, and they will do engineering again in *OpenSciEd Unit K.3: How can we move things to where we want them to go? (Mighty Movers Unit).*" (Lesson 10, Teacher's Edition)

Coherent three-dimensional assessment system rationale is clearly described.

- The Assessment System Overview document includes a table that lists the Unit Assessment Plan by Assessment Type, related tools, the purpose of assessments, and all documents for guidance and teacher observations of understanding. Another table lists Lesson by Lesson Assessment Opportunities. For each lesson, the three-dimensional learning goal is listed, as well as the type of assessment, where to check for understanding, and the related look-fors and listen-fors.
- The Assessment System Overview describes the system: "Each OpenSciEd unit includes an assessment system that offers many opportunities for different types of assessments throughout the lessons. These opportunities include pre-assessment, formative assessment, summative assessment, peer assessment (called peer feedback with students), and self-assessment (called self-reflection with students). Grades K-2 units may only include peer or self-assessment, not always both. Assessment opportunities are embedded and called out directly in the lesson plans. Please look for the yellow "Assessment Opportunity" support in each lesson plan to identify suggested assessments.

Suggestions for Improvement

- For elements intentionally developed only to the formative level, such as patterns, ensure that teachers have support to gather at least one instance of individual performance in the unit. Consider adding a note to the Lesson 6 row of the assessment system overview to guide teachers in making sure they have observed each student's use of patterns through small- or whole-group discussions by Lesson 6.
- Consider being explicit about the elements intentionally developed (cause and effect), beginning to be developed (patterns), and opportunities to be developed.

III.F. Opportunity to Learn — Extensive

Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback.

The reviewers found extensive evidence that the materials provide multiple opportunities for students to demonstrate performance of practices connected with their understanding of Disciplinary Core Ideas and Crosscutting Concepts and receive feedback. There is evidence that there are multiple opportunities for students to demonstrate performances of the targeted learning objectives for each of the three dimensions. While some provided prompts to use and follow-up responses could be considered feedback, it is unclear how students would use this feedback individually to apply it to future learning opportunities. Feedback guidance is provided in each lesson's Lesson Assessment Guidance section, "How can I use the information I gather from this assessment?"

Multiple, interconnected opportunities over time

- Lesson 8, Synthesize Section, Step 4 "Key formative: The Building Understandings Discussion provides an opportunity to gather evidence about lesson learning goal 8, with the purpose of providing feedback to students about the materials they used to build their designs and guiding instruction in the upcoming lesson." Students will have opportunities to test their designs in Lesson 9 and then use feedback and results to redesign a solution and apply their ideas to the group consensus design. (Lesson 8, Teacher Edition)
- Lesson 4, Explore, Step 3, "If students get stuck on a few surfaces in shady places that are hot or warm, remind them that scientists think about what most observations show." (Lesson 4, Teacher Edition)
- Lesson 5, Explore, Step 3, "Discuss what to include in our science drawings. Spend a few minutes asking students what to include in their drawings, based on the evidence gathered in previous investigations. Refer to slide E as you review. Potential things to include are: Surfaces from outside in their schoolyard; Sun; Words to label the parts of the drawing: hot, less hot, cause, effect" (Lesson 5, Teacher Edition)
- Lesson 7, Lesson Assessment Guidance, How can I use the information I gather from this assessment?: "As you look and listen for students' ideas, notice how they depict and/or describe their designs. When needed, probe students for why or how their design will help solve the problem of the blacktop getting hot, prompting them to think back to what they figured out about what causes surfaces to feel hot. Expect that students will continue to develop their designs throughout this lesson as they work with their partner and Lesson 8 as they build." (Lesson 7, Teacher Edition, p7)

Lesson 5, Assessment Statement 1: "Students can make observations and use them as comparisons to determine that the Sun causes the Earth's surface(s) to warm. (aligned to K-PS3-1)"

- In lessons 1-5, students Make (and record) observations to find patterns about surfaces in sunny places feeling hot and surfaces in shady places feeling less hot. They compare observations to determine that the Sun causes the Earth's surface(s) to warm by observing how different surfaces feel, recording observations, and using those observations to find patterns in what causes some surfaces to feel hot and others less hot.
- Lesson 2, Explore Section, Step 4 "Formative assessment: During the discussion when analyzing and interpreting data, you have an opportunity to gather evidence about learning goal 2, with the purpose of providing feedback and supporting students in clarifying and communicating their ideas about how surfaces in sunny and shady places feel based on their observations. Use the suggestions in the Assessment Guidance at the beginning of the lesson along with these suggested prompts to provide feedback and determine next steps, and use the L2-5 Following Student Sensemaking to record evidence of students' developing ideas." (Lesson 2, Teacher Edition)
- Lesson 4, Synthesize Section, Step 5 "Formative assessment: During this discussion, you have another opportunity to formatively assess learning goal 4, with the purpose of providing feedback and supporting students in clarifying and communicating their claims about why surfaces may feel hot or less hot and using evidence to support their claims. Use the suggestions in the Assessment Guidance at the beginning of the lesson and use the L2-5 Following Student Sensemaking to record evidence of students' developing ideas." (Lesson 4, Teacher Edition) Students will have multiple opportunities in upcoming lessons to clarify their claims about why surfaces are hot or less hot as they explore design solutions to keep the playground cool in L6-10. (Lesson 4, Teacher Edition)

