EQuIP Rubric for Science

Why do plants only grow well in certain places, and how can we protect them?

Curriculum Developer: OpenSciEd

GRADE 3 | FEBRUARY 2025

nsta
National Science Teaching Association

Category I Rating

A	B	C	D	E	F
Explaining Phenomena/ Designing Solutions	Three Dimensions	Integrating the Three Dimensions	Unit Coherence	Multiple Science Domains	Math and ELA
EXTENSIVE	EXTENSIVE	EXTENSIVE	EXTENSIVE	EXTENSIVE	EXTENSIVE

Score Category I: 3

Category II Rating

A	B	C	D	E	F	G
Relevance and Authenticity	Student Ideas	Building Progressions	Scientific Accuracy	Differentiated Instruction	Teacher Support for Unit Coherence	Scaffolded Differentiation Over Time
EXTENSIVE	EXTENSIVE	ADEQUATE	EXTENSIVE	EXTENSIVE	EXTENSIVE	ADEQUATE

Score Category II: 3

Category III Rating

A	B	C	D	E	F
Monitoring 3D Student Performance	Formative	Scoring Guidance	Unbiased Tasks/Items	Coherent Assessment System	Opportunity to Learn
EXTENSIVE	EXTENSIVE	EXTENSIVE	ADEQUATE	EXTENSIVE	EXTENSIVE

Score Category III: 3

UNIT 2

Sum Categories	**9**
Rating	**E**

Overall Summary Comments

This unit is designed for the *Next Generation Science Standards* (*NGSS*), including clear and compelling evidence of the following criteria:

- **Monitoring 3-D Student Performance.** This unit has a strong emphasis on direct, observable evidence of three-dimensional learning. Artifacts of students using the practices with Disciplinary Core Ideas and Crosscutting Concepts to make sense of phenomena and/or design solutions were located throughout this unit.
- **Teacher Support for Unit Coherence.** The teacher supports for unit coherence (e.g., Navigate sections of lessons, Our Initial Ideas, DQB) are critical in allowing students to see their learning progress throughout the unit and to assist them in making sense of the anchoring phenomenon.

The unit was reviewed to "provide constructive criterion-based feedback and suggestions for improvement to developers" (EQuIP Rubric for Lessons & Units: Science (Version 3.1). Reviewers recommend focusing on the following criteria during revisions:

- **Scaffolded Differentiation Over Time.** Unit materials do not provide guidance to teachers for where and when to add and remove supports to move students toward independently knowing when to use and demonstrate proficiency with all elements of the intentionally developed SEPs. The materials could be strengthened with such guidance and with teacher supports to help all students explicitly build an understanding and proficiency in specific elements of the SEPs over the course of the unit.
- **Unbiased Tasks/Items.** The materials provide ways for students to understand the phenomena involved in the transfer tasks, regardless of prior knowledge/experience. However, the materials do not provide students opportunities for student choice on significant tasks. Consider including explicit opportunities for students to have a choice of responses across multiple modalities on at least one significant task.

Why are there two colors of text in this report?

Black text is used in this report to identify direct quotations or paraphrases of a lesson/unit (the evidence) and why/how this evidence indicates the criterion is being met (the reasoning). (EQuIP Rubric for Lessons & Units: Science (Version 3.1))

Black text is also used for evidence and reasoning that does not affect the rating of the criterion.

Purple text is used in this report to identify direct quotations or paraphrases of a lesson/unit (the evidence) and why/how this evidence indicates that the criterion is NOT being met (the reasoning). (EQuIP Rubric for Lessons & Units: Science (Version 3.1)) The exception to this is when a criterion is rated as "extensive." In those cases, purple is used as a visual cue to "*provide constructive criterion-based feedback and suggestions for improvement to developers*" (EQuIP Rubric for Lessons & Units: Science (Version 3.1)).

CATEGORY I
NGSS 3D Design

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: year-round fruit availability. Student questions and prior experiences related to the phenomenon or problem adequately motivate sensemaking and/or problem solving. When engineering is a learning focus, it is integrated with developing Disciplinary Core Ideas from Earth and space sciences.

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

The materials have a student-centered focus on phenomena or problems and there is consistent student-driven learning over time. The first lesson sequence focuses on the phenomenon of why plants grow successfully in some places all year. Students are motivated to understand why fruit grows in certain areas of the world by analyzing temperature and precipitation patterns. The second lesson sequence focuses on the phenomenon of the damage done to fruit plants during hazardous weather and designing protective structures for plants. Student investigations relate to their own questions and problem-solving as they explore hazardous weather and use this knowledge to support them in solving engineering challenges. The materials have a student-centered focus on phenomena or problems. For example,

- Lesson 1, Explore Section, Step 2: “Introduce a puzzling phenomenon. Recall how many students mentioned a certain time of year when the fruit or vegetable they grew/like to eat grows. Display slide F. Ask them to think about if/when they have eaten an apple, banana, or orange during a meal at school, including juices and sauces. Have them think about what time of year that was.” (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize Section, Step 5: “Introduce Our Growing Ideas chart. Display slide N, and place the Our Growing Ideas chart in a spot that allows all students to see it. Ask students, What were we trying to figure out from investigating the time lapse video and the infographic cards? Make the lesson question explicit. Add the lesson question to the “Our Questions” column of the chart: How do we get fruits from plants? Ask students if they have questions similar to this one on the DQB. If so, move those sticky note questions over to the Our Growing Ideas chart just below the lesson question” (Lesson 2, Teacher Guide)
- Lesson 3, Navigate step 1: “Use students’ ideas and questions from Lesson 2 or the DQB to develop a possible lesson question similar to, How do the water needs of different plants affect where they can grow well?” (Lesson 3, Teacher Guide).
- Lesson 4, Synthesize Section, Step 7: ”Ask students to share what they noticed about the patterns of the temperatures the plants need. Help them to identify that the patterns of the plants’ needs and the patterns of seasonal temperatures for where they grow are very similar.” (Lesson 4, Teacher Guide)

- Lesson 6, Explore Section, Step 2: "Compare the fruits linking back to science ideas we figured out. Display slide K. Continue the Consensus Discussion, but now push students to connect to previous ideas from Our Growing Ideas chart. It may be helpful to display the Where Fruit Grows map and the Fruit Plant Needs chart so that students can use them as they discuss these ideas." (Lesson 6, Teacher Guide)
- Lesson 7, Connect Section, Step 2: "Share and chart personal connections. Say something like, Seems like we have a lot of experiences of this kind of weather that could help our thinking. Display slide B. Give students a few minutes to turn and talk about their experiences before going public as a whole group." (Lesson 7, Teacher Guide)
- Lesson 8, Navigate Section, Step 1: "Revisit our new DQB questions. Display slide A. Refer back to the DQB additions from the end of Lesson 7. Ask students what questions they have about weather hazards after seeing photos of some of the damage they can cause to fruit plants." (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Display slide L, and display the Our Growing Ideas chart. Using a Consensus Discussion, ask students if they can now make a claim for their lesson question, How can farmers and engineers protect plants from wind damage? Write the lesson question on the chart, and then let students share ideas for a claim they can make, and the evidence from this lesson that supports that claim." (Lesson 9, Teacher Guide)

The materials have consistent student-driven learning over time. The Our Growing Ideas board is used throughout the unit to help the class keep track of their new learnings and for the teacher to guide the students in organizing their own thoughts. For example:

- Lesson 3, Synthesize Step 5: "Update Our Growing Ideas Chart. Share slide L, and work together as a class to make a claim to add to Our Growing Ideas chart. Remind students that a claim is an answer to a question that, in science, we support with evidence...Our question is, How do the water needs of different plants affect where they can grow well? What claim or claims can we make to answer this question?..What new evidence do we have to support our claims?.. Do we all agree? Are there still areas of confusion?" (Lesson 3, Teacher Guide).
- Lesson 9, Synthesize step 5: "Display the Our Growing Ideas chart. Using a Consensus Discussion, ask students if they can now make a claim for their lesson question, How can farmers and engineers protect plants from wind damage? Write the lesson question on the chart, and then let students share ideas for a claim they can make, and the evidence from this lesson that supports that claim. Students should share ideas that could be summarized as: Claim - Windbreak designs work to protect plants from strong winds by blocking or breaking up the wind. Evidence - Models of how three different windbreak designs work to protect plants. As the class reaches consensus around these or similar ideas, record them on the Our Growing Ideas chart."

Students are encouraged to come up with their own investigation questions to add to the class Driving Questions Board.

- Lesson 1, Synthesize, step 5: "As students share questions, aim to organize the questions as they share into clusters of similar questions. Once complete, explain to students that it is part of our mission to answer these questions."
- Lesson 2, Synthesize, step 5: "Make the lesson question explicit. Add the lesson question to the "Our Questions" column of the chart: How do we get fruits from plants? Ask students if they have questions similar to this one on the DQB. If so, move those sticky note questions over to the Our Growing Ideas chart just below the lesson question."
- Lesson 5, Navigate Section, Step 5: "Revisit the Driving Question Board and anchoring phenomenon. Display slide N. Tell students that we have learned a lot about how plants make fruit and also what kinds of growing conditions are best for them to grow well and make this fruit. Ask, Do you think we have enough information to answer our original question: How do we get these fruits all year long? Let some students share ideas and then tell them they will pick back up on this idea in the next lesson." (Lesson 5, Teacher Guide)

- Lesson 6, Navigate Section, Step 1: "Consider when fruits are available. Share that it seems like we have a lot of evidence about where and why fruits grow well in certain places, but we might still be missing when the fruits are grown and harvested for us to eat. For example, are they grown during the school year or during summer break? We initially shared that fruits and vegetables special to us are often grown in the summer when we are not in school. Motivate students to want to look closer at when the fruits are growing and being harvested in different places." (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize Step 6: "Set a purpose for asking questions. Remain in a Scientists Circle. Ask students what we should do next, considering we have some uncertainties. Listen for them to suggest asking questions and/or doing more investigations. Point to the wonderings, which was also a source of questions we wanted to answer. Display slide M, and remind students of resources to write questions." (Lesson 7, Teacher Guide)
- Lesson 8, Navigate step 1: "Refer back to the DQB additions from the end of Lesson 7. Ask students what questions they have about weather hazards after seeing photos of some of the damage they can cause to fruit plants. Questions or ideas to look and listen for: Do the same types of hazards affect bananas, apples, and oranges? Where do different weather hazards/storms happen? Do hazards like these happen by us (or why do they not)? Point out that we are uncertain about where different weather hazards happen and how exactly they might affect different fruit plants. Suggest that we find out more information so that we can figure out if and how weather hazards affect fruit plants and the people that grow them." (Lesson 8, Teacher Guide)
- Lesson 10, Navigate step 1: "Have students examine their initial ideas for how the three types of windbreaks work. Prompt students to pose new questions they want to investigate about windbreak designs now that they will build and test them." (Lesson 10, Teacher Guide)
- Lesson 11, Explore Section, Step 3: "Begin creating the chart as students share data. Use either a digital version or one on chart paper and label it Evaluating Design Solution. If possible, gather in a Scientist Circle around the chart. Ask each group to take 1-2 minutes to share their design test observations with the class from their Our Windbreak Test Results handout." (Lesson 11, Teacher Guide)
- Lesson 12, Navigate, step 4: "Use the Driving Question Board and Our Growing Ideas chart to highlight for students how their ideas have grown and changed over the unit. Celebrate students' growth in developing new science ideas, and also how well they engaged in different science and engineering practices. Tell students that having questions left at the end is normal in science." (Lesson 12, Teacher Guide)

The materials have consistent student-driven learning when multiple phenomena and/or problems are used. For example,

- Lesson 2, Connect Section, Step 3: " Make predictions about other fruiting plants. Display slide G. Ask students to make predictions about whether other plants will also grow in the same way, following the same stages (life begins, growing bigger, making flowers, and making fruits)." (Lesson 2, Teacher Guide)
- Lesson 7, Connect Section, Step 2: "Say something like, Wow, we have a lot of experiences to help us! One of the most important jobs meteorologists do is help predict when weather might be bad so that people can make plans to stay safe. Some of you shared how it is really important for people to stay inside when this weather happens. What do we need to do when this kind of weather happens? Listen for students to share ideas like going inside, staying with family/caregivers, staying safe, not driving, listening to meteorologists, etc. Then ask questions, such as, What about the fruit plants we have been investigating that cannot move inside when the weather changes so quickly? Call back to their ideas about fruit plants being harmed. Share that you have some videos and images we can observe to see how fruit plants handle these kinds of situations." (Lesson 7, Teacher Guide)

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

The materials have a close match between the phenomena/problems and the student learning objectives throughout the materials. For example,

- Lesson 1, Explore Section, Step 2: "Generate some puzzlement with students by emphasizing that many of the special fruits and vegetables we eat are done at certain times of year, and it is puzzling that apples, bananas, and oranges can be eaten on any day in our schools. Discuss initial ideas. Gather the students in a whole group for the first Initial Ideas discussion of how we get fruits year-round. Display slide J and the chart labeled "Initial Ideas: How We Get Fruits All Year." Explain to students that our goal in this discussion is to hear many of our early ideas about how we get fruits all year long." (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize Section, Step 5: " Introduce Our Growing Ideas chart. Display slide N, and place the Our Growing Ideas chart in a spot that allows all students to see it. Ask students, What were we trying to figure out from investigating the time lapse video and the infographic cards? Make the lesson question explicit. Add the lesson question to the "Our Questions" column of the chart: How do we get fruits from plants? Ask students if they have questions similar to this one on the DQB. If so, move those sticky note questions over to the Our Growing Ideas chart just below the lesson question." (Lesson 2, Teacher Guide)
- Lesson 4, Navigate Section, Step 1: "Revisit ideas about precipitation. Show slide A. Have students talk with a partner about some ideas about what we figured out last time about precipitation in places where fruit grows. Point to the Precipitation Graph and the Where Fruit Grows map, or let students come up and point to it as they share their ideas. Give students the opportunity to share a few ideas with the class to summarize what has been figured out so far." (Lesson 4, Teacher Guide)
- Lesson 5, Synthesize Section, Step 3: "Update our Growing Ideas. Display slide F. Using a Consensus Discussion, synthesize what the class has figured out about climate and the expected temperature and precipitation conditions in a place, and why this information is important for growing fruit and vegetable plants. Remind students that they have figured out a lot about the needs of apples, oranges, and bananas, and where they grow well. Remind students of Lesson 2, and ask them if all plants need the same things? (No!) Use the Fruit Plant Needs table to remind students of the specific needs for apples, oranges, and bananas. Ask students if we can answer our question now with a claim: How can temperature and precipitation patterns help us predict where to grow plants? Write the lesson question on the chart, and then let students share some ideas about claims they can make." (Lesson 5, Teacher Guide)
- Lesson 10, Synthesize Section, 6: "Discuss windbreak design in small groups. Display slide K. Prompt students to examine their results and discuss how well their windbreak met the criteria and constraints. The group should update their Group Windbreak Design sketch with any adjustments they made to the windbreak. Then, have students individually write a summary on Step about how they think their windbreak caused a change in how the wind affected fruit plants. Encourage students to show how the windbreak could cause a change in how the wind would affect the fruit plants (e.g., Did it stop the windbreak? Did it push the wind in a different direction?)As groups discuss their results, circulate among the groups to gather evidence about current student thinking about the design process." (Lesson 10, Teacher Guide)

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.

Students design solutions to a problem with connections to the ETS DCIs. Examples include

- Lesson 7, Synthesize Section, Step 4: "Explain that students will create designs to protect fruit plants. Share that we have a lot of ideas about causes of damage to fruit plants, the effects on fruit plants, and criteria that could help us design things to protect fruit plants. Share that we cannot protect fruit plants from everything all at once, so we are going to pick which kinds of hazardous weather to design for. Share that their designs will be sketches of something they think can protect the fruit plant and meet one of the criteria they brainstormed." (Lesson 7, Teacher Guide)
- Lesson 8, Navigate Section, Step 6: "Refer back to the Patterns in Weather Hazards data chart, and say something like, Wow, we have figured out a lot about how fruit plants can get damaged by hazardous weather. And, we have narrowed down our problem to focus on protecting plants from wind. Tell students that something that blocks the wind is called a windbreak. Refer back to students' Initial Designs to Protect Plants handout from Lesson 7. Point out that some students may already have some ideas about how to design a windbreak. Ask students to share with a partner ideas for what a windbreak should be able to do and how we might build a windbreak." (Lesson 8, Teacher Guide)
- Lesson 9, Connect Section, Step 6: "Use ideas from the text to brainstorm criteria as a class. Tell students that, just like engineers, we'll want to build and test. Say that, Like engineers, we need to decide what their design needs to accomplish or do successfully. Let's get clear about our problem and what windbreaks have to do to protect plants. As students share their responses, record these on the Engineers Solve Problems chart." (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 4: "Be sure to encourage students to identify the failure point and how they plan to improve the design if they make adjustments before testing it again. Remind students from previous units that failure points are parts of the design that didn't work as intended. Encourage students to work together to figure out possible ways to improve the design based on what didn't work." (Lesson 10, Teacher Guide)
- Lesson 11, Explore Section, Step 3: "Brainstorm additional constraints. Display slide E. Point out that because several of our design solutions helped solve our engineering problem, wind damage to trees, we might need to consider other possible effects of building windbreaks around fruit plants. Ask students, If you were going to build this onto a farm, do you need to consider how it might impact anything else on the farm? Would it affect anything else that lives there? Would it need to be fixed? What other things should we consider? Give students a minute to consider other things they might need to think about and then let some students share ideas they have. Capture the students' suggestions for new constraints onto the chart." (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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 evidence that the materials give students opportunities to build 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 elements of all three dimensions, which are clearly identified and addressed throughout the unit, to explain year-round fruit availability.

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. Students engage with eight SEPs throughout the unit, and five of these are identified as intentionally developed: Analyzing and Interpreting Data, Using Mathematical and Computational Thinking, Constructing Explanations and Designing Solutions, Engaging in Arguments from Evidence, and Obtaining, Evaluating, and Communicating Information.

AQDP: Asking Questions and Defining Problems

Claimed Element: AQDP E3:Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. Claimed as an opportunity to practice in Lessons 1 and 7. Evidence was found in both. Examples include:

- Lesson 1, Synthesize Section, Step 4: "Set a purpose for asking questions. Remain in a Scientists Circle if possible. Explain that our goal is to figure out how we can get these fruits and other fruits or vegetables we care about, all year long and where they come from. Remind students of all the things they have done so far to investigate this phenomenon, such as sharing their own fruit and vegetable stories, examining a school menu, and making a map of initial ideas for places they grow. Display slide O. Now they get to ask questions they want to investigate to understand this phenomenon better. Explain that they are going to share all their questions to create the class' Driving Question Board." (Lesson 1, Teacher Guide)

- Lesson 7, Synthesize Section, Step 6: "Set a purpose for asking questions. Remain in a Scientists Circle. Ask students what we should do next, considering we have some uncertainties. Listen for them to suggest asking questions and/or doing more investigations. Point to the wonderings, which was also a source of questions we wanted to answer. Display slide M, and remind students of resources to write questions." (Lesson 7, Teacher Guide)

Claimed Element: **AQDP E5:Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.** Claimed as an opportunity to practice in Lesson 9. Evidence was found in Lesson 9. Examples include:

- Lesson 9, Connect Section, Step 6: "Use ideas from the text to brainstorm criteria as a class. Tell students that, just like engineers, we'll want to build and test. Say that, Like engineers, we need to decide what their design needs to accomplish or do successfully. Let's get clear about our problem and what windbreaks have to do to protect plants. As students share their responses, record these on the Engineers Solve Problems chart." (Lesson 9, Teacher Guide)

MOD: Developing and Using Models

Claimed Element: **MOD E4: Develop and/or use models to describe and/or predict phenomena.** Claimed as an opportunity to practice in Lessons 1 and 2. Evidence was found in both. Examples include:

- Lesson 1, Connect Section, Step 3: "Map the locations of where these fruits come from. Choose to either use a 3' x 4' laminated wall map, or the digital option provided here: Unit 3.2 Chart Examples. Pass out 1 copy of Where Do These Fruits Grow? handout and 4 tiny apple, orange, and banana stickers to each student. Ask students to locate the places where the fruits grow on the map and place a matching tiny fruit sticker on that place. They want to match the 4 apple-growing places, 4 orange-growing places, and 4 banana-growing places to the shaded countries or states/provinces on the map. Students can work with a partner if needed." (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize Section, Step 4: "Create the model. Display the blank A Fruiting Plant's Life Cycle chart or a digital whitespace. Begin to sketch the Fruiting Plant Life Cycle model by writing the four life stages (white boxes). The following is an example of a life cycle chart, but ensure you co-construct a chart using your students' suggestions and ideas for how to represent a plant life cycle. Cycles are typically represented with a circular graphic." (Lesson 2, Teacher Guide)

Claimed Element: **MOD E5: Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.** Claimed as an opportunity to practice in Lessons 9 and 10. Evidence was found in both. Examples include:

- Lesson 9, Explore Section, Step 2: " Create an initial model. Display slide B, and provide Model: Wind and Tree to each student. Tell students that in order to know what to do about strong winds damaging plants, they will need to figure out what is happening. Recall that sometimes drawing what we think is happening helps us to understand it, and we call this a model. Explain that first they will individually create an initial model on their handout. Explain to students that their initial model must show what happens to a banana plant when it is impacted by the strong winds from a hurricane or other storms. (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 3: "Build windbreaks. Have students discuss their ideas for a design, then gather materials, and assemble their windbreak. Give them about 15 minutes to work on their designs. When groups appear ready for testing, transition them to the next activity." (Lesson 10, Teacher Guide)

Claimed Element: MOD E6: Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system. Claimed as an opportunity to practice in Lesson 10. Evidence was found in Lesson 10. Examples include:

- Lesson 10, Synthesize Section, Step 6: "Discuss windbreak design in small groups. Display slide K. Prompt students to examine their results and discuss how well their windbreak met the criteria and constraints. The group should update their Group Windbreak Design sketch with any adjustments they made to the windbreak. Then, have students individually write a summary on Step about how they think their windbreak caused a change in how the wind affected fruit plants. Encourage students to show how the windbreak could cause a change in how the wind would affect the fruit plants (e.g., Did it stop the windbreak? Did it push the wind in a different direction?)." (Lesson 10, Teacher Guide)

INV: Planning and Carrying Out Investigations

Claimed Element: INV E3: Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. Claimed as an opportunity to practice in Lesson 10. Evidence was found in Lesson 10 examples include:

- Lesson 10, Explore Section, Step 4: "Test windbreaks. To test each windbreak, display slide H and review the testing procedures and how to record the results on the Our Windbreak Test Results handout in Step 2. Remind students of how they recorded the no windbreak setup in Step 1." (Lesson 10, Teacher Guide)

Claimed Element: INV E5: Test two different models of the same proposed object, tool, or process to determine which better meets criteria for success. Claimed as an opportunity to practice in Lesson 10. Evidence was found in Lesson 10, examples include:

- Lesson 10, Navigate step 7: "Ask students, How can we decide which windbreaks work best? Listen for students to suggest: Compare them! See which one had the fewest fruits fly off. See which one had the lowest wind speed. Build anticipation for comparing the windbreaks to each other in the next lesson."

DATA: Analyzing and Interpreting Data

Claimed Element: DATA E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. Claimed as intentionally developed in Lessons 2-6. Evidence was found in Lessons 2,3,4, and 6. Examples include:

- Lesson 2, Explore Section, Step 3: " Connect Section, Step 3: "Add data to our class chart. Display slide K. Point out the class chart, Our Fruit and Vegetable Life Stages. Remind students that one way scientists share information is through data charts. Because each small group researched different fruits and vegetables, we will all add our information to a shared chart to organize and combine the information. Show students how to add their data to the chart by first adding 7 sticky notes with "tomato" written on them together. Elicit suggestions from students where we should place the tomato sticky notes, and add them to the chart." (Lesson 3, Teacher Guide)
- Lesson 3, Explore Section, Step 2: " Build the bar graph together as a class using sticky notes. Arrange students into 8 groups and assign 1 of the 8 remaining locations to each group. Group size will vary depending on class size, but ensure there are at least 8 groups so that all 8 locations are covered. Hand out 1 fruit location card on the Location Precipitation Cards reference to each group of students. Ask them to work together to determine how many sticky notes they will need to represent the precipitation their location receives in a typical year." (Lesson 3, Teacher Guide)

- Lesson 4, Explore Section, Step 3: "Develop a graph of Michigan data. Ask for volunteers to come up to the graph and locate a season's temperature on the vertical number line on the left side of the graph through pointing (e.g., point to 45°F on the vertical axis for spring). Then, have a student trace a finger from the season's temperature on the vertical axis along the dotted line to construct a bar for the season (e.g., point to 45°F for spring, and then trace a finger along the dotted line until they are above the label for spring). Repeat this process to construct a bar for all 4 seasons or until students feel comfortable with the scaled bar graph." (Lesson 4, Teacher Guide)
- Lesson 5, Connect Section, Analyzing and Interpreting Data callout box: "The text provides further support on how scientists collect temperature and precipitation data, create various representations of that data, and analyze the data to make sense of different climate regions around the world." (Lesson 5, Teacher Guide) While the book clarifies that students hear about scientists using the Practice of Analyzing and Interpreting Data, students are not engaging in the Practice themselves.
- Lesson 6, Explore Section, Step 2: "Discuss how to record the data. Display slide E. You can use this slide to show students how to add information to the chart by looking at one example together for Washington apples. First, explain the data collection process: Students will walk around the room looking for harvest data for their assigned fruit. When they find their fruit, they record the location of the farm on a row in their chart. Using a colored pencil, they should color in the months the fruit is picked fresh. Alternatively, students could draw a line through the months that fruits are grown (thick line) and the additional time they can be stored (thin line). This would leverage their prior understanding of timelines and number lines and would be less reliant on specific colors. Discuss with students how to use a second color to record additional months that the fruit can be stored in cold refrigerators after picking. Use the example on the slide to help. Have students gather the colored pencils that they need and place their handout on a clipboard." (Lesson 6, Teacher Guide)

Claimed Element: DATA E2: Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. Claimed as intentionally developed in Lessons 5 and 12. Evidence was found in Lesson 5, and some evidence was found in Lesson 12. Examples include:

- Lesson 5, Explore Section, Step 4: "Pass out 1 copy of the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well. When complete, they will work with a partner to give and receive feedback before revising their claims and evidence." (Lesson 5, Teacher Guide)
- Lesson 12, Synthesize Section, Schoolyard Flooding Design handout, Lesson 12 Student Assessment Schoolyard Flooding Design, students analyze and interpret data to figure out when a playground would be closed due to flooding: "Based on the data, which day or days of the week was the playground closed because of flooding? Why do you think that?" The teacher is given the option between two assessment tasks. If Lesson 12 Assessment (Choosing a Windbreak) is selected, students do not analyze and interpret data to make sense of a phenomenon during the lesson.

Claimed Element: DATA E3:Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. Claimed as intentionally developed in Lessons 2 and 8. Evidence was found in both lessons. Examples include:

- Lesson 2, Synthesize Section, Step 2: "Continue to work with students to annotate A Fruiting Plant's Life Cycle with similarities (e.g., the main life stages, need for water, production of flower before fruit). Use check marks to note similarities and use a different color for differences. Once annotated, ask students whether this model can tell us how plants make fruits." (Lesson 2, Teacher Guide)

- Lesson 8, Synthesize Section, Step 4: "Identify patterns in the effects of weather hazards. Point out that by combining and organizing the weather hazard information, it is easier to compare hazards to find patterns. Show slide I. Remind students that a pattern is something that repeats over time or from place to place. Ask students to share similarities and differences they notice between the weather hazards. Use a Consensus Discussion to begin identifying patterns in our data." (Lesson 8, Teacher Guide)

Claimed Element: **DATA E5:Use data to evaluate and refine design solutions.** Claimed as intentionally developed in Lesson 11. Evidence was found in Lesson 11.

- Lesson 11, Explore Section, Step 3: "Evaluate our designs using data. Display slide D. Point out that by sharing our designs we can visualize how well each design meets the criteria and constraints relative to each other. Also, when we use evidence to compare our design solutions, we can use argumentation to figure out the best possible solution to our problem without focusing on only our own designs. Ask students to share observations related to the performance of design solutions from other groups relative to the criteria and constraints, and relative to their own design." (Lesson 11, Teacher Guide)

MATH: Using Mathematics and Computational Thinking

Claimed Element: **MATH E2: Organize simple data sets to reveal patterns that suggest relationships.** Claimed as an opportunity to practice in Lessons 3,4,6 and 11. Evidence was found in all claimed lessons. Examples include:

- Lesson 3, Explore Section, Step 2: "Discuss measurement. Explain to students that each sticky note will represent 10 inches of precipitation. Using the Fruit Location card for Michigan, ask students how many sticky notes are needed to represent Michigan's 35 inches of precipitation. Work with the class to count by tens from 0 to 30, placing sticky notes for every 10 inches of precipitation to build a bar of 3 total sticky notes. Ask the class how many more inches of precipitation need to be added to the graph for the Michigan location. When students respond with 5 more inches, remind students that 1 sticky note represents 10 inches of precipitation. Ask students for ideas about how to represent just 5 inches of precipitation using the sticky notes. Listen for students to suggest cutting or folding the sticky note in half to represent 5 inches of precipitation." (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 3: "Consider as a class how to graph temperature. Ask students what would be a useful way to represent the data so we can compare all the seasons and compare Michigan temperatures with temperatures in other places. Some students should suggest using bar graphs like we used to compare precipitation data. If not, remind students that they were able to figure things out using a bar graph when they looked at precipitation data, so it might also be a useful representation here." (Lesson 4, Teacher Guide)
- Lesson 6, Explore Section, Step 2: "Discuss how to record the data. Display slide E. You can use this slide to show students how to add information to the chart by looking at one example together for Washington apples. First, explain the data collection process: Students will walk around the room looking for harvest data for their assigned fruit. When they find their fruit, they record the location of the farm on a row in their chart. Using a colored pencil, they should color in the months the fruit is picked fresh. Alternatively, students could draw a line through the months that fruits are grown (thick line) and the additional time they can be stored (thin line). This would leverage their prior understanding of timelines and number lines and would be less reliant on specific colors. Discuss with students how to use a second color to record additional months that the fruit can be stored in cold refrigerators after picking." (Lesson 6, Teacher Guide)
- Lesson 11, Explore Section, Step 3: "Begin creating the chart as students share data. Use either a digital version or one on chart paper and label it Evaluating Design Solution. If possible, gather in a Scientist Circle around the chart. Ask each group to take 1-2 minutes to share their design test observations with the class from their Our Windbreak

Test Results handout. Since students conducted multiple trials at high and low speed, ask them to share the best test result for their windbreak design. This test result provides data for how well the windbreak design might optimally work. As the first group shares, create columns for recording their information on the Evaluating Design Solutions chart so that we will be able to easily compare how well each solution performed in each criterion and constraint." (Lesson 11, Teacher Guide)

CEDS: Constructing Explanations and Designing Solutions

Claimed Element: CEDS E2: Use evidence (e.g., measurements, observations, patterns) to construct or support an explanation or design a solution to a problem. Claimed as intentionally developed in Lessons 11 and 12. Evidence was found in both lessons, examples include:

- Lesson 11, Synthesize Section, Step 5: "Ask if all students agree with this claim. Then ask, What was our evidence to support this claim? Include in the Evidence column the additional criteria and constraints added to the chart, and how our initial thinking about the best design solution may have changed." (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart or they can propose a new design that combines features of the ones they tested. When they write their claim, they need to describe the design they think is best by naming one tested by the class (e.g., fence design #1, wall design #2, natural designs, etc.), or by referencing how they would combine the best features from them. Their claims will also need to include how the design meets the criteria and constraints. Ask students if they have any questions about the design problem." (Lesson 12, Teacher Guide)

Claimed Element: CEDS E5: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. Claimed as intentionally developed in Lessons 9, 10, and 11. Evidence was found in all claimed lessons. Examples include:

- Lesson 9, Explore Section, Step 3: "Facilitate a gallery tour. Display slide I. Tell students that just like earlier when they shared their individual models with their group, each group will now share their group models with the class by doing a gallery tour. Explain that each group must select one person to stay with their model in order to explain it to others who will visit their group. Meanwhile, the rest of the group will visit two other groups in total; one group modeling the same windbreak design, and one group modeling a different windbreak design. Explain that the traveling students must pay close attention to what is explained and what is included in the model. Remind students to notice the parts or components included in the model, how the parts work together, and how the model shows what is happening (the interactions.)" (Lesson 9, Teacher Guide) Explicit evidence of students using criteria and constraints was not located.
- Lesson 10, Explore Section, Step 3: "Two groups will build wall-like designs, two groups will build fence-like designs, and 2 groups will build natural designs. Provide each group with a styrofoam baseboard and assorted tape or glue. Show where the other materials are located and which materials the different groups can access. After groups discuss their design ideas, they should send 1 or 2 members to "shop" for materials at the designated location, using only the materials they think they will need. The person shopping for materials will need to track the cost of the materials. Display slide G and review the instructions. Pass out 1 copy of Group Windbreak Design to each group and designate one group member to sketch their design for the class record. The sketch of the design will be paired with the actual scaled model but will include more details about the group's idea for how the windbreak works...Ask students, How can we decide which windbreaks work best? Listen for students to suggest: Compare them! See which one had the fewest fruits fly off. See which one had the lowest wind speed. Build anticipation for comparing the windbreaks to each other in the next lesson." ."') While students are comparing multiple solutions to a problem, explicit evidence of students using criteria and constraints was not located.

- Lesson 11, Explore Section, Step 3: "Begin creating the chart as students share data. Use either a digital version or one on chart paper and label it Evaluating Design Solution. As the first group shares, create columns for recording their information on the Evaluating Design Solutions chart so that we will be able to easily compare how well each solution performed in each criterion and constraint." (Lesson 11, Teacher Guide)

ARG: Engaging in Argument From Evidence

Claimed Element: ARG E3: Respectfully provide and receive critiques from peers about a proposed procedure, explanation or model by citing relevant evidence and posing specific questions. Claimed as intentionally developed in Lessons 5 and 12. Evidence was located in both lessons. Examples include:

- Lesson 5, Explore Section, Step 4: "Show students slide J and use the Tips for Giving and Receiving Feedback handout to go over how students can give feedback to one another to improve their claims. Focus students on looking for a clear prediction on where to grow a fruit and evidence about how precipitation and temperatures match the fruit's needs. Use slide K to support students in listening to the feedback and considering how to improve their claims. Once students have given and received feedback, give them time to revise their claims to improve them. In Lesson 6, they will be explicitly introduced to argumentation more fully." (Lesson 5, Teacher Guide)
- Lesson 12, Synthesize Section, Step 3: "Provide peer review and feedback. Display slide G. When students complete their individual work on the assessment, ask students to trade handouts and read each other's ideas. Using Giving and Receiving Feedback ask students to give their 1-2 feedback ideas to their partner. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints. The purpose of giving feedback is to help improve our claims by emphasizing things to look for." (Lesson 12, Teacher Guide)

Claimed Element: ARG E4: Construct and/or support an argument with evidence, data, and/or a model. Claimed as intentionally developed in Lessons 1,3,4,5,6. Evidence was located in the claimed lessons. Examples include:

- Lesson 1, Synthesize Section, Step 4: "Facilitate an Initial Ideas Discussion. The purpose is to surface students' early thinking about the phenomenon and ask clarifying questions so that other students can work with the ideas being shared. Remind students of the classroom agreements for a shared learning community. All ideas should be accepted. Throughout the discussion, encourage students to ask each other questions as they listen to their classmates' ideas." (Lesson 1, Teacher Guide)
- Lesson 3, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Share slide L, and work together as a class to make a claim to add to Our Growing Ideas chart. Remind students that a claim is an answer to a question that, in science, we support with evidence." (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize Section, Step 7: "Our question is, How is temperature related to where fruit plants grow? What claim or claims can we make to answer this question? What new evidence do we have to support our claims? Do we all agree? Are there still areas of confusion?" (Lesson 4, Teacher Guide)
- Lesson 5, Explore Section, Step 4: "Display slide H. Pass out 1 copy of the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well." (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize Section, Step 4: "Construct an argument together. Gather in a Scientists Circle. Display the chart paper with our question written on top and slide N. Facilitate a Consensus Discussion to draft an argument together." (Lesson 6, Teacher Guide)

Claimed Element: ARG E6: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. Claimed as intentionally developed in Lessons 7 and 12. Evidence was located in both lessons, examples include:

- Lesson 7, Synthesize Section, Step 4: "Explain that after they sketch their designs, they need to write a claim to answer the question: How does your design protect the fruit plant in hazardous weather? They can use evidence from things they've experienced, heard about, or seen in class or their life that makes them think their design can work." (Lesson 7, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart or they can propose a new design that combines features of the ones they tested. When they write their claim, they need to describe the design they think is best by naming one tested by the class (e.g., fence design #1, wall design #2, natural designs, etc.), or by referencing how they would combine the best features from them. Their claims will also need to include how the design meets the criteria and constraints. Ask students if they have any questions about the design problem." (Lesson 12, Teacher Guide)

INFO: Obtaining, Evaluating, and Communicating Information

Claimed Element: INFO E1: Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence. Claimed as intentionally developed in Lesson 4. Evidence was located in Lesson 4. Examples include:

- Lesson 4, Synthesize Section, Step 6: "Predict seasonal temperatures for three other locations. Display slide Q. Just as in Lesson 3, point out that there were three places we did not have temperature data for: Washington, US; Florida, US; and Ecuador. Point to the locations on the Where Fruit Grows map as you list them, and ask students what fruit grows there. Wonder aloud what it might be like in those places, and invite students to share their ideas." (Lesson 4, Teacher Guide)

Claimed Element: INFO E3: Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices. Claimed as intentionally developed in Lessons 3,4, and 5. Evidence was located in all claimed lessons. Examples include:

- Lesson 3, Explore Section, Step 2: "Facilitate a Building Understandings discussion. Have a quick discussion about the initial patterns students see on the graph by comparing the places with the most precipitation and the places with the least precipitation and how there seems to be a relationship between the amount of precipitation and the type of fruit grown there." (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 5: "Compare data for the same fruit-growing locations. Once the individual groups have completed their analysis of their locations seasonal data, use slide N to communicate across groups. Gather apple locations into one larger group and banana- and orange locations into larger groups. In these larger groups, have students compare their graphs and talk about what they figured out about the temperatures in their assigned location." (Lesson 4, Teacher Guide)
- Lesson 5, Explore Section, Step 4: "Provide students with copies of Fruit Growing Guides, which has the options for fruit and vegetable plants they can grow. Also, provide students with copies of Possible Farm Locations, which include the 5 possible locations they can start their farm. These are also provided on their handouts." (Lesson 5, Teacher Guide)

Claimed Element: **INFO E4: Obtain and combine information from books and/or other reliable media to explain phenomena or solutions to a design problem.** Claimed as intentionally developed in Lessons 5,8, and 12. Evidence was found in all claimed lessons. Examples include:

- Lesson 5, Synthesize Section, Step 3: "Revisit the Where Fruit Grows map to consider climate. Ask students, How would we describe the climates in places that grow apples compared to places that grow oranges or bananas? Are they similar or different from one another? Take a minute to study our map one more time and be ready to share some ideas." (Lesson 5, Teacher Guide)
- Lesson 8, Explore Section, Step 3: "Introduce the resources for research. Display slide C. Refer to specific weather hazards or characteristics of weather hazards that the students brought up at the end of Lesson 7 on the Our Experiences of Weather Change chart. Say something like, You mentioned several different types of hazardous weather. I found information on the ones you mentioned, and the ones we read about and some others that seemed to be related (or that occur in places where our fruit plants grow)." (Lesson 8, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Read aloud Part 2. Display slide E. Use Part 2 on the assessment to set the context for the design solutions. Read aloud the scenario of the students and the principal trying to solve the problem. As the class reads Part 2, encourage students to take notes or highlight/underline important information about the criteria, constraints, and possible solutions." (Lesson 12, Teacher Guide) Note that the teacher is given the option between two assessment tasks. If the Lesson 12 Assessment (Schoolyard Flooding Designs) is chosen, students do not combine information from multiple reliable media to explain their solutions.

Criterion-Based Suggestions for Improvement: N/A

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. The materials include activities in which students are developing and using grade-appropriate elements of the DCIs because students not only use, but also develop over time, several specific elements of various DCIs involving weather, climate, natural hazards, and engineering ideas.

ETS1.A Defining and Delimiting Engineering Problems

Claimed Element: **3-5-ETS1.A.1 ETS1.A Defining and Delimiting Engineering Problems: Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5-ETS1-1) (secondary to 4-PS3-4)** Claimed in Lessons 9 and 10. Some evidence was located in both lessons. Examples include:

- Lesson 9, Connect Section, Step 6: " Record criteria for windbreak designs. Once students recall that strong winds can damage plants, display slide N. Ask students to discuss the prompt with a partner. Consider possible constraints.

Take a moment to brainstorm possible constraints they might need to consider on their designs. From the book, they will likely consider cost and materials, like the 3rd graders in the book did. Record some of these initial ideas onto the chart." (Lesson 9, Teacher Guide)

- Lesson 10, Connect Section, Step 2: "Display slide B. Explain that they will build and test scaled models of windbreak designs and that they named a few criteria their windbreaks need to meet or do to be successful. Review those criteria now. Make adjustments or clarify any of the criteria. Revisit the constraints. Display slide C. Remind students, using the word wall, that constraints are limitations on designs, which often come in the form of time, materials, and money." (Lesson 10, Teacher Guide) However, students are not yet leveraging the idea of comparing different solutions based on criteria and constraints and do not do so until Lesson 11.

ETS1.B Developing Possible Solutions

Claimed Element: **3-5-ETS1.B1: ETS1.B Developing Possible Solutions: Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2) (secondary to 4-ESS3-2)** Claimed in Lessons 8,9 and 10. Some evidence was located in all claimed lessons. Examples include:

- Lesson 8, Explore Section, Step 3: "Give students time to research their weather hazards. Display slide F. Distribute a copy of the Research Notes handout to each student, several copies of the appropriate story from the Weather Hazard Stories handout, and research cards from Weather Hazard Cards to each group." (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Display slide L, and display the Our Growing Ideas chart. Using a Consensus Discussion, ask students if they can now make a claim for their lesson question, How can farmers and engineers protect plants from wind damage? Motivate the need to build and test windbreak designs. Once the class completes part two of the consensus model, ask them how we could find out which windbreak design works best. If students need additional support to respond, ask what an engineer might do to figure this out. Students will likely respond by saying that they could build and test each design, so take the opportunity to move on right away to the next activity." (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 2: "Share the testing setup with students. Say something like, OK, we've got some great ideas for how we might test windbreaks. Let's make sure we use all the materials the same way. Demonstrate the materials to students and talk through what they represent in the real world so that all students are clear about the setup." (Lesson 10, Teacher Guide) While students tested a solution through investigation of how well it performed under a range of likely conditions, they did not research the problem/refer to their research on the problem.