Lesson 10, Assessment Statement 2: "Students can connect why they used tools and materials to design and build a structure intended to reduce the warming effect of the sun on blacktop in a sunny area. (aligned to K-PS3-2)"

- In lessons 7-8, students Design and/or build a structure intended to reduce the warming effect of sunlight on blacktop in a sunny area by identifying a problem to solve, considering a variety of solutions, and planning, building and testing their solution.
- Lesson 7, Lesson Assessment Guidance, How can I use the information I gather from this assessment? Section: "As you look and listen for students' ideas, notice how they depict and/or describe their designs. When needed, probe students for why or how their design will help solve the problem of the blacktop getting hot, prompting them to think back to what they figured out about what causes surfaces to feel hot. Expect that students will continue to develop their designs throughout this lesson as they work with their partner and Lesson 8 as they build." (Lesson 7, Teacher Edition)
- Lesson 8, Synthesize Section, Step 4 "Key formative: The Building Understandings Discussion provides an opportunity to gather evidence about lesson learning goal 8, with the purpose of providing feedback to students about the materials they used to build their designs and guiding instruction in the upcoming lesson." Students will have opportunities to test their designs in Lesson 9, and then use feedback and results to redesign a solution, and apply their ideas to the group consensus design." (Lesson 8, Teacher Edition)
- In lessons 9-10, students Compare multiple solutions intended to reduce the warming effect of sunlight on blacktop in a sunny area. They compare test data of each student group's solution to determine a class consensus design that solves the problem.
- Lesson 9, Lesson Assessment Guidance, How can I use the information I gather from this assessment? Section: "As you look and listen for students' ideas, notice how they depict and/or describe their designs. When needed, prompt students to compare multiple solutions (designs and/or materials) intended to solve the problem of the blacktop getting hot, supporting them to think back to what they figured out about

what causes surfaces to feel hot. Expect that students will continue to develop their understanding of designs and materials that block the sun throughout this lesson and in the next lesson." (Lesson 7, Teacher Edition)

Multi-modal feedback loops

- Lesson 3, Instructional Guidance 1 tool provides next steps for students with a variety of needs. "To differentiate for individuals or a small group, consider the following extension options: Encourage students to make observations and try to notice whether or not the sun warms surfaces differently depending on a surface's material and color."(Lesson 3, Teacher Edition)
- Lesson 5, Synthesize Section, Step 4 "Peer feedback: When students share their Schoolyard Drawings with a partner and use the *Gotta Have It Checklist* for guidance, they will provide feedback to support each other in improving the accuracy of their drawings to explain the cause/effect relationship of the sun warming surfaces outside (or not). Students should use this feedback to make revisions to their drawings after their partner shares ideas and questions about what might be missing." (Lesson 5, Teacher Edition)
- Lesson 7, Synthesize Step 5 "Continue supporting this important partner work. Bring the class back together and acknowledge again that combining ideas is really important in engineering, but it can be hard to decide which ideas to use and which might not get used this time. Ask what classroom agreement(s) will be very important as we work together to plan a design that combines ideas from both partners. Then go on with prompts such as these: What parts of each of your designs will you use when you build a combined design? Work with your partner to decide. Use a new color to circle the parts of each design that you will build. Talk with your partner about how you will use those different parts together. Use words like "above" or "under" or "next to" or "in front" to talk about where everything will go in your combined design." (Lesson 7, Teacher Edition)

Suggestions for Improvement

- Consider providing guidance on how individual students can use teacher- or peer-provided feedback to revise their work.

CATEGORY RATINGS			Total Score
CATEGORY I: NGSS 3D Design	CATEGORY II: NGSS Instructional Supports	CATEGORY III: Monitoring NGSS Student Progress	
0 1 2 (3)	0 1 2 (3)	0 1 2 (3)	9

Overall ratings: The score total is an approximate guide for the rating. Reviewers should use the evidence of quality across categories to guide the final rating. In other words, the rating could differ from the total score recommendations if the reviewer has evidence to support this variation.	**E: Example of high quality NGSS design**–High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. (total score ~8–9) **E/I: Example of high quality NGSS design if Improved**–Adequate design for the NGSS, but would benefit from some improvement in one or more categories; most criteria have at least adequate evidence (total score ~6–7) **R: Revision needed**–Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5) **N: Not ready to review**–Not designed for the NGSS; does not meet criteria (total 0–2)	**Overall rating below:** **E**