Claimed Element: **3-5-ETS1.B2: ETS1.B Developing Possible Solutions: Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3)** Claimed in Lesson 10. Evidence was located in Lesson 10. Examples include:

- Lesson 10, Explore Section, Step 4: "Be sure to encourage students to identify the failure point and how they plan to improve the design if they make adjustments before testing it again. Remind students from previous units that failure points are parts of the design that didn't work as intended. Encourage students to work together to figure out possible ways to improve the design based on what didn't work." (Lesson 10, Teacher Guide)

Claimed Element: **3-5-ETS1.B3: ETS1.B Developing Possible Solutions: At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.** (3-5-ETS1-2) Claimed in Lessons 10, 11 and 12. Evidence was found in all claimed lessons. Examples include:

- Lesson 10, Synthesize Section, Step 6: "Discuss windbreak design in small groups. Display slide K. Prompt students to examine their results and discuss how well their windbreak met the criteria and constraints. The group should update their Group Windbreak Design sketch with any adjustments they made to the windbreak." (Lesson 10, Teacher Guide)
- Lesson 10, Explore Section, Step 3: "After groups discuss their design ideas, they should send 1 or 2 members to "shop" for materials at the designated location, using only the materials they think they will need. The person shopping for materials will need to track the cost of the materials. Display slide G and review the instructions. Pass out 1 copy of Group Windbreak Design to each group and designate one group member to sketch their design for the class record. The sketch of the design will be paired with the actual scaled model but will include more details about the group's idea for how the windbreak works."(Lesson 10, Teacher Guide)
- Lesson 10, Connect Section, Step 5: "Reflect on the design process. Display slide J. Explain that engineering is a process that takes many attempts to get a design just right. Engineers tend to work in teams and they brainstorm ideas together, a lot like the students did on their team, and this work together results in an even better idea across the team. But the process can feel messy. Some designs do not work very well while others end up working. This can result in frustration at times, and also excitement at other times. How successful was I at working with my team to design a windbreak to protect plants? (Lesson 10, Teacher Guide)
- Lesson 11, Synthesize Section, Step 5: "Why do we compare design solutions before making decisions? What might have happened if we skipped this step? We would not have thought about cost or animals. We might not have realized that our solutions could cause a new problem. We might not have noticed that natural windbreaks are a good choice." (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize Section, Step 3: "Provide peer review and feedback. Display slide G. When students complete their individual work on the assessment, ask students to trade handouts and read each other's ideas. Using Giving and Receiving Feedback ask students to give their 1-2 feedback ideas to their partner. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints." (Lesson 12, Teacher Guide)

ETS1.C Optimizing the Design Solution

Claimed Element: **3-5-ETS1.C1: ETS1.C Optimizing the Design Solution: Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.** (3-5-ETS1-3) (**secondary to 4-PS4-3**) Claimed in Lessons 10 and 11. Evidence was found in both lessons. Examples include:

- Lesson 10, Explore Section, Step 4: "Test windbreaks. To test each windbreak, display slide H and review the testing procedures and how to record the results on the Our Windbreak Test Results handout in Step 2. Remind students of how they recorded the no windbreak setup in Step 1. Provide an opportunity to improve the design. After students have done the first test of their design, provide an opportunity for students to make adjustments to their designs and test a second time so they can improve their designs based on the results during the first test." (Lesson 10, Teacher Guide)
- Lesson 11, Explore Section, Step 3: " Ask students to share observations related to the performance of design solutions from other groups relative to the criteria and constraints, and relative to their own design." (Lesson 11, Teacher Guide)

ESS2.D Weather and Climate

Claimed Element: **3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)** Claimed in Lessons 1,3,4,5, and 6. Evidence was found in Lesson 5, and partial evidence in lessons 3, 4, and 6. Examples include:

- Lesson 3, Synthesize Section, Step 4: "Propose using water droplet symbols to represent precipitation. Show students the single, double, and triple water droplet symbols and ask them which levels of precipitation each one should represent. As you work with students' ideas, add a key to the bottom of the map as shown. Have 1 or 2 different students from each small group come up and add the appropriate water symbol next to the fruit die-cut at their location...Say something like, We have figured out a lot! I bet we could predict how much precipitation falls on a place based on where it is on the map and what fruit grows there. Let's give it a try! Let partners choose 1 fruit/location to make a prediction for and give them a few minutes to work. Ask students to share their ideas about how much precipitation they predict for the locations and why. Add the appropriate water droplet die-cuts to the map for each location once the class comes to agreement." (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize Section, Step 6: "Point out that there were three places we did not have temperature data for: Washington, US; Florida, US; and Ecuador. Point to the locations on the Where Fruit Grows map as you list them, and ask students what fruit grows there. Wonder aloud what it might be like in those places, and invite students to share their ideas. Ask students to talk with a partner about whether we could figure out what these places might be like just by looking at our map. Then invite a few students to share what their partner said about whether that would be possible. Build consensus around the idea that the patterns of fruit and temperature could help us predict the temperature in another place." (Lesson 4, Teacher Guide)
- Lesson 5, Connect Section, Step 2: "What do you notice about this graph? What do you wonder? What is the scientist trying to figure out using this graph?" (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize Section, Step 4: "Listen for a claim like, We can get these fruits on the school menu all year because they come from different places at different times of year. Add evidence and science ideas. First, focus students on the evidence and science ideas supporting that the fruits come from certain places (i.e., where we get them). Help them connect their ideas to the weather patterns and climate ideas they have figured out. Next, have students focus on the evidence and science ideas supporting that the fruits are only available from these places at certain times. Help students connect to seasonal patterns in weather and life cycles." (Lesson 6, Teacher Guide) While students leverage ideas about climate but do not extend to the idea of predicting future weather trends.

Claimed Element: **3-ESS2.D.2: ESS2.D Weather and Climate: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)** Claimed in Lessons 1 and 5. Evidence was found in Lesson 5. Examples include:

- Lesson 1, Synthesize Section, Step 4: "Record evidence for where apples, bananas, and oranges grow. Gather students in a Scientists Circle with their individual maps around the Where Fruit Grows map. Display slide M and remind students of the community agreements. Next to the map, have a chart or whitespace available to record some initial "Patterns We Notice." (Lesson 1, Teacher Guide)
- Lesson 5, Connect Section, Step 2: "Develop a shared understanding of climate. Display slide D. Have a short discussion about a new word, climate, and that it means long-term temperature and precipitation in a place, including what kinds of data are important to understand different climates." (Lesson 5, Teacher Guide)

ESS3.B Natural Hazards

Claimed Element: **3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)**
Claimed in Lessons 7, 8, 9, 10, 11 and 12. Evidence was found in all claimed lessons, examples include:

- Lesson 7, Connect Section, Step 2: "Wow, we have a lot of experiences to help us! One of the most important jobs meteorologists do is help predict when weather might be bad so that people can make plans to stay safe. Some of you shared how it is really important for people to stay inside when this weather happens. What do we need to do when this kind of weather happens? Listen for students to share ideas like going inside, staying with family/caregivers, staying safe, not driving, listening to meteorologists, etc. Then ask questions, such as, What about the fruit plants we have been investigating that cannot move inside when the weather changes so quickly? Call back to their ideas about fruit plants being harmed. Share that you have some videos and images we can observe to see how fruit plants handle these kinds of situations." (Lesson 7, Teacher Guide)
- Lesson 8, Explore Section, Step 3: "Introduce the resources for research. Display slide C. Refer to specific weather hazards or characteristics of weather hazards that the students brought up at the end of Lesson 7 on the Our Experiences of Weather Change chart. Say something like, You mentioned several different types of hazardous weather. I found information on the ones you mentioned, and the ones we read about and some others that seemed to be related (or that occur in places where our fruit plants grow). Explain that you have some resources students suggested we look at: images and facts about different weather hazards, maps of where those hazards occur, and stories from people who have experienced the effects of those weather hazards on their crops." (Lesson 8, Teacher Guide)
- Lesson 9, Explore Section, Step 2: "Explain to students that in addition to seeing their classmates' models, it may also help to watch again what happens to banana plants during a hazardous weather event. Tell students to focus on what they see happening to the plants so they can be sure to include this in their revised models. Play the Storm Time: Banana Trees video. Consider details from research in Lesson 8. Prompt students to look at the Patterns in Weather Hazard Data chart, and talk with their group about information from the weather hazard cards they might add to their model of what happens when strong winds impact a plant." (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 2: "Consider how we might test windbreaks. Gather around the testing area and/or display slide D. Explain that every group is going to use the same test area and materials. Give students some time to look over the available materials and then ask students what ideas they have for testing to see if windbreaks meet the criteria." (Lesson 10, Teacher Guide)
- Lesson 11, Connect Section, Step 2: "Introduce the book. Display slide B. Gather students together where they will all be able to see the Weather Hazard Cards book. Explain to students that we now have multiple design solutions to protect trees against winds." (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Revisit ideas and experiences about too much precipitation. In Lesson 8, students observed that different weather hazards also can bring a lot of precipitation. Return to this aspect of hazardous weather to motivate designing solutions when we get too much rain. Connect to the stories and experiences that surfaced during Lesson 7 and 8 when discussing hazardous weather and precipitation." (Lesson 12, Teacher Guide)

LS1.B Growth and Development of Organisms

Claimed Element: **Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)** Claimed in Lessons 1 and 2.

- Lesson 1, While students discuss where things grow, students do not discuss reproduction or the fact that the life cycles are diverse. This is explained in the 3.2 Weather & Hazards SEP-DCI-CCC-ELA-Math-Matrix "In this first lesson of the unit, students may share initial ideas for where they think fruit or vegetables come from, how they grow on plants, and/or what times of year plants may produce a fruit or vegetable. This lesson only surfaces prior knowledge and will not fully develop any part of the DCI on its own, but rather sets the stage for future learning in subsequent lessons." (3.2 Weather & Hazards SEP-DCI-CCC-ELA-Math-Matrix)
- Lesson 2, Explore Section, Step 2: "Label the stages of growth. Celebrate the observations students made of the growing tomato plant. Explain that it can be helpful to add words to describe the stages of the tomato plant's growth. Ask students to suggest words that could label or describe the main thing happening at the different stages of growth. When possible, co-construct these labels using students' words and suggestions." (Lesson 2, Teacher Guide) Students do not address animal life cycles in this unit.
- 3.2 Weather & Hazards SEP-DCI-CCC-ELA-Math-Matrix "In this lesson, students explore the life cycles of different plants that produce fruits and vegetables to reveal patterns in plant life stages, including the unique and diverse aspects of the life cycles of these plants. Students figure out that all the plants share common life stages of new life beginning, growth, reproduction, and death. They also figure out that most of the plants in this lesson (fruiting plants) reproduce by making flowers and fruit, which carry seeds needed for new life to begin. Finally, students explore the environmental needs that plants have to ensure they can grow and produce fruit and this motivates further ideas and investigations about specific plant needs and the environments that can best support those needs. In 3rd grade, this DCI is split across this unit, where it focuses on plant life cycles and needs, and *Unit 3.3: Why do animals look and act the way that they do?* which explores life cycles in the context of animals. Note: The mechanism of plant reproduction, including specialized structures necessary for flowering, pollination, and fruiting are out-of-grade-band for 3rd grade and will be more fully explored in middle school science." (3.2 Weather & Hazards SEP-DCI-CCC-ELA-Math-Matrix)

Criterion-Based Suggestions for Improvement

- Consider including additional opportunities for students to use and apply LS1.B. Currently, students are only engaged with portions of this element in two lessons. Ensure "there are sufficient SEP, CCC, and DCI elements and times that students are engaged in the elements for the length of materials." (Detailed Guidance, p. 10).

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. The materials include activities in which students are developing and using grade-appropriate elements of all three dimensions to make sense of phenomena or design solutions to problems.

PAT: Patterns

Claimed Element: **PAT E1: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.** Claimed as intentionally developed in Lessons 2,3,4, and 8. Evidence was located in all claimed lessons. Examples include:

- Lesson 2, Connect Section, Step 3: "Give students time to obtain information about their fruit or vegetable. Display slide I. Explain that you have some infographic texts about different kinds of fruits and vegetables that may help us figure out similarities and differences in their life cycles. Preview with students what kinds of information they will find in these new infographic texts." (Lesson 2, Teacher Guide)
- Lesson 3, Synthesize Section, Step 4: " Gather students in a Scientists Circle near the Precipitation Graph and the Where Fruit Grows map. Display slide H, and remind students that the goal of our discussion is to consider how the precipitation data we graphed helps us answer our question about how plants' water needs affect where they can grow. Tell students that it will be important for them to not only share ideas connected to what they see in the graph but also to listen and connect with what other students share. Remind students that in science a pattern is something that repeats over time or from place to place." (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize Section, Step 7: "Have students turn and talk to a partner about the patterns of the temperatures the plants need. Ask students to share what they noticed about the patterns of the temperatures the plants need. Help them to identify that the patterns of the plants' needs and the patterns of seasonal temperatures for where they grow are very similar." (Lesson 4, Teacher Guide)
- Lesson 8, Synthesize Section, Step 4: "Identify patterns in the effects of weather hazards. Point out that by combining and organizing the weather hazard information, it is easier to compare hazards to find patterns. Show slide I. Remind students that a pattern is something that repeats over time or from place to place. Ask students to share similarities and differences they notice between the weather hazards. Use a Consensus Discussion to begin identifying patterns in our data." (Lesson 8, Teacher Guide)

Claimed Element: **PAT E2: Patterns of change can be used to make predictions.** Claimed as intentionally developed in Lessons 3,4, and 5. Evidence was located in all claimed lessons, examples include:

- Lesson 3, Synthesize Section, Step 4: "Predict precipitation for 3 other locations. Step back, look at the map, and point out that there were 3 places we did not have precipitation data for: Washington, US; Florida, US; and Ecuador. Point to the locations on the Where Fruit Grows map as you list them and ask students what fruit grows there. Display slide K. Say something like, We have figured out a lot! I bet we could predict how much precipitation falls on a place based on where it is on the map and what fruit grows there. Let's give it a try!" (Lesson 3, Teacher Guide)

- Lesson 4, Synthesize Section, Step 6: "Add predictions to the map. Start with apples. Ask students to notice the pattern in seasonal temperatures for apple-growing places, and use that as evidence to make a prediction for Washington. Then repeat for noticing patterns of orange-growing places to make a prediction for Florida, and then banana-growing places to make a prediction for Ecuador." (Lesson 4, Teacher Guide)
- Lesson 5, Explore Section, Step 4: "Display slide H. Pass out 1 copy of the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well. " (Lesson 5, Teacher Guide)

Claimed Element: **PAT E3:Patterns can be used as evidence to support an explanation.** Claimed as intentionally developed in Lessons 1,2,5,6 and 12. Evidence was located in all claimed lessons; examples include:

- Lesson 1, Synthesize Section, Step 4: "Do we notice patterns in where the fruit grows? (jot down ideas in the where column) Why do we think they grow in these places? (jot down ideas in the why column)" (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize Section, Step 5: " Practice using claims and evidence. Remind students of the lesson question, How do we get fruits from plants? Ask students to share a claim they might have that answers this question, and press them to use some evidence from the time lapse video, infographic cards, or class charts. Have the Tomato Plant Observations, Fruit and Vegetables Life Stages chart, and the Our Fruiting Plant Life Cycle model accessible so that students can reference these as they share their ideas. Start by having 1 student share a claim about one of the fruits. Then, work towards a claim that can answer the whole lesson question. Once the class agrees on a claim, add it to the Our Growing Ideas chart." (Lesson 2, Teacher Guide)
- Lesson 5, Explore Section, Step 2: "Remind students of claims and evidence. Tell students that they have been practicing making claims and evidence for many lessons. Some of these have been on the Our Growing Ideas chart, and some have been claims predicting what the precipitation or temperature is like in a place. They will use this whole class practice to now practice individually making a claim with evidence." (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize Section, Step 4: "Add evidence and science ideas. First, focus students on the evidence and science ideas supporting that the fruits come from certain places (i.e., where we get them). Help them connect their ideas to the weather patterns and climate ideas they have figured out. Next, have students focus on the evidence and science ideas supporting that the fruits are only available from these places at certain times. Help students connect to seasonal patterns in weather and life cycles." (Lesson 6, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart or they can propose a new design that combines features of the ones they tested. When they write their claim, they need to describe the design they think is best by naming one tested by the class (e.g., fence design #1, wall design #2, natural designs, etc.), or by referencing how they would combine the best features from them. Their claims will also need to include how the design meets the criteria and constraints. Ask students if they have any questions about the design problem." (Lesson 12, Teacher Guide)

CE: Cause and Effect

Claimed Element: **CE E1: Cause and effect relationships are routinely identified, tested, and used to explain change.** Claimed as intentionally developed in Lessons 7,8,9,10,11, and 12. examples include:

- Lesson 7, Synthesize Section, Step 4: "Pass out 1 copy of the Initial Designs to Protect Plants handout to each student. Look at the handout together. Explain that everyone will design something to protect fruit plants, like the banana plants shown in the videos. They can choose any type of hazardous weather to address, such as strong winds, heavy

rain, or lightning, and can imagine the plant as an apple tree, an orange tree, or any other kind of fruit plant. Give students a moment to write down 1 cause of damage to fruit plants, 1 effect on fruit plants, and 1 criteria they want to meet to protect their plant. Explain that they need to sketch the cause and effect on the fruit plant, then have them sketch a design that will protect it. Remind them to use symbols and words to show the cause, effect, and how the design works to protect the plant." (Lesson 7, Teacher Guide)

- Lesson 8, Synthesize Section, Step 4: "Discuss the cause of fruit damage by each hazard. Point out what the class has accomplished so far: identifying patterns in the characteristics of weather hazards and in the fruits affected by them. Invite them to now share which characteristics of their weather hazard cause damage to the fruit and/or fruit plants. Create a column titled 'Cause of most of the damage to fruit plants,' and add the characteristics that students share. Identify patterns in the causes of damage to fruit plants. Focus students' attention on the last column of the Weather Hazard Data chart, and ask them to share patterns they notice in the 'Cause of damage to fruit plants for different weather hazards.' Look for students to cite wind as the common cause of damage to fruits in all the hazards, except late frost." (Lesson 8, Teacher Guide)
- Lesson 9, Explore Section, Step 2: "Consider details from research in Lesson 8. Prompt students to look at the Patterns in Weather Hazard Data chart, and talk with their group about information from the weather hazard cards they might add to their model of what happens when strong winds impact a plant." (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize Section, Step 6: "Discuss windbreak design in small groups. Display slide K. Prompt students to examine their results and discuss how well their windbreak met the criteria and constraints. The group should update their Group Windbreak Design sketch with any adjustments they made to the windbreak. Then, have students individually write a summary on Step about how they think their windbreak caused a change in how the wind affected fruit plants. Encourage students to show how the windbreak could cause a change in how the wind would affect the fruit plants (e.g., Did it stop the windbreak? Did it push the wind in a different direction?)." (Lesson 10, Teacher Guide)
- Lesson 11, Synthesize Section, Step 5: "Update Our Growing Ideas chart. Display slide I. Gather in a Scientists Circle around the Our Growing Ideas chart, if time allows. Using a Consensus Discussion, ask students if they can now make a claim for their lesson question, How and why do we compare design solutions before making decisions? Beginning with the "how" and then discussing the "why", invite students to share some ideas about claims they can make." (Lesson 11, Teacher Guide).
- Lesson 12, Synthesize Section, Cause and Effect Callout Box: "In this scenario, there are two cause-and-effect relationships. The first is that when the school has heavy rain (cause), then the playground floods (effect). The second is that when we design a solution to move the water away (cause), then the playground will stop flooding (effect). Use this discussion as an opportunity to emphasize the latter so that students are focused on the criteria for success." (Lesson 12, Teacher Guide)

SPQ: Scale, Proportion and Quantity

Claimed Element: **SPQ E1: Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods** Claimed as an opportunity to practice in Lesson 5. Evidence was found in Lesson 5, examples include:

- Lesson 5, Connect Section, Step 2: " "Up to this point, students have worked with data that represents yearly patterns in temperature and precipitation. Now, they begin thinking about how these patterns are consistent over time. This shift in scale involves moving from thinking about data that represents a single year to considering data that reflects patterns over many years in a specific location." (Lesson 5, Teacher Guide)

Claimed Element: **SPQ E2: Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.** Claimed as an opportunity to practice in Lessons 3 and 4. Evidence was found in all claimed lessons, examples include:

- Lesson 3, Explore Section, Step 2: "Bring out your rain gauge and 1 cup of water. Show the rain gauge to the class, and connect it to their ideas about measuring rainfall (e.g., catching rain in a bucket, using a ruler, etc.). Explain that scientists and people use all different types of tools to collect data about the weather. Explain that the rain gauge is a tool for collecting and measuring rainfall, and it does this similar to buckets or cups that could catch the rain. The gauge has a built-in ruler, too! Display slide C, and/or use the questions on the slide to orient students to a rain gauge and how it works. Pour water into the rain gauge, and have students practice reading the amount in inches. Emphasis that the rain gauge must be held level for accurate measurement." (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 4: "Pass around the thermometer, and let students practice reading it. They can examine the thermometer closely and look at the numbers, tick marks, and other features." (Lesson 4, Teacher Guide)

SYS: Systems and System Models

Claimed Element: **SYS E1: A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot.** Claimed as an opportunity to practice in Lesson 11.

- Lesson 11, Connect Section, Step 4: "Circulate among groups while students are sharing and prompt them to find similarities and differences in the information they gathered. Ideas to look and listen for during small group discussions: Native plants are ones that have always grown in an area; they were the most wind-resistant in Florida when hurricanes happened. Natural windbreaks can help habitats. They can provide additional food/shelter/shade for people and/or animals. They can support pollinators and other important animals in the larger system." (Lesson 11, Teacher Guide)

Claimed Element: **SYS E2: A system can be described in terms of its components and their interactions.** Claimed as an opportunity to practice in Lesson 9.

- Lesson 9, Synthesize Section, Step 5: "As students offer ideas for the model, support them in using their revised initial model by asking them how they might want to represent a missing component or interaction."

SF: Structure and Function

Claimed Element: **SF E2: Substructures have shapes and parts that serve functions.** Claimed as an opportunity to practice in Lessons 7,9, and 10. Evidence was found in Lesson 9, examples include:

- Lesson 7- The 5.3.2 Weather Hazards SEP-DCI-CCC-ELA- Math Matrix document states. "Students may engage with structure and function as they create their designs and explain how they function to reduce impact on fruit plants. In this way, structure and function can be used similarly to cause and effect, but, more specifically, can help guide students in identifying parts of their initial design they believe could effectively protect the fruit plants. It may be useful to help students see how different designs and the variety of structures they brainstormed are functioning in similar or different ways. For example, comparing 2 different structures that students brainstormed that could reduce wind damage, but functioning in different ways" (page 14). However, this is not explicitly called out for teachers in the lessons; therefore, they may not make these connections for the students to engage with this element.

- Lesson 9, Synthesize Section, Step 5: "Develop Part Two of the class consensus model. When drawing Part Two the consensus model, start by drawing a model for each windbreak type with no wind. This helps to highlight the differences between each design (structure), and allows students to make a more informed prediction about how each one will protect plants (function). As you add wind to each model, have students share ideas about how the wind will interact with it, and how it might be similar or different from the others, and from the first model. Guide students to construct the second part of the class consensus model to explain how each type of windbreak works to protect plants from strong wind. Facilitate a discussion to build part two of the model similar to part one of the model, adding ideas to the model that the class agrees on." (Lesson 9, Teacher Guide) The concepts of "structure" and "function" are mentioned, it is implied that students would consider the structure and function of substructures.
- Lesson 10, Explore Section, Step 4: "Provide an opportunity to improve the design. After students have done the first test of their design, provide an opportunity for students to make adjustments to their designs and test a second time so they can improve their designs based on the results during the first test." (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement

- Consider including opportunities for students to engage with CCC SF E2: Substructures have shapes and parts that serve functions.

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 use the information researched by identifying and testing cause-and-effect relationships to explain how humans can take steps to reduce the impact of natural hazards, which requires them to use grade-appropriate elements of the three dimensions simultaneously. The three dimensions are not used in isolation, and in most activities in the unit, students are expected to figure out something that requires the use of three dimensions working together at grade level.

The materials have integrated learning that supports student sense-making over time. For example, each lesson was purposely built around a 3-dimensional learning target, which is then specifically addressed in the lesson, and in which students must use all three dimensions to make sense of a phenomenon. Examples include:

- Lesson 2, Synthesize Section, Step 4 students integrate the use of the elements when they use patterns in plant growth stages to create a model showing a typical plant life cycle, in the three dimensions: **PAT-E3: Patterns can be used as evidence to support an explanation, LS1.B-E1: Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles,** and **MOD-E4: Develop and/or use models to describe and/or predict phenomena.** See I.B for additional LS1.B evidence and feedback.

- Lesson 3, Synthesize Section, Step 4, students integrate the use of the elements when students work in groups to discuss precipitation patterns on the Where Fruit Grows map in the three dimensions: **CCC PAT E1:Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena, DCI 3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)),** and **SEP DATA E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.**
- Lesson 4, Explore Section, Step 3, students integrate the use of the elements when students work in groups to create a graph of the seasonal temperatures for one of the places on the map, which helps them better understand that fruits grow in places with different precipitation patterns that meet the fruit plant's water needs in the three dimensions: **CCC PAT E2: Patterns of change can be used to make predictions, DCI 3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)),** and **SEP DATA E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.**
- Lesson 5, Explore Section, Step 4, students integrate the use of the elements when they apply their understanding of how to use climate data to decide which places are more or less suitable for growing certain fruits in the three dimensions**: CCC PAT E3:Patterns can be used as evidence to support an explanation, DCI 3-ESS2.D.2: ESS2.D Weather and Climate: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2), SEP DATA E3: Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings**
- Lesson 7, Synthesize Section, Step 4, students integrate the use of the elements when they complete their initial design to protect plants making connections between the elements of hazardous weather they chose to impacts on the fruit plants before making a claim about how their design reduces the impacts on fruit plants in the three dimensions: **CCC CE E1: Cause and effect relationships are routinely identified, tested, and used to explain change. DCI 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1) SEP AQDP E3: Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.**
- Lesson 8, Synthesize Section, Step 4, students integrate the use of the elements when they discuss the similarities and differences between weather related hazards and identifying the patterns of high winds across the hazards in the three dimensions**: CCC PAT E1: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena, DCI 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1), SEP DATA E3: Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings.**
- Lesson 9, Explore Section, Step 2, students integrate the use of the elements when they identify the components and interactions on their windbreak models in the three dimensions**: CCC SF E2: Substructures have shapes and parts that serve functions, DCI 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1), SEP AQDP E5: Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.**

- Lesson 10, Synthesize Section, Step 6, students integrate the use of the elements when they compare their designs against the criteria, constraints, and the no windbreak results in three dimensions: **CE E1: Cause and effect relationships are routinely identified, tested, and used to explain change, DCI 3-5-ETS1.B2: ETS1.B Developing Possible Solutions: Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3), SEP MOD E6: Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system.**
- Lesson 11, Explore Section, Step 3, students integrate the use of the elements when they compare their designs against the criteria, constraints, and against other design results in three dimensions: **SYS E1: A system is a group of related parts that make up a whole and can carry out functions its individual parts cannot. DCI 3-5-ETS1.B3: ETS1.B Developing Possible Solutions: At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2) SEP DATA E5: Use data to evaluate and refine design solutions.**

Criterion-Based Suggestions for Improvement: N/A

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 acknowledging questions raised in those lessons, cultivating new questions that build on what students figured out, and/or cultivating new questions from related phenomena, problems, and/or prior student experiences. The lessons help students develop toward proficiency in a targeted 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.

- Lesson 1 Navigate Section, Step 1: "Ask, How could we find answers to our questions? What investigations should we do? Pause to discuss the term investigation. Ask students what they think of when they hear the word investigation. Elicit a few ideas, then share that an investigation means to study something to figure out more facts or information about it. In science, this can include doing labs, reading, watching videos, examining images, getting information, and hearing from experts, among other things. Have students turn and talk with a partner about ideas for ways to investigate their questions. Bring students back together to record ideas on a chart labeled Investigation Ideas." (Lesson 1, Teacher Guide)

- Lesson 2, Navigate Section, Step 6: " Consider where to go next. Display slide O. Refer back to the Our Fruit and Vegetable Life Stages chart. Cue students to look at the bottom section of the chart where we combined information about what our fruits and vegetables need to grow best. Ask students, If we were to plant apples, bananas, or oranges, are there any specific questions they have about the specific needs to help them grow well?" (Lesson 2, Teacher Guide)
- Lesson 3, Navigate Section, Step 1: "Motivate the new lesson. Point to the bottom of the Fruit and Vegetable Life Stages chart again, and remind students that we were exploring more about plants' water needs since all plants need water. Some students were wondering how much water they would need to add to help a plant grow well. Use students' ideas and questions from Lesson 2 or the DQB to develop a possible lesson question similar to, How do the water needs of different plants affect where they can grow well? " (Lesson 3, Teacher Guide)
- Lesson 5, Navigate Section. Step 5: "Revisit the Driving Question Board and anchoring phenomenon. Display slide N. Tell students that we have learned a lot about how plants make fruit and also what kinds of growing conditions are best for them to grow well and make this fruit. Ask, Do you think we have enough information to answer our original question: How do we get these fruits all year long? Let some students share ideas and then tell them they will pick back up on this idea in the next lesson." (Lesson 5, Teacher Guide)
- Lesson 6, Navigate Section, Step 1: " Transition to next steps. Celebrate with students the work to figure out some big ideas to answer their questions. Then, reorient students to the anchoring phenomenon by displaying slide B. Remind them that we started the unit wondering how we can get apples, oranges, and bananas on the school menu all year. Ask the students to look at their Initial Ideas: How We Get Fruits All Year chart. Read aloud some of the initial ideas students had in Lesson 1 as they were trying to answer the question, How do we get fruits all year long? Elicit from students new ideas they might have about the phenomenon." (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize Section, Step 6: "Add to the Driving Question Board (DQB). As students share questions, aim to organize the questions as they share into clusters of similar questions. Once complete, explain to students that it is part of our mission to answer these new questions. You may want to add to or edit the unit question if it is posted at the top of your DQB. You can add to the unit question by posting a second question like, How can we protect fruit plants in hazardous weather?" (Lesson 7, Teacher Guide)
- Lesson 10, Navigate Section, Step 1: "Post new questions to the Driving Question Board. Display slide A and the Part 2: How a Windbreak Works chart from Lesson 9. Have students examine their initial ideas for how the three types of windbreaks work. Prompt students to pose new questions they want to investigate about windbreak designs now that they will build and test them. To keep this brief, jot down the questions for students on sticky notes and post them to the DQB as students pose them." (Lesson 10, Teacher Guide)

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. The target Performance Expectations are 3-LS1-1: Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death.

- Lesson 2, Synthesize Section, Step 4: "Create the model. Display the blank A Fruiting Plant's Life Cycle chart or a digital whitespace. Begin to sketch the Fruiting Plant Life Cycle model by writing the four life stages (white boxes). The following is an example of a life cycle chart, but ensure you co-construct a chart using your students' suggestions and ideas for how to represent a plant life cycle. Cycles are typically represented with a circular graphic." (Lesson 2, Teacher Guide)

3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

- Lesson 3, Explore Section, Step 2: "Build the bar graph together as a class using sticky notes. Arrange students into 8 groups and assign 1 of the 8 remaining locations to each group. Group size will vary depending on class size, but ensure there are at least 8 groups so that all 8 locations are covered. Hand out 1 fruit location card on the Location Precipitation Cards reference to each group of students. Ask them to work together to determine how many sticky notes they will need to represent the precipitation their location receives in a typical year. Remind them that each sticky note represents 10 inches of precipitation. Once they determine the number of sticky notes for their location, 1 or 2 group members should add them to the class Precipitation Graph." (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 4: "Build more graphs in small groups. Display slide L. Put students into 8 groups of 2-4 students based on class size. Explain that each small group will make a graph of the seasonal temperatures for 1 of the places on our map as we did for Michigan as a whole class. Distribute 1 copy of the Seasonal Temperature Graph handout to each student, and 1 copy of the All Location Temperatures handout. Assign locations to each of the 8 groups, and explain that each group will use only 1 of the tables from this sheet. Have groups circle their assigned location and then transfer their information to Step 1 on the Seasonal Temperature Graph handout." (Lesson 4, Teacher Guide)

3-ESS2-2: Obtain and combine information to describe climates in different regions of the world.

- Lesson 4, Connect Section, Step 2: " As you read, pause after each season for a community, and have students consider how the places change across the seasons....Compare the pictures in the book. Show slide D. Tell students that pictures can provide us information about what it is like in these places that grow fruit. Use the prompts to support students to obtain more information about the temperatures in these places that grow fruit." (Lesson 4, Teacher Guide)
- Lesson 5, Synthesize Section, Step 3: "Revisit the Where Fruit Grows map to consider climate. Ask students, How would we describe the climates in places that grow apples compared to places that grow oranges or bananas? Are they similar or different from one another? Take a minute to study our map one more time and be ready to share some ideas." (Lesson 5, Teacher Guide)
- Lesson 6, Explore Section, Step 2: " Compare the fruits linking back to science ideas we figured out. Display slide K. Continue the Consensus Discussion, but now push students to connect to previous ideas from Our Growing Ideas chart. It may be helpful to display the Where Fruit Grows map and the Fruit Plant Needs chart so that students can use them as they discuss these ideas. What did we figure out about climates and seasonal weather to help explain the differences? Feel free to use our Fruit Plant Needs and Where Fruit Grows map as you share your ideas." (Lesson 6, Teacher Guide)

3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.

- Lesson 7, Synthesize Section, Step 4: "Have students create initial designs and make claims. Display slide J. Explain that students will create designs to protect fruit plants. Explain that after they sketch their designs, they need to write a claim to answer the question: How does your design protect the fruit plant in hazardous weather? They can use evidence from things they've experienced, heard about, or seen in class or their life that makes them think their design can work." (Lesson 7, Teacher Guide)
- Lesson 9, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Display slide L, and display the Our Growing Ideas chart. Using a Consensus Discussion, ask students if they can now make a claim for their lesson question, How can farmers and engineers protect plants from wind damage? Write the lesson question on the chart, and then let students share ideas for a claim they can make, and the evidence from this lesson that supports that claim." (Lesson 9, Teacher Guide)

3-5-ETS1-1: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

- Lesson 7, Synthesize Section, Step 4: "Introduce the design problem. Display slide I. Restate the problem using the ideas students have already shared, including that fruit plants might be harmed or die in hazardous weather and that fruit plants cannot move indoors like people. Reiterate that people are also impacted. Now is a great opportunity to articulate the lesson question with students, something similar to, How can we protect fruit plants in hazardous weather? Brainstorm criteria. Remind students that when they are designing solutions to solve problems, their designs need to meet criteria to be successful." (Lesson 7, Teacher Guide)
- Lesson 9, Connect Section, Step 6: "Remind students that since we want to engineer a solution to this problem, we want to be sure we are doing things the way engineers do. Remind them that we have a book that tells us about how engineers design solutions. Tell students that as we read, they might notice steps they have already taken to help solve a problem. I heard the word "criteria". Can someone share something from the book, or from another unit we have done, to help me understand that word better. They used the word "constraints". How would you describe the difference between "criteria" and "constraints"?" (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 2: "Revisit the criteria. Return to the Engineers Solve Problems chart from Lesson 9. Ask students to briefly describe the problems they observed with fruit plants in strong wind (e.g., plants fall over, fruits fall off). Revisit the constraints. Display slide C. Remind students, using the word wall, that constraints are limitations on designs, which often come in the form of time, materials, and money. Point to the word on the Word Wall if needed. Share some predetermined constraints with students, explaining that you only have so many materials for them to use and only so much time. Additionally, the materials have a "cost" to them, so they will need to consider how much they spend as they use materials." (Lesson 10, Teacher Guide)

3-5-ETS1-2: Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

- Lesson 11, Explore Section, Step 3: "Share and compare our solutions. Display slide C. Restate that we are wondering how to compare our design solutions so we can choose the best one. Remind students that engineers use evidence from observations to evaluate different design solutions, and that we decided to do the same, but it is difficult to make sense of all that information on each team's handouts." (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart or they can propose a new design that combines features of the ones they tested. When they write their claim, they need to describe the design they think is best by naming one tested by the class (e.g., fence design #1, wall design #2, natural designs, etc.) or by referencing how they would combine the best features from them. Their claims will also need to include how the design meets the criteria and constraints." (Lesson 12, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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 unit currently integrates the Life and Earth and Space Science DCIs. The phenomenon, year-round fruit availability, "requires multiple domains to be clearly included in order for students to explain it." (Detailed Guidance, p.18)

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

- Lesson 2, Synthesize Section, Step 5: "Practice using claims and evidence. Remind students of the lesson question, How do we get fruits from plants? Ask students to share a claim they might have that answers this question, and press them to use some evidence from the time lapse video, infographic cards, or class charts. Have the Tomato Plant Observations, Fruit and Vegetables Life Stages chart, and the Our Fruiting Plant Life Cycle model accessible so that students can reference these as they share their ideas." (Lesson 2, Teacher Guide) Here students are using the **DCI, LS1.B Growth and Development of Organisms Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)** to make sense of how fruits and vegetables have life cycles that occur at certain times throughout the year.
- Lesson 4, Explore Section, Step 4, "Share observations and patterns. Gather in a Scientists Circle around the three harvest charts. Display the Summary of Our Data chart. Display slide G, and facilitate a Consensus discussion to summarize how the data helps us understand how we can have apples, bananas, and oranges all school year. Start by asking what information we get from the geographic data or world maps. Then, ask volunteers to describe what we found out from the geographic data." (Lesson 4, Teacher Edition) Here students are using the **DCI ESS2.D Weather and Climate 3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)** to make sense of temperature and precipitation patterns in different places and different times of the year.
- Lesson 6, Synthesize Section, Step 4, "Make a claim with evidence about other places in the world. Display slide G and distribute Where else could we grow fruit? Using Climate Map: Temperature Regions and the Where Fruit Grows Map, have students make a claim for another place in the world that might grow one of the fruits. Emphasize that this needs to be a new place they haven't investigated yet." (Leeson 6, Teacher Edition) Here students are using the **DCI ESS2.D Weather and Climate 3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)** to make sense of how they can use climate data to predict future weather patterns.
- Lesson 5, Connect Section, Step 2: "Does our climate change that quickly? Climate stays the same in a place. I think it can maybe change a little but it has to stay about the same. Do you think the climate in a place changes a lot from one year to the next? Why or why not? Not much, because our summers are usually the same year to year. Maybe, because sometimes we get a lot more snow than we did in past winters." (Lesson 5, Teacher Guide) Here students are using the **DCI ESS2.D Weather and Climate 3-ESS2.D.2: ESS2.D Weather and Climate: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2)** to make sense of how knowledge of climate in an area can help to determine which plants can be grown in an area.

- Lesson 7, Explore Section, Step 3: "Facilitate a brief Initial Ideas Discussion. Display slide H. Guide students to share their initial ideas about what is hazardous weather (e.g., strong winds, rain, lightning) and how those aspects of hazardous weather could damage the fruit plants and affect people. When you discuss the term "hazardous weather," elicit students' ideas first, and work toward a class definition before adding the word to the class Word Wall. Feel free to modify the word wall card as needed." (Lesson 7, Teacher Guide) Here students are using the **DCI ESS3.B Natural Hazards 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)** to make sense of how hazardous weather affects plants and humans.
- Lesson 9, Explore Section, Step 2: "Consider details from research in Lesson 8. Prompt students to look at the Patterns in Weather Hazard Data chart, and talk with their group about information from the weather hazard cards they might add to their model of what happens when strong winds impact a plant." (Lesson 9, Teacher Guide) Here students are using the **DCI ESS3.B Natural Hazards 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)** to make sense of how data from hazardous weather can help when creating designs that will protect plants in an area.
- Lesson 12, Synthesize Section, Step 2: "Revisit ideas and experiences about too much precipitation. In Lesson 8, students observed that different weather hazards also can bring a lot of precipitation. Return to this aspect of hazardous weather to motivate designing solutions when we get too much rain. Connect to the stories and experiences that surfaced during Lesson 7 and 8 when discussing hazardous weather and precipitation. If students created initial solutions in Lesson 7 to minimize the impact of too much rain, now would be a great time to revisit their ideas about how to protect plants from this kind of hazard." (Lesson 12, Teacher Guide) Here students are using the **DCI ESS3.B Natural Hazards 3-ESS3.B.1: ESS3.B Natural Hazards: A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)** to make sense of hazardous weather patterns, which help determine design decisions when creating a model to protect plants or humans from the negative effects.

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

- Lesson 2, Synthesize Section, Step 4: "Continue to work with students to annotate A Fruiting Plant's Life Cycle with similarities (e.g., the main life stages, need for water, production of flower before fruit). Use check marks to note similarities and use a different color for differences. Once annotated, ask students whether this model can tell us how plants make fruits." (Lesson 2, Teacher Guide) Here students are using the **CCC PAT E1: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena** to make sense of the differences and similarities between life cycles for fruiting plants.
- Lesson 4, Synthesize Section, Step 6: "Add predictions to the map. Start with apples. Ask students to notice the pattern in seasonal temperatures for apple-growing places, and use that as evidence to make a prediction for Washington. Then repeat for noticing patterns of orange-growing places to make a prediction for Florida, and then banana-growing places to make a prediction for Ecuador." (Lesson 4, Teacher Edition) Here, students are using the **CCC PAT E2: Patterns of change can be used to make predictions** about how the patterns of seasonal temperatures for apples can help them make predictions of apple growth in Washington.
- Lesson 6, Synthesize Section, Step 4: " Add evidence and science ideas. First, focus students on the evidence and science ideas supporting that the fruits come from certain places (i.e., where we get them). Help them connect their ideas to the weather patterns and climate ideas they have figured out. Next, have students focus on the evidence and science ideas supporting that the fruits are only available from these places at certain times. Help students

connect to seasonal patterns in weather and life cycles." (Lesson 6, Teacher Guide) Here, students are using the **CCC PAT E3:Patterns can be used as evidence to support an explanation** and make sense of why fruit is grown in certain places and at certain times.

- Lesson 7, Synthesize Section, Step 4: "Name causes and effects. Ask students to think back to the videos and photos of what happened to fruit plants in hazardous weather. Ask students what causes damage to fruit plants. Listen for students to suggest: wind, hail, lightning, too much rain, cold weather. Ask students what effects happened to the fruit plants. Listen for students to suggest: trees fall over, fruit falls off plants, leaves get torn up, the farm gets flooded, trees freeze, etc." (Lesson 7, Teacher Guide) Here students are using the **CCC CE E1: Cause and effect relationships are routinely identified, tested, and used to explain change** to make sense of the causes and effects of damage to fruit plants.
- Lesson 10, Handout Or Windbreak Test: "Now, on your own: How do you think your windbreak caused a change in how the wind affected fruit plants? How might you improve your design?" Here, students are using the **CCC CE E1: Cause and effect relationships are routinely identified, tested, and used to explain,** identify, and test the cause and effect relationship between windbreak designs and fruit tree protection from wind.
- Lesson 11, Synthesize Section, Step 5 Cause and Effect callout box: "Support students in developing this crosscutting concept by pushing students to name the cause-effect relationships they used to evaluate their designs. You might ask, How did considering causes and effects help us compare design solutions?"Here, students are using the **CCC CE E1: Cause and effect relationships are routinely identified, tested, and used to explain** to integrate ideas about how hazardous weather causes damage to fruit crops and how their design solutions affect the fruit plants.

Criterion-Based Suggestions for Improvement: N/A

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 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 among content areas.

The materials explicitly state the mathematics and ELA standards that are used in the unit to support students in seeing the connections between content areas. The document titled SEP-DCI-CCC-ELA-MATH-Matrix includes a table that lists all of the ELA and Math standards that are claimed to be supported by the lessons throughout the unit. Unit Connections to the Common Core Standards: "OpenSciEd Elementary program, texts intended for use in interactive read-alouds are approximately two grade levels above the CCSS range for text complexity, and texts intended for scaffolded independent reading are within the CCSS text complexity range for that grade level. We have noted in the table below the standards that are supported within each lesson." (Weather & Hazards SEP-DCI-CCC-ELA-MATH-Matrix)

The following are examples of ELA Language standards that were noted as "standards supported within each lesson."

CCSS.ELA-LITERACY.RI.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers. Claimed as supported in Lessons 2, 3, 5, 6, 8, 9, 11, and 12. Evidence was located in all claimed lessons, examples include:

- Lesson 2, Connect Section, Step 3: "Give students time to obtain information about their fruit or vegetable. Display slide I. Explain that you have some infographic texts about different kinds of fruits and vegetables that may help us figure out similarities and differences in their life cycles. Preview with students what kinds of information they will find in these new infographic texts." (Lesson 2, Teacher Guide)
- Lesson 5, Connect Section, Step 2: "Introduce the book, Planting Ideas. Display slide C, and gather students together to read the book aloud. While reading, pause to ask prompts to gather students' ideas for what they notice about how the fruit spread around the world and how people knew where to grow the fruit in the past and present-day." (Lesson 5, Teacher Guide)
- Lesson 8, Connect Section, Step 2: "Read pages 1-8 of the book aloud and discuss prompts. Pause to let students notice and wonder about the images in the book or to think and share their ideas about questions in the book. Use the questions in the book to discuss big ideas about conducting research and how it is used to help design solutions to problems." (Lesson 8, Teacher Guide)

CCSS.ELA-LITERACY.RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. Claimed as explicitly used in Lesson 9. Evidence was located in Lesson 9:

- Lesson 9, Connect Section, Literacy Support sidebar: "Asking and answering questions supports students' comprehension of a text. Students also use the words and images in the text to develop an understanding of the words criteria and constraints and how to define the problem, the criteria, and the constraints prior to designing, building, and testing solutions." (Lesson 9, Teacher Guide)

CCSS-ELA-LITERACY.RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. Claimed as explicitly used in Lessons 3, 5, 9, 10, and 11. Evidence was located in all claimed lessons, examples include:

- Lesson 3, Connect Section, Step 3: "Discuss changing precipitation and water needs. Use the prompts in the table below to facilitate a short discussion about changes in precipitation and the water needs of orange trees over time. If needed, refer back to specific pages in the book." (Lesson 3, Teacher Guide)
- Lesson 9 The book Engineers Design Solutions describes a sequence of events that engineers undertake when conducting research and designing solutions. The book relates this sequence to a cause/effect situation for crops in the school garden.
- Lesson 11 As the class finishes the Engineers Design Solutions book, they read about the last steps in an engineer's sequence of events, and relate the steps to a class' work to decide on the best solution for their school garden crop frost problem.

CCSS-ELA-LITERACY.RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). Claimed as explicitly used in Lessons 2, 4, 8, 9, and 12. Evidence was located in all claimed lessons. Examples include:

- Lesson 2, Connect Section, Step 3: "Distribute a copy of the A Fruit or Vegetable's Life Research Notes handout to each small group and enough copies of the appropriate Plant Life Cycle Infographic Cards for each student in the group to have their own copy. Having only 1 copy of the handout per group is intended to promote student discourse since students will need to discuss and come to a consensus before adding to their group handout." (Lesson 2, Teacher Guide)

- Lesson 8, Explore Section, Step 3: "Give students time to research their weather hazards. Display slide F. Distribute a copy of the Research Notes handout to each student, several copies of the appropriate story from the Weather Hazard Stories handout, and research cards from Weather Hazard Cards to each group." (Lesson 8, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "Introduce the schoolyard flooding task. Share that students are going to think about a new design context for protecting a place from too much rain and flooding. Display slide D. Read aloud Part 1 about Oak Elementary School. Give students a few minutes to work individually on Questions 1 and 2, using the text and bar graph. Then have students turn and talk with a partner about their ideas for those questions before sharing as a whole class." (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. Claimed as explicitly used in Lesson 6. Evidence was located in Lesson 6, examples include:

- Lesson 6, Synthesize Section, Step 4: "Construct an argument together. Gather in a Scientists Circle. Display the chart paper with our question written on top and slide N. Facilitate a Consensus Discussion to draft an argument together." (Lesson 6, Teacher Guide)

CCSS-ELA-LITERACY.W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. Claimed as explicitly used in Lessons 5 and 6. Evidence was located in Lessons 5 and 6, examples include:

- Lesson 6, Synthesize Section, Step 4: "Construct an argument together. Gather in a Scientists Circle. Display the chart paper with our question written on top and slide N. Facilitate a Consensus Discussion to draft an argument together." (Lesson 6, Teacher Guide)

CCSS-ELA-LITERACY.W.3.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. Claimed as explicitly used in Lesson 12. Evidence was located in Lesson 12, examples include:

- Lesson 12, Synthesize Section, Step 3: "Provide peer review and feedback. Display slide G. When students complete their individual work on the assessment, ask students to trade handouts and read each other's ideas. Using Giving and Receiving Feedback ask students to give their 1-2 feedback ideas to their partner. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints." (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.W.3.7 Conduct short research projects that build knowledge about a topic. Claimed as explicitly used in Lesson 8. Evidence was located in Lesson 8, examples include:

- Lesson 8, Explore Section, Step 3: "Explain that you have some resources students suggested we look at: images and facts about different weather hazards, maps of where those hazards occur, and stories from people who have experienced the effects of those weather hazards on their crops." (Lesson 8, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly. Claimed as supported in all Lessons. Evidence was located in all claimed lessons, examples include:

- Lesson 6, Explore Section, Step 2: "Give students time to collect the harvest data for their group. When students finish collecting their data, they can meet back in their groups to start sharing. Display slide F to guide students' small group discussion. It is OK if some groups only get a minute or two to share because they will get to share as a class next." (Lesson 6, Teacher Guide)

- Lesson 10, Synthesize Section, Step 6: "Discuss windbreak design in small groups. Display slide K. Prompt students to examine their results and discuss how well their windbreak met the criteria and constraints. The group should update their Group Windbreak Design sketch with any adjustments they made to the windbreak." (Lesson 10, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.1B Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). Claimed as explicitly used in Lessons 1, 6 and 12. Evidence was located in all claimed lessons, examples include:

- Lesson 1, Synthesize Section, Literacy Supports Callout Box: "Establishing classroom agreements provides an opportunity for students to develop and follow agreed-upon rules for discussion. Students' use of the classroom agreements, specifically as they listen to others with care and speak one at a time about the topics and texts under discussion, allows them to learn pragmatic rules for discussion and how to communicate in large and small group settings. This work supports SL.3.1B." (Lesson 1, Teacher Guide)
- Lesson 12, Navigate Section, Literacy Supports Callout Box: "As we revisit Our Growing Ideas chart together, it is helpful to check in on class agreements and encourage our community to follow the agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). This will support students in practicing agreed-upon rules for discussions and further cultivate a safe community for learning science together. This work supports SL.3.1B." (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 3 Language standards 1 and 3 for specific expectations.) Claimed as explicitly used in Lesson 5. Evidence was located in Lesson 5, examples include:

- Lesson 5, Explore Section, Step 4: "Transition to giving and receiving feedback. Display slide I. Tell students to get into partners to give and receive feedback. Make sure each set of partners has the Tips for Giving and Receiving Feedback handout, folded as a table tent in front of them. The partners will take turns reading their claim aloud to each other and providing feedback for what ideas and evidence are clear, confusing, or could be improved. To support students in giving and receiving peer feedback, first remind them of the classroom agreements: "We look listen and respond to each others' ideas" and "We let our ideas change and grow." (Lesson 5, Teacher Guide)

CCSS-ELA-LITERACY.L.3.1A Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences. Claimed as explicitly used in Lesson 7. Evidence was located in Lesson 7, examples include:

- Lesson 7, Navigate Section, Literacy Supports Callout Box: "Support students in developing new understandings of words by pausing to discuss what forecast means. In the current context, forecast is used as both a verb (The meteorologist forecasts weather.) and as a noun (the forecast from the meteorologist). Remind students that sometimes the same word can have different meanings or uses in different contexts. Prompt students to identify when they are using the word forecast as a verb or a noun and why this usage is appropriate given the current sentence. This discussion supports L.3.1A by giving students practice explaining the function of nouns and verbs in general and their functions in particular sentences." (Lesson 7, Teacher Guide)

CCSS-ELA-LITERACY.L.3.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing. Claimed as explicitly used in Lesson 12. Evidence was located in Lesson 12, examples include:

- Lesson 12, Synthesize Section, Literacy Supports Callout Box: "Encourage students to use clear sentences, illustrations, and appropriate punctuation and capitalization to improve communication of ideas. Use the peer review as an opportunity to strengthen their ideas through revising and editing their writing. (L.3.2)" (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.L.3.4C Use a known root word as a clue to the meaning of an unknown word with the same root (e.g., company, companion). Claimed as explicitly used in Lesson 4. Evidence was located in Lesson 4, examples include:

- Lesson 4, Explore Section, Literacy Supports Callout Box: "Students may use season and seasonal throughout this lesson to describe the temperatures for each season. This is a good opportunity to support them in applying their knowledge of the word "season" to the meaning of a different word with the same root (i.e., seasonal). Ask students questions like, Can we use clues from our understanding of "season" to help us use this new word? (L.3.4.C)" (Lesson 4, Teacher Guide)

CCSS-ELA-LITERACY.L.3.5 Demonstrate understanding of word relationships and nuances in word meanings. Claimed as explicitly used in Lesson 6. Evidence was located in Lesson 6, examples include:

- Lesson 6, Connect Section, Literacy Supports Callout Box: "Students may have everyday understandings of the word argument that do not align with the way that arguments are used in science. While reading the book, take a moment to discuss the nuances of the word argument when used in different contexts (L.3.5). You can also use the book to help students practice word relationships between claim, evidence, and argument." (Lesson 6, Teacher Guide)

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. Claimed in Lessons 7 and 10.

- Lesson 10, Synthesize Section, Step 3: "When students complete their individual work on the assessment, ask students to trade handouts and read each other's ideas. Using Giving and Receiving Feedback ask students to give their 1-2 feedback ideas to their partner. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints. The purpose of giving feedback is to help improve our claims by emphasizing things to look for, such as: Does the claim answer the question? Is it clear? Is there evidence to support the claim? What could make the claim or evidence easier to understand or have more support?"

CCSS.ELA-LITERACY.RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. Claimed in Lesson 9

- Lesson 9, Connect Section, Literacy Support sidebar: "Asking and answering questions supports students' comprehension of a text. Students also use the words and images in the text to develop an understanding of the words criteria and constraints and how to define the problem, the criteria, and the constraints prior to designing, building, and testing solutions."

CCSS-ELA-LITERACY.RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect. Claimed and found in Lessons 3, 5, 9, 10 and 11. Examples include,

- Lesson 3, Connect Section, Literacy Support sidebar: "Students use the images and words in the text to answer questions about how it is possible to grow oranges in California, even though the annual precipitation falls below the water needs of orange trees. This work supports RI.3.3 as students rely on cause and effect language to explain the scientific ideas in the text (i.e., the weather conditions that cause a response from orange growers in California)." Students use ideas of cause and effect when considering watering trees under different conditions.
- Lesson 9 The book Engineers Design Solutions describes a sequence of events that engineers undertake when conducting research and designing solutions. The book relates this sequence to a cause/effect situation for crops in the school garden.
- Lesson 11 As the class finishes the Engineers Design Solutions book, they read about the last steps in an engineer's sequence of events, and relate the steps to a class' work to decide on the best solution for their school garden crop frost problem.

CCSS-ELA-LITERACY.RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). Claimed in lessons 2, 4, 8, 9 and 12. Examples include,

- Lesson 2, Explore Section, Step 2: Students use information from pictures and words in a video clip to describe a tomato's life cycle. "Play the video Tomato Time Lapse. Pause as necessary to help students make sense of what they are observing...Point out the Tomato Growth Observation chart, or use the one on the slide to digitally record observations. Remind students that one way scientists keep track of their observations is through data charts. As you build the chart, use prompts that will help students identify the key stages in plant growth. Try to record students' observations in alignment with the ways they share them (e.g., using their own words, using drawings to capture gestures, using multiple languages with translations, etc.)"
- Lesson 8, Connect Section, Literacy Support sidebar refers to the Engineers Design Solutions read-aloud book: "Students also use the words and images in the text to develop an understanding of the word research and how the research that engineers do connects to the research that they have done and will do in this science unit and other units."
- Lesson 12, Synthesize Section, Step 2: "Share that students are going to think about a new design context for protecting a place from too much rain and flooding. Display slide D. Read aloud Part 1 about Oak Elementary School. Give students a few minutes to work individually on Questions 1 and 2, using the text and bar graph. Then have students turn and talk with a partner about their ideas for those questions before sharing as a whole class." Note that the teacher has a choice between two assessments, and if the Windbreak Design task is chosen instead of Schoolyard Flooding, then this CCSS will not be met in this lesson.

CCSS-ELA-LITERACY.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic. Claimed in Lessons 4, 9, and 11. Evidence found in each lesson. Examples include,

- Lesson 4, Connect, Step 2: Students use pictures, a data table (slide J), and a bar graph (slide K) to compare and contrast temperatures across Michigan's four seasons. (Lesson 4, Teacher Guide)
- Lesson 9, Explore Section, Step 2: "Prompt students to discuss with their group any details they noticed in the video that might improve their Wind and Tree model. As you walk around, listen for groups describing specific details they will add in their revised model or parts that they may clarify from their initial models. If students are unsure of what to change or add to their model, consider playing the video again and ask students to tell you to pause when they notice it looks like the plant is being blown or damaged by the wind." (Lesson 9. Teacher Guide)

CCSS-ELA-LITERACY.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. Claimed in Lesson 6

- Lesson 6 Student Assessment: Where Do All Those Pumpkins Grow? "6. Which claim best answers the question: Where would pumpkin plants grow well and make pumpkins year after year? Ireland is the best place. Mexico is the best place. Egypt is the best place. 7. Write an argument to support your claim. Include evidence and science ideas from Our Growing Ideas chart to make your argument convincing."

CCSS-ELA-LITERACY.W.3.4 With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. Claimed in Lessons 5 and 6.

- Lesson 5, Explore Section, Step 4: "Remind students of claims and evidence. Tell students that they have been practicing making claims and evidence for many lessons. Some of these have been on the Our Growing Ideas chart, and some have been claims predicting what the precipitation or temperature is like in a place. They will use this whole class practice to now practice individually making a claim with evidence. Display slide H. Pass out 1 copy of

the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well. When complete, they will work with a partner to give and receive feedback before revising their claims and evidence." (Lesson 5, Teacher Guide)

- Lesson 6 Students co-develop an argument with the teacher, during which process the organization and development are called out by the teacher. Synthesize step 4: "Facilitate a Consensus Discussion to draft an argument together. Write a claim. Ask the class if it seems like we can get these fruits throughout the whole school year. If students struggle to answer yes, revisit the My Harvest Data charts. Ask a student to propose a claim to answer the question. Listen for something like, We can get these fruits on the school menu all year. Push students to elaborate using the word 'because'. Then, listen for a claim like, We can get these fruits on the school menu all year because they come from different places at different times of year. Add evidence and science ideas. First, focus students on the evidence and science ideas supporting that the fruits come from certain places (i.e., where we get them). Help them connect their ideas to the weather patterns and climate ideas they have figured out. Next, have students focus on the evidence and science ideas supporting that the fruits are only available from these places at certain times. Help students connect to seasonal patterns in weather and life cycles." (Lesson 6, Teacher Guide)

Mathematics

The following are examples of **Mathematics standards** that were noted as "standards supported within each lesson" that the reviewers found some evidence related to the connection of the standard in the lesson.

CCSS-MATH-Practice.MP1 Make sense of problems and persevere in solving them. Claimed as explicitly used in Lesson 3. Evidence was located in Lesson 3. Examples include:

- Lesson 3, Explore Section, Step 2: "Discuss measurement. Explain to students that each sticky note will represent 10 inches of precipitation. Using the Fruit Location card for Michigan, ask students how many sticky notes are needed to represent Michigan's 35 inches of precipitation. Work with the class to count by tens from 0 to 30, placing sticky notes for each 10 inches of precipitation to build a bar of 3 total sticky notes. Ask the class how many more inches of precipitation need to be added to the graph for the Michigan location. When students respond with 5 more inches, remind students that 1 sticky note represents 10 inches of precipitation. Ask students for ideas about how to represent just 5 inches of precipitation using the sticky notes. Listen for students to suggest cutting or folding the sticky note in half to represent 5 inches of precipitation." (Lesson 3, Teacher Guide)

CCSS-MATH-Practice.MP2 Reason abstractly and quantitatively. Claimed as explicitly used in Lessons 3, 4, 8, and 10. Evidence was located in all claimed lessons, examples include:

- Lesson 4, Explore Section, Step 3: "Pass around the thermometer, and let students practice reading it. They can examine the thermometer closely and look at the numbers, tick marks, and other features." (Lesson 4, Teacher Guide)
- Lesson 10, Explore Section, Step 2: "Demonstrate the anemometer. Explain that the anemometer is a tool that measures wind speed. Look back at the criteria and discuss how the tool can help us gather data on the criteria. Demonstrate how placing the anemometer near the plant can gather data for students. Have students consider how they can use this data to see how well each windbreak works for different wind speeds or to reduce the wind speed at the plant." (Lesson 10, Teacher Guide)CCSS-MATH-Practice.MP3 Construct viable arguments and critique the reasoning of others.

CCSS-MATH-Practice.MP2 Reason abstractly and quantitatively. Claimed in Lesson 8, 10. Evidence was found in 8, 10. Examples include:

- Lesson 8, Explore Section, Step 2: Teacher provides research materials on hurricanes/cyclones, frost, blizzards, hailstorms and thunderstorms including wind speed and precipitation rates, what seasons they take place, geographic locations with fruit icons overlaid.
- Lesson 10, Explore Section, Step 4: Students collect data on their prototype testing to track high and low wind speeds, whether the plant falls over, whether fruit stays on the plant, and the criteria/constraints of a successful design.

CCSS-MATH-Practice.MP3 Construct viable arguments and critique the reasoning of others. Claimed in Lesson 3, 4, 5, 6. Evidence was found in lessons 3, 4, 5, 6. Examples include:

- Lesson 3, Synthesize Section, Mathematics callout box: "Students use precipitation data to construct claims about why fruits grow well in certain places. Have students critique the claims of others during class discussion by asking the following questions, "What is similar or different about your claims?" and "What evidence did they use to support their claim?". (MP3)" (Lesson 3, Teacher Guide)
- Lesson 5, Synthesize Section, Callout box "Have students use the provided data on temperature and precipitation to support their claim for the best location to grow their chosen fruit. When giving feedback on their partner's reasoning, have students ensure that their evidence aligns with the needs of the selected fruit." (Lesson 5, Teacher Guide)

CCSS-MATH-Practice.MP4 Model with mathematics. Claimed in Lesson 3, 4, 6. Evidence was found in 3, 4, and 6. Examples include:

- Lesson 3, Explore Section, Step 3: Students study a rain gauge to see how precipitation is measured, Class creates a bar graph from a data table with precipitation numbers across geographic areas (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 4: "When reading temperatures on a thermometer, have students estimate where the red bar falls between marked increments on the scale. Encourage them to use their understanding of the scale to estimate the distance from the red bar to the nearest benchmark temperature value. Students will also use quantitative reasoning to conceptualize higher and lower temperatures as they compare and analyze seasonal temperatures in different locations, Explore Section: Slide K Students create a bar graph to practice looking at temperatures and visualizing data." (Lesson 4, Teacher Guide)

CCSS-MATH-Practice.MP5 Use appropriate tools strategically. Claimed in Lesson 3. Evidence was found in 3. Examples include:

- Lesson 3, Explore Section, Step 3: Students study a rain gauge to see how precipitation is measured, Class creates a bar graph from a data table with precipitation numbers across geographic areas (Lesson 3, Teacher Guide)

CCSS-MATH-Practice.MP6 Attend to precision. Claimed in Lesson 4. Evidence was found in 4. Examples include:

- Lesson 4, Synthesize Section, Step 6: "Ask for volunteers to come up to the graph and locate a season's temperature on the vertical number line on the left side of the graph through pointing (e.g., point to 45°F on the vertical axis for spring). Then, have a student trace a finger from the season's temperature on the vertical axis along the dotted line to construct a bar for the season (e.g., point to 45°F for spring, and then trace a finger along the dotted line until they are above the label for spring). Repeat this process to construct a bar for all 4 seasons or until students feel comfortable with the scaled bar graph." (Lesson 4, Teacher Guide)

CCSS-MATH-Practice.NF.A.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.

- Lesson 3, Explore Section, Mathematics Supports callout box: When discussing how to represent 5 inches of precipitation using the sticky notes, students will develop their understanding of fractions by recognizing that 5 inches equals one-half of 10 inches, requiring them to divide 1 whole (10 inches) into 2 equal parts (5 inches each) (3.NF.A.1)." (Lesson 3, Teacher Guide) "

CCSS-MATH-Practice.MD.B.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in scaled bar graphs. For example, draw a bar graph in which each square in the bar graph might represent 5 pets. Claimed in Lesson 3, 4, 6. Evidence was found in 3, 4, and 6. Examples include:

- Lesson 3, Explore Section, Step 5: The class creates a bar graph from a data table with precipitation numbers across geographic areas (Lesson 3, Teacher Guide)
- Lesson 6, Synthesize Section, Step 6: "Slides G-I Students work in groups to collect harvest data for apples, oranges, and bananas. They color code a chart to represent their data in a table that includes fruit type, geographic location, month, season, and a distinction between those months that are part of the school year and which are in summer." (Lesson 6, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

CATEGORY II

NGSS Instructional Supports

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/when six of the 12 lessons feature a read-aloud book that connects directly to the phenomena presented. There are also videos throughout the unit that showcase the phenomena. The materials include suggestions for how to connect instruction to the students' homes and to the community. These are found in Community Connections sidebars in Lessons 1, 2, 3, 6, and 9. 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.

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

Students watch several videos and read books or text throughout the unit to engage with the phenomena, for example:

- Lesson 2, Explore Section, Step 2: "Tell students that we will watch a timelapse video of a tomato plant growing so we can make observations. Explain that we will watch the video 1 time without stopping and then again to pause and record our observations on our Tomato Growth Observation chart." (Lesson 2, Teacher Guide)
- Lesson 3, Connect Section, Step 3: "Introduce the book, Squeeze the Day: Growing Fruit throughout the Year. Display slide G, and gather students together. Say something like, This book will give us a chance to learn about a community in California that grows oranges and how the farmers get enough water to the orange trees. As you listen to the book, pay attention to information about how the precipitation in California and the water needs of orange trees change." (Lesson 3, Teacher Guide)
- Lesson 5, Connect Section, Step 2: "Introduce the book, Planting Ideas. Display slide C, and gather students together to read the book aloud. While reading, pause to ask prompts to gather students' ideas for what they notice about how the fruit spread around the world and how people knew where to grow the fruit in the past and present-day." (Lesson 5, Teacher Guide)
- Lesson 6, Connect Section, Step 3: "Introduce the book, Scientists Make Arguments. Display slide L, and gather students together. Explain to students that we now have more information to answer our question about how we can have apples, oranges, and bananas on our school menu all year." (Lesson 6, Teacher Guide)
- Lesson 7, Explore Section, Step 3: "Watch Storm Time: Banana Trees showing banana plants during a storm. The video is short, so replay several times. After making observations, ask students to turn and talk about their noticings and wonderings with a partner. Then, elicit 3-4 (or more) noticings and wonderings aloud. Record them on a class Notice and Wonder chart. Explain that this first video is during the storm, but ask students to predict what the banana plants may be like after the storm." (Lesson 7, Teacher Guide)

- Lesson 8, Connect Section, Step 2: "Introduce the Engineers Design Solutions book. Show slide B. Set the purpose for reading the book by explaining to students that conducting research to gather more information is one of the first things engineers usually do to solve a problem, and we can discover more about conducting research from this book." (Lesson 8, Teacher Guide)
- Lesson 9, Connect Section, Step 6: " Recall that they did research to find out more about wind, which then helped them to develop a model. Remind students that since we want to engineer a solution to this problem, we want to be sure we are doing things the way engineers do. Remind them that we have a book that tells us about how engineers design solutions. Tell students that as we read, they might notice steps they have already taken to help solve a problem. Read pages 9-13 using prompts to elicit student ideas." (Lesson 9, Teacher Guide)
- Lesson 10, Explore Section, Step 3: "Test windbreaks. To test each windbreak, display slide H and review the testing procedures and how to record the results on the Our Windbreak Test Results handout in Step 2. Remind students of how they recorded the no windbreak setup in Step 1. Provide an opportunity to improve the design. After students have done the first test of their design, provide an opportunity for students to make adjustments to their designs and test a second time so they can improve their designs based on the results during the first test. If they test an improved design, they will need to collect the data on a new handout. Additionally, if some groups finish early, direct them to begin reflecting on their process using Step 3 of their handout." (Lesson 10, Teacher Guide)

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

Suggestions for connections are featured in lessons throughout the unit, for example:

- Lesson 1, Connect Section, Step 1: "Introduce community connection. Move this slide to the end of your first class period on this unit. When ready, display slide D and distribute 1 copy of What is Your Favorite Fruit or Vegetable? Community Connection to each student. Ask students to talk with a trusted grown-up (adult or older sibling) about their favorite fruit or vegetable to eat, why it is important to them, and what time of year they are able to eat it fresh or if we can get it all the time. They should record ideas on their handout and bring them back to class." (Lesson 1, Teacher Guide)
- Lesson 2, Connect Section, Community Connection Callout Box: "Bringing members of the community--who are approved to volunteer at the school--into the classroom can help connect students' at-home and in-school communities in ways that build science identities, relevance, and value. Consider inviting community members with gardening or farming experience (e.g., family members of students, volunteers from a local community garden, etc.) into the classroom, either in person or online, to share their expertise and support students in noticing patterns of life cycle stages across different fruits and vegetables." (Lesson 2, Teacher Guide)
- Lesson 3, Explore Section, Step 2: "This book provides a good opportunity to connect to the local community if apples, bananas, or oranges grow nearby or if there are other important crops that grow nearby that students have experience with. Consider modifying this activity to also draw upon these local experiences with fruits or other crops, focusing on what they need to grow and how the precipitation in a place and plant needs might change throughout the year." (Lesson 3, Teacher Guide)
- Lesson 4, Connect Section, Broadening Access Callout: "Images provide a way for students to connect with personal experience and describe what they notice in their own words. When showing images of fruit-growing places, give students ample opportunity to share experiences in similar places or with similar apparent temperatures, and use personal or family language to describe those places and experiences." (Lesson 4, Teacher Guide)
- Lesson 5, Navigate Section, Community Connection Callout Box: "If students in your classroom have experiences with planting different fruits or vegetables or other plants, leverage this experience now, and ask them how they know that plant might grow well where they live? What do they have to think about?" (Lesson 5, Teacher Guide)

- Lesson 12, Navigate Section, Step 4, Community Connections Callout: "Inviting students to reflect on how they might share their learning with others outside the classroom can support students in seeing their in-school science experiences as valuable ways of knowing the world that have meaning in their out-of-school lives and communities." (Lesson 12, Teacher Guide)

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.

Students are provided opportunities to connect their explanation of a phenomenon to their own experiences, for example:

- Lesson 2, Synthesize Section, Step 4: "Restate that we are wondering if other fruits and vegetables, though very different, may grow in the same way and share some of the same life stages experienced by tomatoes." (Lesson 2, Teacher Guide)
- Lesson 5, Explore Section, Step 4: "Pass out 1 copy of the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well. When complete, they will work with a partner to give and receive feedback before revising their claims and evidence." (Lesson 5, Teacher Guide)
- Lesson 6, Navigate Section, Step 6: "Say something like, We have been talking about how to know where to grow all these plants so that they produce fruit over long periods. We have been focused on typical weather and climate conditions. But does the weather always stay the same?" This question is not brought up by students but forms the basis for the anchoring phenomenon for Lessons 7-12.
- Lesson 7, Explore Section, Community Connection Callout Box: "Use this discussion to make connections to students' experiences and interests to motivate their next steps in designing solutions to protect plants. Use examples of not being able to get our favorite fruits and vegetables as a way for students to consider wanting to protect those plants from hazardous weather." (Lesson 7, Teacher Guide)
- Lesson 9, Connect Section, Step 4: "Discuss examples of everyday windbreaks. Explain that when they do research, engineers are always looking for as many ideas as they can find to solve a problem, so we will want to think about wind in our own lives, not just wind on farms. Ask students to raise their hand if they have ever experienced a windy day, then ask them to talk with a partner about anything they did or used to protect themselves from the wind." (Lesson 9, Teacher Guide)
- Lesson 12, Navigate Section, Community Connection Callout Box: "Inviting students to reflect on how they might share their learning with others outside the classroom can support students in seeing their in-school science experiences as valuable ways of knowing the world that have meaning in their out-of-school lives and communities." (Lesson 12, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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 provide students opportunities to provide peer feedback and to receive and reflect on feedback related to their thinking and reasoning. The materials provide opportunities for student ideas to be justified, clarified, and built upon. Artifacts do show evidence of students' reasoning and changes in their thinking over time. There are some teacher-to-student and peer-to-peer feedback loops to help students justify or build upon their ideas and to support students in reflecting on others' ideas, or for students' changing their own ideas.

Students justify their ideas as they support claims with evidence. Teachers are given support in eliciting students' ideas through multiple modalities via discussion prompts embedded in lesson plans, in Following Student Sensemaking documents, and Teacher assessment Tools provided for summative assessments. For example,

- Lesson 2, Explore Section, Step 2: "The plant continued to get bigger and bigger (moving hands apart to show size). It got more leaves and the leaves got bigger. The leaves got a new shape. The plant got so tall that it needed support. The person took some plants away so that only 1 plant was left. When did this happen? Who agrees? Who disagrees? How do you know?" (Lesson 2, Teacher Guide)
- Lesson 4, Explore Section, Step 4, Broadening Access Callout: "This activity will produce a lot of graphs, and students will compare and sort these graphs to notice patterns. Some students may make errors as they complete their graphs. Give small groups the space to discover these irregularities on their own, and have extra Seasonal Temperature Graph handouts available in case a student wants to re-do their work. Welcome these observations as an opportunity to unpack how we notice errors and whether the pattern is still visible even though some of the graphs are not perfect (rather than trying to correct everything.) Also, emphasize that in science, we check each other's work as a good practice to catch any errors, which all people make sometimes." (Lesson 4, Teacher Guide)
- Lesson 9, Navigate, Step 1, Teaching Tip: "So students may more easily recall their ideas from previous lessons, it helps to provide them with visual cues. Display the Initial Design Ideas chart from Lesson 7, students can identify which of their earlier ideas might apply to protecting plants from strong winds. Also, by recalling the final navigation conversation from Lesson 8, students will remember that a successful windbreak should protect the plant and fruits from strong, damaging wind." (Lesson 9, Teacher Guide)
- Lesson 12 Teacher Assessment Tool Scoring Guide Choosing a Windbreak Design: "What to do/feedback: Encourage student to use the Windbreak Testing Lab from Lesson 10 and the Evaluating Design Solutions chart from Lesson 11 to find additional ways in which the design solution meets the farmer's criteria and/or constraints."

The Growing Ideas Chart is an artifact that is used to track the whole class's reasoning and changes in their thinking over time. It is used several times throughout the unit. While the information on this comes from the students, they create this as a whole group; therefore, the teacher may not know if individual students' thinking changes over time. For example:

- Lesson 3, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Share slide L, and work together as a class to make a claim to add to Our Growing Ideas chart. Remind students that a claim is an answer to a question that, in science, we support with evidence." (Lesson 3, Teacher Guide)
- Lesson 5, Synthesize Section, Step 3: "Update our Growing Ideas. Display slide F. Using a Consensus Discussion, synthesize what the class has figured out about climate and the expected temperature and precipitation conditions in a place, and why this information is important for growing fruit and vegetable plants. Remind students that they

have figured out a lot about the needs of apples, oranges, and bananas, and where they grow well. Remind students of Lesson 2, and ask them if all plants need the same things? (No!) Use the Fruit Plant Needs table to remind students of the specific needs for apples, oranges, and bananas." (Lesson 5, Teacher Guide)

- Lesson 8, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Display slide K. Remain in the Scientists Circle to continue the Consensus Discussion. Ask students if they can now make a claim for their lesson question, How can weather hazards affect plants? Write the lesson question on the chart, and then let students share some ideas about claims they can make." (Lesson 8, Teacher Guide)

The Following Student Sensemaking Tool for Lessons 3-6 and 8-11 is provided for teachers to track each student's thinking over time.

- Lesson 3, Synthesize Section, Step 4: "These questions can help students notice similarities and differences in patterns between fruit-growing locations. Refer to the Following Student Sensemaking (Lessons 3-6) tool and the Assessment Guidance at the beginning of the lesson." (Lesson 3, Teacher Guide)
- Lesson 8, Explore Section, Step 3: "Formative assessment: Students working in small groups to research their hazard is an opportunity to assess Learning Goal 8. Review students' notes on the Research Notes handout, referring to the Following Student Sensemaking (Lessons 8-11) tool." (Lesson 8, Teacher Guide)

Students receive constructive feedback from both the teacher and peers. The Assessment Guide document calls out lessons 5 and 12 as opportunities for peer feedback to occur. For example,

- Lesson 5, Explore Section, Step 4: "Peer feedback: Students' use of slides I-K and the Tips for Giving and Receiving Feedback handout provides an opportunity for them to review their partner's claim with the purpose of providing feedback that supports their partner in improving their claim by making it more clear or including additional evidence to support the claim. Students will have an opportunity to use the feedback to revise their claims for where they might start a farm." (Lesson 5, Teacher Guide)
- Lesson 12, Synthesize Section, Step 3: "Peer feedback: Students' use of slide G and the Giving and Receiving Feedback handout provides an opportunity for them to review their partner's claim with the purpose of providing feedback that supports their partner in improving their argument for a solution. Remind students that all solutions are possible, but it is important that the argument consider the criteria and constraints. Students will have an opportunity to use the feedback to revise their arguments. Encourage students to record the revisions of their argument in a separate color or on a separate sheet of paper so that you can see what changes they made as a result of the feedback. While students are providing feedback, circulate among the partners and provide teacher feedback on the quality of the feedback that is being provided. " (Lesson 12, Teacher Guide)

The Lesson Assessment Guidance in each Teacher Guide offers suggestions on how to act on assessment information and often includes individual feedback suggestions. Again, while the students are creating artifacts, many of them are created by the group; therefore, teachers may not know if individual students are struggling, which would affect the type of feedback provided. For example,

- Lesson 4, Explore Section, Step 4: "Formative assessment: Small group graph-making provides the first opportunity to gather evidence about Learning Goal 4. with the purpose of providing feedback and supporting students in representing data sets on graphs to reveal patterns." (Lesson 4, Teacher Guide) This is an example where the teacher provides feedback to a small group.
- Lesson 6, Synthesize Section, Step 5: "Summative assessment: Students' individual data analysis work and arguments on Where do all those pumpkins grow? provide an opportunity to gather evidence about learning goal 6. The purpose is to summatively assess students' analysis and interpretation of typical rainfall and temperature data for a play and

at certain times of year. This assessment is an opportunity for formative feedback on engaging in arguments from evidence. Have the Scoring Guide for Pumpkin Transfer Task tool handy to provide in-the-moment support and feedback to students. Refer to the Assessment Guidance at the beginning of the lesson" (Lesson 6, Teacher Guide)

- Lesson 9, Explore Section, Step 2: "Formative Assessment: Developing and revising models provides students the opportunity to consider ideas in their models and in other models, This is the first opportunity to assess Learning Goal 9 with the purpose of providing feedback to students to improve their windbreak models. Focus on whether students are identifying the components and interactions when developing models. As part of this system, look for students to include a representation of a strong wind, to show what is happening to the plant (either bending, breaking, or being pushed over), and to show fruits either falling from the tree or on the ground. Refer to the Assessment Guidance at the beginning of the lesson." (Lesson 9, Teacher Guide) This is an example of the teacher providing feedback to the group.
- Lesson 10, Synthesize Section, Step 6: "Formative assessment: This is your assessment moment for Learning Goal 10 with the purpose of providing feedback and supporting students in comparing designs they have generated against the agreed-upon criteria. Listen for students comparing their design against the criteria and constraints and also comparing their design against the no windbreak results. Support students in looking at how their design compares to the no windbreak results for each of the three criteria (e.g., Did your design reduce the wobble of the trees? Did more fruits stay on the tree when using the windbreak? Was the wind speed less?)." (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement

- Consider more individual student artifacts to show changes in student ideas about how fruit is available year-round.

II.C. Building Progressions

ADEQUATE

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 adequate evidence that the materials identify and build upon students' prior learning in all three dimensions because the materials do identify expected prior learning for some of the featured three dimensions, though it is not at the element level. The supports to teachers explain how some prior learning will be built upon in all three dimensions. The materials do provide limited support to teachers to clarify adult understanding of the potential alternate conceptions that they, or their students, may have during the unit.

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

The materials contain the Weather and Hazards Unit Front Matter document that features a section titled, "What ideas and experiences will my students bring that can help them in this unit". It contains the expected learning students will come to third grade with three DCI concepts, two SEPs, and two CCCs. There is guidance about what a teacher should expect the students to be upon arrival, and how to move students further in their use of the Practices, CCCs, and DCIs. This information addresses the three dimensions but does not provide information about expected prior learning at the elements level.

Disciplinary Core Ideas:

- Weather and Climate (ESS2.D): "In kindergarten, students learn about their local weather patterns, including an understanding that weather involves sunlight, clouds, wind, rain or snow, and temperature. They also learn about recording patterns in weather and forecasting. In this scope and sequence, these ideas are built during the Unit K.2: How can we be prepared for the weather? and can be leveraged throughout the unit."
- Growth and Development of Organisms (LS1.B) The Front Matter describes that students may have widely varying experiences seeing how food is grown. However, it does not describe the prior learning that students are expected to have.
- Natural Hazards (ESS3.B): "In kindergarten, students learn about some kinds of severe weather and that this weather may be more likely to occur in some places compared to other places. They may have explored the kinds of severe weather in their community. Students also learn that scientists forecast severe weather to help people prepare for it and respond when it happens. In this scope and sequence, these ideas are built during the Weather Unit and can be leveraged throughout the unit."
- Defining and Delimiting Engineering Problems (ETS1.A): "Students will have engaged in engineering design tasks before they begin third grade. Likewise, the first unit for 3rd grade in the scope and sequence (Unit 3.1: How can we design objects to balance and move in different ways?) also emphasizes engineering design. Students will have experiences defining a problem before they engage in creating solutions...From the Unit 3.1: How can we design objects to balance and move in different ways? they will also have an early understanding of the terms criteria and constraints."

Science and Engineering Practices:

- Constructing Explanations and Designing Solutions (CEDS-E2, CEDS-E5): "Students will have engaged in engineering design tasks before they begin third grade. Likewise, the first unit for 3rd grade in the scope and sequence (Unit 3.1: How can we design objects to balance and move in different ways?) also emphasizes engineering design. Students will have experiences defining a problem before they engage in creating solutions. They also will likely have experience sketching designs for solutions, creating physical models, and testing a variety of design options to see what solution works best."
- Analyzing and Interpreting Data (DATA-E1, DATA-E2, DATA-E3): "Throughout K-2 science learning, students will have recorded observational data and made simple data sets from tests they conducted in their science classrooms. They will also be skilled in comparing outcomes to their predictions. Students will know the difference between qualitative and quantitative data, they will have characterized data using numbers and they will have worked with simple graphs."
- Engaging in Argument from Evidence (ARG-E3, ARG-E4, ARG-E6): "In K-2, students will have made claims and supported claims with evidence. They may know that a claim answers a scientific question and that it needs to account for and be supported by evidence. Students may also have prior experiences distinguishing between their opinions versus an evidence-based explanation. Some of the students' experiences with developing arguments may arise from their prior learning in language arts, and therefore, could be useful to make connections across the disciplines."
- Obtaining, Evaluating, and Communicating Information (INFO-E1, INFO-E3, INFO-E4) The materials do not identify the expected student prior learning.

Crosscutting Concepts:

- Patterns (PAT-E1, PAT-E2, PAT-E3): "In K-2, students develop their initial experiences of observing patterns in natural phenomena, describing patterns, and using patterns as evidence. Students will bring the understanding that patterns are something that happens over and over again...It is important to recognize that students may bring varying strengths in different pattern recognition. For example, some students may have stronger spatial pattern recognition, while other students may have stronger mathematical or geometric pattern recognition."
- Cause and Effect (CE-E1): "Throughout K-2 and in the Unit 3.1: How can we design objects to balance and move in different ways? students will have developed ideas about cause and effect relationships arising from observable patterns and being useful for determining relationships."

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

This information is also found in the Unit 3.2, Weather and Hazards Front Matter. While some of the DCIs, CCCs, and SEPs have descriptions of how prior learning will be built upon, they are not provided for all focal DCIs and SEPs. For example,

Disciplinary Core Ideas:

- Weather and Climate (ESS2.D): Unit 3.2 Weather And Hazards About the Science spells out in a paragraph how student learning will build toward this DCI. For example, "Reinforce with students ideas from kindergarten that weather varies each day and seasonally throughout the year, and that weather is the conditions of the atmosphere at a given place and time, which includes the temperature, rain or snow, cloudiness, and wind, for example. In 3rd grade, you will support students in developing new ideas about weather patterns over months to years and that long-term patterns over many years result in climate. Climate is the long-term weather patterns in a place and varies based on several factors. The climate depends on latitude, topography, proximity to a large body of water, and altitude, for example. While students will not investigate these factors influencing climate until middle school, you will work with students to notice patterns in temperature and precipitation in places over the course of one year, and over many years that allow us to understand different climate regions around the world."
- Growth and Development of Organisms (LS1.B): Since prior learning is not described, the materials cannot explain how it will be built upon.
- Natural Hazards (ESS3.B): Lesson 3.2 Weather And Hazards About the Science: "Reinforce from kindergarten that weather can be severe, and it's important to be able to predict severe weather so people can prepare for it. The focus in 3rd grade is not on explaining mechanisms behind the severe weather, but rather that these events occur naturally and people can engineer designs to minimize their impacts. Students will start by researching severe weather to understand where different kinds of severe weather are likely to occur and what fruits they may impact. After research, students transition to designing and testing engineering solutions for one common element of most severe weather - strong wind. Students will define the problem that wind can damage crops. They will then design, build, and test various windbreak designs and compare them in terms of benefits and drawbacks when used to protect fruit crops. The focus in this part of the unit is on minimizing impacts from hazardous weather using windbreak designs as an example in the anchoring phenomenon context."
- Defining and Delimiting Engineering Problems (ETS1.A): Unit 3.2 Weather And Hazards Front Matter "Use these experiences to reinforce defining problems, generating shared criteria and constraints, and adding new ideas about conducting fair tests to generate reliable data for comparison across designs."
- Developing Possible Solutions (ETS1.B): "Use these experiences to reinforce defining problems, generating shared criteria and constraints, and adding new ideas about conducting fair tests to generate reliable data for comparison across designs."

Science and Engineering Practices:

- Analyzing and Interpreting Data: Unit 3.2 Weather and Hazards About the Science: " In 3rd grade, these representations should be limited to pictographs, bar graphs, and pie charts. While temperature is often represented using line graphs, this unit represents data using bar graphs, with seasons as the categorical data. Third-grade students will not have worked with averages yet, so the data used by students is called "typical" temperatures for each season. Average monthly data for the unit was gathered from a location within a fruit-growing region and then averaged across three-months to develop a "typical" seasonal temperature. This is a simplified way to examine seasonal patterns in temperature while remaining within 3rd-grade math levels. Further, these average seasonal temperatures are rounded to the nearest 5 or 10°F to support students in constructing the scaled bar graphs. Precipitation data is typically represented in bar graphs, which is the representation used in this unit, and the representation that students encounter in the assessments. Precipitation data is also rounded to the nearest 5 inches to support students' construction of the Precipitation Graph in Lesson 3."
- Constructing Explanations and Designing Solutions: "In the second half of the unit, students focus on generating and comparing multiple possible design solutions to protect plants from high winds. After researching the problem in Lesson 8, students generate models in Lesson 9 to conceptually show how wind affects fruit plants and how three possible windbreak designs would protect the plants. In Lesson 10, they build and test the different windbreaks, gathering data on how well the windbreaks worked to protect the plants. They also collect data on the design solutions in terms of the constraints they had in designing them (e.g., time, materials, and cost)."
- Engaging in Arguments from Evidence: "Throughout the unit, students develop the practice of arguing from evidence by making initial claims, working on whole-class claims using evidence, and working toward constructing full arguments with peer feedback. In Lesson 1, students work on an initial claim of how they can get fruits all year. They investigate these ideas in Lessons 2-5 and practice making whole-class claims on the Our Growing Ideas chart, which are supported with evidence gathered during the lessons. In Lesson 5, they write a claim using evidence and give and receive feedback on that claim. In Lesson 6, they write, as a whole class, a full argument for how they can get fruits all year." The materials do not identify how prior learning will be built upon within this Practice.
- Obtaining, Evaluating and Communicating Information: "Throughout the unit, students obtain and combine information from varied sources, such as books, infographics, research cards, articles, graphs, images and videos, and maps. Students gather the information either as a whole class or in small groups, and they work together to make sense of it to create a graphic display of data, a model, a shared claim, or to design a solution to a problem. In Lesson 2, students work in small groups to obtain information from grade-appropriate Plant Life Cycle cards. Working as a class, they create a shared representation of the information to make sense of patterns. In Lessons 3-5, students obtain information from a variety of text and visual media to develop ideas about weather patterns and climate around the world." Prior learning is not described, therefore materials cannot explain how it will be built upon.

Crosscutting Concepts:

- Patterns (PAT-E1, PAT-E2, PAT-E3): "This unit emphasizes patterns in temporal, graphical, and spatial data and students may need more or less support based on the type of pattern they are using to sort and classify phenomena."
- Cause and Effect (CE-E1): "Use these ideas to support students as they design fair tests and evaluate windbreak designs."

The About the Science Document identifies science ideas that students will encounter in the unit. This document also provides resources and links to build their science understandings of concepts in the unit. It is implied that this information will support teachers in clarifying adults' understanding of the potential alternate conceptions that they or their students may have while building toward students' three-dimensional learning.

- About the Science, "These are parts of the plant that we eat, but are not used for reproduction. However, students (and most adults!) may commonly think that peas are a vegetable and would call them that. Scientifically, peas are classified as a fruit. Tomatoes are a fruit, but are still shown as a vegetable on the USDA food pyramid, which is a common visual that many students will see at some point. It is not important to distinguish this idea for students in 3rd grade. Rather, use students' common understandings to emphasize that plants make fruits and vegetables as part of their life cycle. Emphasize for students that for this unit, we are focused on the kinds of fruits and vegetables that typically have seeds in them." (About the Science). Though this does identify a common misconception that peas and tomatoes are vegetables, though they are classified as fruit, additional explicit guidance for teachers about this misconception is not provided in the links or resources for adults.
- The About the Science document does not list potential student or adult alternative conceptions about weather, climate, and natural hazards.

Criterion-Based Suggestions for Improvement

- Ensure "[t]he materials explicitly state the expected level of prior proficiency students should have with individual elements of all three dimensions for the core learning of the materials." [Detailed Guidance, p. 24]
- Ensure "[a]progression of learning toward the targeted elements of all three dimensions is clearly described for teachers for each section of the materials." [Detailed Guidance, p. 25]
- Ensure "[e]xplicit support is provided to teachers to clarify adult understanding of the potential alternate conceptions that they, or their students, may have while building toward students' three-dimensional learning, along with guidance for how to help students negotiate their understandings [vs. telling students they are wrong]." [Detailed Guidance, p. 25]

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 students' three-dimensional learning.

There is a Unit 3.2 Weather and Hazards About the Science document that includes "What Are The Boundaries Of The Science Ideas For Students In This Unit? (3.2 Weather & Hazards About the Science)

Where language is simplified for the students' level, this is carefully explained for the teacher. For example,

- Lesson 1 Preparation Checklist: "Important lesson guidance: Throughout this unit, "fruits and vegetables" are used in everyday language for students as different foods we eat. In science, there are specific categories of what constitutes a fruit and what is a vegetable. There are also ways that different types of plants are categorized based on how they reproduce. Knowing these categories is out-of-grade-band for 3rd grade and not necessary for the learning goals of this unit."
- Lesson 2, Connect Section, Broadening Access sidebar: "To remove unnecessary language demands, each fruit or vegetable will be referred to by its colloquial name (e.g., banana instead of cavendish banana). This can be true in both conversation as well as sticky note labels. However, a lot of variation exists between different types of the same fruit and vegetables. For example, cavendish bananas (the ones we typically find in the grocery store) are very different from red bananas. To ensure scientific accuracy, the information presented on the infographics is specific to 1 type of the fruit or vegetable. You can see the specific type in smaller text on the infographic cards and on class charts." (Lesson 2, Teacher Guide)
- Lesson 4 Explore Section, Teaching Tip sidebars: "If students bring up ideas about some days being colder or hotter during a season (or days/nights being hotter and colder), that is OK. Tell them that is an important observation, and they will learn more in 5th grade about how scientists take all the temperatures across a season and come up with a typical temperature...If students notice a pattern of all the temperatures ending in 0 or 5, it would be a good opportunity to highlight how scientists sometimes round data to make it easier to model the data and notice patterns." (Lesson 4)

Criterion-Based Suggestions for Improvement: N/A

II.E. Differentiated Instruction

EXTENSIVE

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 extensive evidence of guidance for teachers to support differentiated instruction. The materials provided guidance for teachers to support multiple modality expressions and multiple means of engagement. Detailed guidance and support that all teachers would recognize for multilingual learners—including students who are learning English, who read well below grade level, or who have already met the performance expectations—are also included in the materials.

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.

The materials provide information for teachers to support students of different levels in learning and engaging with the content. For example,

- The Weather and Hazards Unit Front Matter document contains a section titled, "What unit-specific strategies are important for supporting equitable science learning in this unit?" that explains the design of the OpenSciEd Units and the use of the Universal Design for Learning.
- The Teacher Handbook also contains UDL and differentiation supports, including: "Building an equitable classroom culture for science, Integrating literacy (has support for readers and writers and word development), Using math to support science sensemaking, Incorporating trauma-informed approaches, University Design for Learning (UDL), and Supporting multilingual students."
- The Additional Accessibility Resources document contains additional strategies and resources for teachers to access if needed. One strategy included states: "Utilize Descriptive Transcripts, Alt Text, and Closed Captioning. All OpenSciEd elementary materials (except field test version) have descriptive transcripts, alt text, and closed captioning for video and image files. This is a good resource to provide alternate options for students to engage in learning from a video or image. If utilizing a screen reader technology, it should read aloud the alt text of an image in line with the text on the page. When viewing a video, you may need to enable closed captioning. Finally, descriptive transcripts are provided for each video, which gives both a narrative account from the video, with visual and auditory descriptions of what is happening during the video."
- Kinesthetic learning opportunities are found in several lessons in the Broadening Access sidebars. For example, Lesson 8, Explore step 3, Broadening Access sidebar: "To support all students in accessing and understanding wind speed information, invite students to use their bodies to imitate how trees might look or feel in each wind speed category (and model doing so yourself). For example, you might hold your arms out and stay very still for 0-3 mph, then gently move your arms and wiggle your fingers for 4-24 mph, and so on. In addition to providing multiple representations of the wind speed information, this can serve as a helpful movement break for students."

- Teachers are reminded of the different modes students might use to express themselves, in the "Following Student Sensemaking" documents for lessons 3-6 and 8-11. Both documents include a column for the teacher to record "Notes about what students say, write, draw, gesture, do", as well as a "Possible Evidence of Student Sensemaking" section which reminds teachers: "Remember students are often using multiple means of communication to express their sensemaking. Recall that what you aim to identify here is the extent to which students are figuring out and demonstrating an understanding of the focal performance assessment across lessons. In this space, it is important that you identify evidence of this understanding, regardless of how students express their ideas. Use the following ideas below as evidence that students have a secure grasp of the assessment statement... Students might say... Students might gesture/manipulate..."

Differentiation strategies address the needs of students when an obvious need arises: Emerging multilingual students learning English

- Lesson 3, Synthesize Section, Step 4: "It is important to organize activities in ways that support student engagement by emphasizing socially safe activity structures (e.g., small-group or partner work before a whole-class discussion). This can be especially beneficial for multilingual learners, but provides an opportunity for all learners to review their developing ideas and share with peers before going public with the whole class. This can promote confidence, which ultimately optimizes motivation to engage in whole class discussions. It may be helpful to insert a partner or small-group talk prior to the whole-group discussion about claims later in the lesson as well." (Lesson 3, Teacher Guide)
- Lesson 6, Connect Section, Broadening Access sidebar: "You can support all students, particularly multilingual students, in forming a deeper understanding of newly encountered vocabulary by connecting it to what they have already done in previous lessons (e.g., point out how students made arguments when they chose where to start a farm) and by representing it in multiple ways. For example, you can (1) write the term, (2) draw or discuss how students might draw a representation of the term, (3) use gestures or act out the term, and (4) have students explain the term in their own words. You can also ask students to translate these words into other languages they speak and to look for cognates." (Lesson 6, Teacher Guide)
- Lesson 9, Explore Section, Broadening Access sidebar: "Encourage multilingual learners to add words and labels to their models in the language that they are most comfortable with. Encourage all students to add words and labels in another language to the parts of their model that show similar ideas. Provide opportunities in the gallery tour for multilingual learners to visit or travel with each other, if possible." (Lesson 9, Teacher Guide)

Learners with special needs (visual impairments, tactile engagement, etc.)

- Lesson 2, Connect Section, Broadening Access Callout Box: "To remove a barrier for students who have a color vision deficiency, make sure to refer to plants by the fruit name (e.g., strawberry) and not the color of the sticky note (e.g., pink). Doing so ensures that all students have access to the data being analyzed as the class discusses observations and patterns." (Lesson 2, Teacher Guide)
- Lesson 4, Explore Section, Broadening Access Callout Box: "The color bar on the side of the graph is provided as an additional support for students to consider cold - cool - warm - hot temperatures (blue - green - yellow - red). It may be helpful for some students to associate colors with what it feels like outside, such as red indicating "hot" temperatures and blue indicating "cold" temperatures. For some students, adding an icon, such as emojis or types of clothing, is also helpful for them to distinguish between hot and cold temperatures." (Lesson 4, Teacher Guide)

Learners reading below grade level, for example:

- Lesson 2, Connect Section, Broadening Access Callout Box: "In order to accommodate different processing speeds and language proficiency, provide time for each student to preview the infographic card on their own before sharing/listening to other ideas. By encouraging individual process time to make sense of the layout, students are more likely to generate some ideas that can be added to the group's conversation." (Lesson 2, Teacher Guide)
- Lesson 8, Explore Section, Broadening Access Callout Box: "As students read together in their small groups, provide support strategies, such as: Encourage students to take turns reading a paragraph out loud. Have all group members read aloud at the same time in quiet voices. Have one group member read aloud while everyone else follows along with their finger, pausing at the end of each paragraph to talk with each other (in any language) about what happened in the story. As they read, pause to talk about any unfamiliar words or phrases. Also, consider providing digital copies and text-to-speech tools, as appropriate." (Lesson 8, Teacher Guide)

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

The materials explicitly clarify how they anticipate the needs of students who might struggle with any of the three dimensions in the assessment portion of the lesson. For example,

- Lesson 3, Assessment Guidance: "If a student needs extra support in developing a bar graph, consider using manipulatives, such as cubes to provide them a way to represent 5 inches in precipitation. The student could stack the cubes until they get to a total amount. To support comparing data across locations, have a student point to the place that gets the most and least precipitation each year. Ask something like, What fruit grows there? Do other places that grow that fruit get a lot of precipitation or not very much? Show me on the graph." (Lesson 3, Teacher Guide)
- Lesson 5, Assessment Guidance: "If a student struggles to decide on a location, encourage them to eliminate possible locations first by eliminating places that do not match the plant's temperature or precipitation needs. Additionally, the student could highlight places that match the precipitation needs (in blue) and temperature needs (in yellow) and then find which place has both blue and yellow highlighting." (Lesson 5, Teacher Guide)
- Lesson 10, Connect Section, Assessment Opportunity: "Check in with students who report that they might need some additional support, particularly if they need support considering how well the designs met the criteria for success. To support them, ask questions such as: How well did ___ design prevent fruit falling off the tree? Was it better than having no windbreak at all? Why do you think so? Did the tree stay upright? If not, how much wind did it take for it to fall over? If many students need support, revisit the book, Weather Hazard Cards as needed to use it as an example for what the students are carrying out in the classroom. Ask, How did students in this book test their ideas? What data did they collect to see if their designs were successful?" (Lesson 10, Teacher Guide)

The "How Can I Use This Assessment Information?" section in the Lesson Assessment Guidance for each lesson includes tips to help students who are struggling to meet expectations. For example:

- Lesson 4, Assessment Guidance: "When comparing graphs across many locations, ask questions, such as: How is your place similar to ____ (other place)? How is it different? Does your place get colder in the winter? Warmer in the summer? For a student who might need extra support describing the temperature, use the colors and words in the right-side scale to describe what the temperature might feel like in a place during a particular season and how that might change from season to season. The student can also write the words above each bar." (Lesson 4, Teacher Guide)
- Lesson 11, Assessment Guidance: "If a student needs more support communicating about possible solutions, use the prompts provided in the lesson to help them consider additional constraints. As needed based on the formative insights you gain in this discussion, highlight that choosing the "best" solution is context-specific and timebound. In Lesson 12, students will consider a design solution for a farmer with limited money and time." (Lesson 11, Teacher Guide)

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.

Extension opportunities are embedded in several of the lessons, for example:

- Lesson 2 Connect step 3 Teaching Tip sidebar: "Extension Opportunity: Students may be curious to watch a seed grow into a plant and track the life stages as it does so. Use the extension opportunity provided in the Seed Germination Extension reference to germinate seeds in the classroom and track a plant's growth through some of its life stages. Students can observe and track plant growth and possibly reproduction, depending on how long the plant is grown in the classroom." (Lesson 2, Teacher Guide)
- Lesson 5 Explore step 3 Teaching Tip sidebar: "Extension Opportunities: On the handout, there is a short extension question provided for students to explain why another location is not well suited for growing their chosen fruit. Challenge students to investigate their own community's climate data to see what fruits from the list could grow well in their community and which would not. Have them explain why. Have students choose a climate that might be difficult to grow fruits and vegetables, such as a cold climate or a very dry place. Have them research what kinds of plants would grow there instead of the fruits we have been working with (e.g., cacti in dry, desert climates)." (Lesson 5, Teacher Guide)
- Lesson 7 Navigate step 1 Community Connections sidebar: "Some or all of your students may be interested in meteorology. If time permits, consider reading more about Juan Hernandez and his job. If there is high interest in your class, you could read together as a whole group. Alternatively, you can provide a link to a student or two with high interest to read on their own or with their caregivers and report back to the class more about what a meteorologist does. Read more about Juan Hernandez and other meteorologists at Meteorology Careers." (Lesson 7, Teacher Guide)
- Lesson 8 Explore step 3 Teaching Tip sidebar: "Extension Opportunity: After students have researched the different hazards, ask questions like, Which kind of weather-related hazards happen where we live? What was it like when it happened? Is that similar to what we read about on the card or hazard story? Ask students to conduct additional research by talking to local family or community members about their experiences with hazardous weather and share them with the class. You can also curate local news stories and books about weather hazards in your area. If you need to find out more about local hazards your community is at risk of experiencing, see Natural Hazard Risk Map." (Lesson 8, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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 sufficient support to facilitate coherent and explicit links between student sensemaking of phenomena and their learning in all three dimensions over time.

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.).

The materials provide guidance and support for teachers to recognize what students figure out in a lesson, what questions are left unanswered, and what new questions could be answered in the next investigation. Each lesson begins and ends with a Navigate section that guides teachers in supporting students with engagement across lessons. For example,

- Lesson 3, Navigate Section, Step 1: "Recall what we figured out. Display slide A, and make sure the Where Fruit Grows map and the Fruit and Vegetable Life Stages chart are visible to all students. Give table groups a few minutes to discuss the prompts on the slide, and refer to the map and chart as needed. Bring the class back together, and facilitate a brief discussion." (Lesson 3, Teacher Guide)
- Lesson 3, Navigate Section, Step 6: "Build a sense of puzzlement among the students. Say something like, We "think" we have figured out that fruits grow best where their water needs are met but is water the only thing plants need? Present slide M. Give students a few minutes to think about the questions on the slide then elicit a few ideas." (Lesson 3, Teacher Guide)
- Lesson 7, Navigate Section, Step 1: "Bring forward ideas from Lesson 6. Display slide A. Read together about meteorologists, who are scientists who study and forecast weather. Ask students what they think the term, forecast, means. Look for students to suggest ideas like "predict" and "prediction." Explain that forecast means that something is likely to happen, so a weather forecast predicts what kind of weather is likely to happen. Add forecast and meteorologist to the Word Wall." (Lesson 7, Teacher Guide)
- Lesson 7, Navigate Section, Step 7: "Stay in a Scientists Circle to brainstorm ideas for investigations. Display slide N. Remind students that scientists and engineers gather more information for a problem they are trying to solve. Ask students what kind of information they should gather to help them answer their questions to make better designs. Add to your Ideas for Investigation chart from Lesson 1, or jot down some new ideas near the questions students just added to the DQB." (Lesson 7, Teacher Guide)

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

Throughout the unit, lessons include Callout Boxes to highlight for teachers how students are using and developing SEPs and CCCs across the unit and to guide teachers in supporting students as they progress. For example,

- Lesson 1, Synthesize Section, Patterns Callout Box: "Consider using the following additional prompts to focus students on patterns in where fruits might grow and why in those kinds of places: Did we place new fruits in similar places or different places than the stickers? What was our reasoning for that? Describe the characteristics you think the places have that grow apples. Are those characteristics possibly different for oranges and bananas?" (Lesson 1, Teacher Guide)
- Lesson 3, Synthesize Section, Patterns Callout Box: "Students are developing their use of patterns in two ways in this lesson. First, they are using similarities and differences to sort and classify the precipitation in different fruit-growing places. Then, they use these patterns to make predictions about precipitation in other fruit-growing places. Highlight their use of patterns with questions like: What is similar about the precipitation in apple-growing places? How is it different from orange- or banana-growing places? Would we predict other apple-growing places to have a similar amount of precipitation as the ones we have graphed so far?" (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Analyzing and Interpreting Data Callout Box: "Students work in small groups to represent data on a bar graph to reveal relationships between where fruit plants grow and seasonal temperatures. Use this opportunity to support students in becoming increasingly independent in representing data on a bar graph so that they feel confident in doing it on their own in subsequent lessons. Ask questions such as, What does this bar tell us about temperature (point to a bar)? What does the data on this graph tell us about the seasons in this place?" (Lesson 4, Teacher Guide)
- Lesson 6, Explore Section, Analyzing and Interpreting Data Callout Box: "Students will represent harvest data in a Gantt-style chart to reveal relationships between when fruits are harvested and the school year. To help students reflect on this practice, ask them how the data chart representation helped them see the harvest data more easily, and compare it to the school year and summer break." (Lesson 6, Teacher Guide)
- Lesson 9, Explore Section, Developing and Using Models Callout Box: "This modeling moment is more about guiding students to identify all the necessary components (parts to include in a model) and interactions (how all the parts of the model are related) so they can do this with less support in the next activity. Ask students if they have heard the word model before. Explain that in science, models are used to help scientists explain something or to make predictions. One kind of model scientists use is a diagram. This kind of model includes words and pictures, but it's more than a picture. This kind of model helps to answer a question or to explain a phenomenon out in the world. Remind students that they developed models during the Unit 3.1: How can we design objects to balance and move in different ways? when they designed balanced sculptures." (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize Section, Cause and Effect Callout Box: "Students identify and test cause and effect relationships to compare windbreak designs. Support students in discussing the effects of each design with questions such as: What happened to the fruits when ____ design was put in place. Why do you think this happened?" (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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 support is provided to help students engage in the practices as needed, and it gradually adjusts over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems for one of the two intentionally developed SEP elements. In the unit overview, two elements are identified as elements students use with increasing responsibility as the unit continues: DATA E1 and ARG-E4. Students focus on two elements for the duration of the unit. This does not allow students to engage with enough elements for there to be "a match between targeted learning objectives and those that are developed by students during the learning experience." (EQuIP Detailed Guidance, p. 32)

There are two intentionally developed elements claimed in the Unit Front Matter: "Students use this element with increasing responsibility as the unit goes on." See evidence in I.B SEPs for the elements that "support the overall development of the practice." (Unit Front Matter)

DATA: Analyzing and Interpreting Data

DATA-E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships.

This element is specifically claimed to have developed over time. Unit 3.2 Weather and Hazards Front Matter p. 17: "To support development of Analyzing and Interpreting Data, students use each of these elements with increasing responsibility as the unit goes on. Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. (DATA-E1)"

- Lesson 2, Explore Section, Step 3: " Connect Section, Step 3: "Add data to our class chart. Display slide K. Point out the class chart, Our Fruit and Vegetable Life Stages. Remind students that one way scientists share information is through data charts. Because each small group researched different fruits and vegetables, we will all add our information to a shared chart to organize and combine the information. Show students how to add their data to the chart by first adding 7 sticky notes with "tomato" written on them together. Elicit suggestions from students where we should place the tomato sticky notes, and add them to the chart." (Lesson 3, Teacher Guide)
- Lesson 3, Explore Section, Step 2: " Build the bar graph together as a class using sticky notes. Arrange students into 8 groups and assign 1 of the 8 remaining locations to each group. Group size will vary depending on class size, but ensure there are at least 8 groups so that all 8 locations are covered. Hand out 1 fruit location card on the Location Precipitation Cards reference to each group of students. Ask them to work together to determine how many sticky notes they will need to represent the precipitation their location receives in a typical year." (Lesson 3, Teacher Guide)
- Lesson 4, Explore Section, Step 3: "Develop a graph of Michigan data. Ask for volunteers to come up to the graph and locate a season's temperature on the vertical number line on the left side of the graph through pointing (e.g., point to 45°F on the vertical axis for spring). Then, have a student trace a finger from the season's temperature on the vertical axis along the dotted line to construct a bar for the season (e.g., point to 45°F for spring, and then trace a finger along the dotted line until they are above the label for spring). Repeat this process to construct a bar for all 4 seasons or until students feel comfortable with the scaled bar graph." (Lesson 4, Teacher Guide)
- Lesson 6, Explore Section, Step 2: "Discuss how to record the data. Display slide E. You can use this slide to show students how to add information to the chart by looking at one example together for Washington apples. First,

explain the data collection process: Students will walk around the room looking for harvest data for their assigned fruit. When they find their fruit, they record the location of the farm on a row in their chart. Using a colored pencil, they should color in the months the fruit is picked fresh. Alternatively, students could draw a line through the months that fruits are grown (thick line) and the additional time they can be stored (thin line). This would leverage their prior understanding of timelines and number lines and would be less reliant on specific colors. Discuss with students how to use a second color to record additional months that the fruit can be stored in cold refrigerators after picking. Use the example on the slide to help. Have students gather the colored pencils that they need and place their handout on a clipboard." (Lesson 6, Teacher Guide)

ARG: Engaging in Argument From Evidence

ARG E4: Construct and/or support an argument with evidence, data, and/or a model.

This element is specifically claimed to have developed over time. Unit 3.2 Front Matter p. 18: "To support development of Arguing from Evidence, students use each of these elements with increasing responsibility as the unit goes on. Construct and/or support an argument with evidence, data, and/or a model. (ARG-E4)"

- Lesson 1, Synthesize Section, Step 4: "Facilitate an Initial Ideas Discussion. The purpose is to surface students' early thinking about the phenomenon and ask clarifying questions so that other students can work with the ideas being shared. Remind students of the classroom agreements for a shared learning community. All ideas should be accepted. Throughout the discussion, encourage students to ask each other questions as they listen to their classmates' ideas." (Lesson 1, Teacher Guide)
- Lesson 3, Synthesize Section, Step 5: "Update Our Growing Ideas Chart. Share slide L, and work together as a class to make a claim to add to Our Growing Ideas chart. Remind students that a claim is an answer to a question that, in science, we support with evidence." (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize Section, Step 7: " Our question is, How is temperature related to where fruit plants grow? What claim or claims can we make to answer this question? What new evidence do we have to support our claims? Do we all agree? Are there still areas of confusion?" (Lesson 4, Teacher Guide) Students engage with making claims the same way they did in the previous lesson.
- Lesson 5, Explore Section, Step 4: "Display slide H. Pass out 1 copy of the Start a Farm Challenge handout to each student. Overview the instructions for students. They will first work individually to decide which fruit they want to farm. Then, they will study the possible location's climate information. Using this information, they will make a claim for where they predict their fruit would grow well." (Lesson 5, Teacher Guide) Lessons 4 and 5 use the same teacher prompts/supports for creating Our Growing Ideas as Lesson 3 and do not provide a reduction in scaffolding.
- Lesson 6, Synthesize Section, Step 4: "Construct an argument together. Gather in a Scientists Circle. Display the chart paper with our question written on top and slide N. Facilitate a Consensus Discussion to draft an argument together." (Lesson 6, Teacher Guide) Students engage with making claims the same way they did in the previous lesson.

Criterion-Based Suggestions for Improvement

- To increase the rating of this criterion, ensure that "[s]caffolding is explicitly reduced over time for the use of nearly all SEP elements stated as targeted learning objectives." [Detailed Guidance, p. 33]
- Consider altering scaffolding when the same scaffolding persists across several lessons or when scaffolding is reintroduced.

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 use of student artifacts shows direct, observable evidence of using all three dimensions at a grade-appropriate level. Tasks require students to integrate all three dimensions as part of the learning performance, applying them to explain the year-round fruit phenomenon. Assessments are similar in style and context to student learning activities. The focus is on using student sensemaking of the phenomenon to uncover student understanding of all three dimensions.

Lessons 6 and 12 contain summative assessments that are transfer tasks. Students must use their existing knowledge to construct a new understanding of the scenario presented. Students complete these tasks independently, and the artifacts can be collected and evaluated to determine their mastery of the learning objectives.

- Lesson 6, Synthesize Section, Where do all those pumpkins grow Student Assessment: "In this task, you will answer questions to identify where pumpkins are most likely to grow. You will also explain why that place is a good place to grow them. You will investigate three places that might grow pumpkins. These places are Ireland, Mexico, and Egypt." (Lesson 6, Where Do All Those Pumpkins Grow Student Assessment)
- Lesson 12, Synthesize Section, Choosing a Windbreak Design Student Assessment: "Introduce the apple orchard design challenge. Display slide B. Tell students they will use what they have figured out from windbreak testing to help a farmer choose a windbreak design for her apple orchard. This assessment is designed to build on the ideas figured out across Lessons 9-11 with windbreaks specifically. Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart, or they can propose a new design that combines features of the ones they tested. When they write their claim, they need to describe the design they think is best by naming one tested by the class (e.g., fence design #1, wall design #2, natural designs, etc.), or by referencing how they would combine the best features from them. " (Lesson 12, Teacher Guide)
- Lesson 12, Synthesize Section, Schoolyard Flooding Designs Student Assessment: "Share that students are going to think about a new design context for protecting a place from too much rain and flooding." (Lesson 12, Teacher Guide)

Throughout the unit, several student performances produce artifacts of integrating the three dimensions in service of sense-making or problem-solving.

- Lesson 2 Learning Goal: "**Develop a model to describe** that **while plants have unique and diverse life cycles**, they all follow a **similar pattern** of life stages." Lesson 2, Synthesize Section, Step 4: "Construct a class consensus model. [25 min]Look for patterns. Gather in a Scientists Circle and facilitate a Building Understandings Discussion. Display slide L. Restate that we are wondering if other fruits and vegetables, though very different, may grow in the same way and share some of the same life stages experienced by tomatoes. Point out that all groups gathered helpful data about the life stages of different fruits and vegetables that we organized on our class chart. Ask students to look at the chart to see if there are any patterns they notice." "Create the model. Display the blank A Fruiting Plant's Life Cycle chart or a digital whitespace. Begin to sketch the Fruiting Plant Life Cycle model by writing the four life stages (white boxes). The following is an example of a life cycle chart, but ensure you co-construct a chart using your students' suggestions and ideas for how to represent a plant life cycle. Cycles are typically represented with a circular graphic. (Lesson 2 Teacher Guide)" This is identified as a Key Formative Assessment moment, yet the model is co-constructed with the whole class, and the artifact produced cannot be used to evaluate individual student understanding.

The Following Sensemaking (Lessons 3-6): "For Lessons 3-6 use the learning goals below as a guide for student sensemaking as they work toward the performance expectations listed above. **Represent and analyze data to reveal** that **fruits grow in places with different precipitation patterns that meet the fruit plant's water needs**. (Lesson 3) **Represent and analyze data to reveal** that **fruits grow in places in the world with different temperature patterns that meet the plants' needs to grow fruit**. (Lesson 4) **Obtain and combine information** using **patterns** to develop a shared understanding of **different climate regions around the world**. (Lesson 5) **Construct an argument** for how a location's **long-term patterns in temperature and precipitation, called climate,** can be used **to predict the best places to grow a fruit or vegetable**. (Lesson 5)"

- Lesson 3, Synthesize Section, Step 4: "Predict precipitation for 3 other locations. Step back, look at the map, and point out that there were 3 places we did not have precipitation data for: Washington, US; Florida, US; and Ecuador. Point to the locations on the Where Fruit Grows map as you list them and ask students what fruit grows there. Display slide K. Say something like, We have figured out a lot! I bet we could predict how much precipitation falls on a place based on where it is on the map and what fruit grows there. Let's give it a try! Let partners choose 1 fruit/location to make a prediction for and give them a few minutes to work. Ask students to share their ideas about how much precipitation they predict for the locations and why. Add the appropriate water droplet die-cuts to the map for each location once the class comes to agreement." (Lesson 3, Teacher Guide) **SEP DATA E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. DCI 3-ESS2.D.1: ESS2.D Weather and Climate: Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next. (3-ESS2-1)). CCC PAT E1: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena**
- Lesson 5, Explore Section, Step 4, students integrate the use of the elements when they apply their understanding of how to use climate data to decide which places are more or less suitable for growing certain fruits in the three dimensions: **SEP DATA E3: Compare and contrast data collected by different groups in order to discuss similarities and differences in their findings. DCI 3-ESS2.D.2: ESS2.D Weather and Climate: Climate describes a range of an area's typical weather conditions and the extent to which those conditions vary over years. (3-ESS2-2), CCC PAT E3:Patterns can be used as evidence to support an explanation.**

Following Student Sensemaking (Lessons 8-11): "For Lessons 8-11, use the learning goals below as a guide for student sensemaking as they work toward the performance expectations listed above. Obtain and combine information to identify **patterns** in **weather hazards that are likely to impact fruit plants**. **Define a problem and develop a system model to show how a windbreak works (cause) to protect plants from strong winds (effect). Generate and test multiple possible solutions for windbreak designs to reduce the impact of strong wind on plants. Compare** the **effects** of **multiple possible solutions for windbreak designs** based on data from testing and ideas from **communicating with peers**."

- Lesson 10 Student Handout Our Windbreak Test Results. Students use the Practice of testing multiple possible solutions generated in an earlier lesson (**CEDS-E5 Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.**) to record the effects of different windbreaks on fruit trees during simulated storms, (**CE-E1 Cause and effect relationships are routinely identified, tested, and used to explain change.**) in order to decide how best to protect fruit trees from hazardous weather (**ESS3.B-E1 A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts.**). "How do you think your windbreak caused a change in how the wind affected fruit plants? How might you improve your design?"

Throughout the unit, students routinely produce artifacts that demonstrate their use of the grade-appropriate elements of SEPs, CCCs, and DCIs, which are targeted as learning objectives.

- Lesson 5, Synthesize, Step 3: "The class makes and supports claims as part of the "Our Growing Ideas" chart and uses the teacher prompt "What was our evidence to support this claim? Include the book that was read and any data from previous lessons that students want to use as evidence." (Lesson 5, Teacher Guide)
- Lesson 7, Synthesize Section, Step 4: "Pass out 1 copy of the Initial Designs to Protect Plants handout to each student. Look at the handout together. Explain that everyone will design something to protect fruit plants, like the banana plants shown in the videos. They can choose any type of hazardous weather to address, such as strong winds, heavy rain, or lightning, and can imagine the plant as an apple tree, an orange tree, or any other kind of fruit plant. Give students a moment to write down 1 cause of damage to fruit plants, 1 effect on fruit plants, and 1 criteria they want to meet to protect their plant. Explain that they need to sketch the cause and effect on the fruit plant, then have them sketch a design that will protect it. Remind them to use symbols and words to show the cause, effect, and how the design works to protect the plant." (Lesson 7, Teacher Guide)
- Lesson 9, Explore Section, Step 2: "Create an initial model. Display slide B, and provide Model: Wind and Tree to each student. Tell students that in order to know what to do about strong winds damaging plants, they will need to figure out what is happening. Recall that sometimes drawing what we think is happening helps us to understand it, and we call this a model. Explain that first they will individually create an initial model on their handout. Explain to students that their initial model must show what happens to a banana plant when it is impacted by the strong winds from a hurricane or other storms. Encourage students to add labels to their model to give someone looking at it more information." (Lesson 9, Teacher Edition)

Criterion-Based Suggestions for Improvement: N/A

III.B. Formative

EXTENSIVE

Embeds formative assessment processes throughout that evaluate student learning to inform instruction.

The reviewers found extensive evidence that the materials provided opportunities that are called out as formative and that most of those opportunities include support for next steps. Evidence of varied support for student thinking across the three dimensions was located, and most of the formative assessment processes attend to multiple aspects of student equity.

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

- The Weather and Hazards Assessment System Overview contains Self-Reflection information. "These lessons/ This lesson provide(s) opportunities to support students in reflecting on their own learning and sensemaking. These opportunities allow students to take ownership of their learning and use their reflections to guide future sensemaking. The self-reflections in this unit are designed to be short check-in moments for students to gauge their progress toward the learning goals. The slides provide a prompt with options for students to quickly share their reaction. This allows you to identify students who need more support and provide additional feedback, guidance, or practice. The final reflection in Lesson 12 is a way for students to celebrate their progress and all they have accomplished in the unit." (Assessment Overview, Page 3)

Instructional guidance tools are provided for Key Formative assessments in Lessons 2 and 5. These tools include the lesson learning goal and a two-column chart: "If You Notice" and the corresponding "Possible Next Steps." for the teacher to use during formative assessments.

- Following Student Sensemaking tools are provided for Lessons 3-6 and for Lessons 8 - 11. These two documents provide a chart that a teacher can use to formatively assess each individual student on aspects of the learning goals for the lesson set, as well as possible examples of student sensemaking that a teacher might observe.
- Lesson 4, Navigate Section, Assessment Opportunity Callout Box: "This is the second time to let students self-assess their progress of using data and information to reveal patterns for where fruits grow. Check in with students who might not feel confident in representing data and information on graphs and maps prior to the summative assessment in Lesson 6. Revisit the graphs, as needed, with any student who feels they need additional practice with representing data in a graph. Ask the student: What temperature is this bar showing us? How do we know that? Point to the place on the graph where we can see the temperature. Is that a higher or lower temperature than another season on the graph?" (Lesson 4, Teacher Guide)
- Lesson 8, Explore Section, Step 3: "Show slide G. When students are finished researching their weather hazard, have them respond to the self-assessment question on the slide. Have students complete the reflection independently, but read the prompt aloud as needed." (Lesson 8, Teacher Guide)

Formative assessment opportunities are called out for each lesson with a connection to all three dimensions highlighted in separate colors. These include a "How can I use the information I gather from this assessment?" section in the assessment instructions at the beginning of each lesson, often in an if-then format.

- Lesson 1, Lesson Assessment Guidance: "Use this information to uncover students' initial ideas about where fruits may grow and why they grow there. Encourage students to share related experiences, examples from their lives, and their initial ideas and reasoning, such as: When students mention fruits growing in gardens or farms, ask them why they think that farm can grow that fruit or vegetable well. When students use terms or ideas, like 'weather', "pattern", "temperature", or "precipitation", probe what they mean by the words or ideas. There is no need to define terms or come to a consensus on ideas right now." (Lesson 1, Teacher Guide)
- Lesson 5, Lesson Assessment Guidance: "This is a key formative assessment (aligned to 3-ESS2-2) where students are combining ideas they have figured out in previous lessons with new information about climate to develop an understanding that there are many different climate regions around the world. Students may struggle to distinguish between weather (daily precipitation and temperature conditions) and climate (long-term patterns of precipitation and temperature in a place). It may be helpful to make a comparison between the school's local climate and other places by asking questions such as: What would we typically expect our summers (or winters) to be like? Could we expect that this year? What about in 5 years? Or 10 years? Let's say we planted a tree 5 years ago - would that tree have gotten the same amount of precipitation and temperatures from year to year since we planted it? Why or why not?" (Lesson 5, Teacher Guide)

Formative assessment processes routinely provide varied support for student thinking across all three dimensions. Formative assessments are directly tied to elements of dimensions, as they are closely linked to the 3-dimensional Lesson Learning Goals. The goals form the "What Will Students Do?" column of the Lesson Assessment Guidance table in each lesson's Teacher Guide. The "When to Check For Understanding" and "What to Look and Listen For" guide teachers in assessing the dimensions of the Learning Goal. Lessons 2 and 5 are identified as Key Formative Assessments.

Lesson 2, Learning Goal: "**Develop a model to describe** that **while plants have unique and diverse life cycles**, they all follow a **similar pattern** of life stages."

- Where to Check for Understanding: "In the Explore, when students collaboratively uncover patterns in data, use a model template to describe the major life stages and processes of a fruit or vegetable's life cycle, and explain when fruits or vegetables occur. In the Synthesize, when students collaboratively construct a consensus model of the life cycle for a typical fruit or vegetable."
- What to Look and Listen for: "**A co-developed model showing: Plants have similar life cycle patterns: begin life, grow, flower and fruit, death, Fruits and vegetables typically grow on plants during part of their life cycle, The fruit or vegetable typically holds the seeds, which can usually grow into new plants that will experience a similar life cycle, Plants live for different lengths of time, but eventually all plants die, Plants have unique water and temperature needs that are necessary to grow well."**
- The Instructional Guidance for Lesson 2 document includes a chart with two columns labeled "If you notice…" and "Possible next steps." "If you notice: Students identify different shared stages of a life cycle, but are not sure how to represent them." Possible next Steps: "Leverage student experiences about how to sequence steps. Some students may say "use numbers," and other students may want to use boxes with arrows pointing in between. They may not have created a cycle diagram yet, and that is OK."

Lesson 5, Learning Goal: " **Obtain and combine information** using **patterns** to develop a shared understanding of **different climate regions around the world**."

- Where to check for Understanding: "During the Connect as students engage in text, images, and discussion using ideas from the text." (Lesson 5, Teacher Guide)
- What to look for and listen to: " **Obtaining and combining information across written text and images** to see how **scientists have collected and represented temperature and precipitation data** to **reveal patterns** of **climate regions**. **Obtaining and combining information across written text and images** to develop an understanding that **long-term precipitation and temperatures in a place is called climate**. **Patterns** in precipitation and temperature vary from place to place resulting in **different climate regions in the world**." (Lesson 5, Teacher Guide)
- Assessment Opportunity Callout Box: "Students obtain and combine information across the text and discussions to provide an opportunity to gather evidence about Assessment Statement 5A. Use this opportunity to support students with developing ideas about climate regions and climate data. This is a key moment in the unit where students develop a shared understanding of climate and how it is different from weather. As the class reads the book, emphasize how the expected temperature and precipitation is different from place to place. Ask questions, such as, If you lived in this place, what would you expect the winter to be like? The summer? Would you expect it to be like that next year or 5 years from now? Refer to the Assessment Guidance at the beginning of the lesson." (Lesson 5, Teacher Guide)

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

- Lesson 4, Connect Section, Broadening Access Callout Box: "Images provide a way for students to connect with personal experience and describe what they notice in their own words. When showing images of fruit-growing places, give students ample opportunity to share experiences in similar places or with similar apparent temperatures, and use personal or family language to describe those places and experiences." (Lesson 4, Teacher Guide)
- Lesson 6, Synthesize Section, Broadening Access Callout Box: "Provide multiple means of engagement by asking students to bring in things they have seen or heard about that can help them better understand designs to protect

fruit plants, even if those things were not designed for fruit plants (e.g., people wear jackets or blankets to keep warm - could this work for fruit plants, too?). This helps optimize the relevance, value, and authenticity of the science ideas they are working toward." (Lesson 6, Teacher Guide)

- Lesson 8, Synthesize Section, Broadening Access Callout Box: "Consider including a Turn and Talk or small group discussion before the whole-group discussion to give students a chance to develop their thinking, use their linguistic and multimodal resources to express their ideas, and learn from their peers' uses of these resources before sharing in a larger discussion. This can promote confidence and ultimately increase engagement in whole-group discussions." (Lesson 8, Teacher Guide)

Formative assessment information is contained at the beginning of each lesson in the Lesson Assessment Guidance. For example:

- Lesson 8, Explore Section, Assessment Opportunity box: "Formative assessment: Students working in small groups to research their hazard is an opportunity to assess Learning Goal 8. Review students' notes on the Research Notes handout, referring to the Following Student Sensemaking (Lessons 8-11) tool, if helpful. If you notice a student struggling to connect the story with the card information, ask them to highlight important information from the story and then check to see if it matches the card. Students will also have a chance to continue working toward this learning goal in the Synthesize. Refer to the Assessment Guidance section at the beginning of this lesson." (Lesson 8, Teacher Guide) Though a Key Formative assessment is named for Lessons 8-11, and the Following Student Sensemaking doc (Lessons 8 - 11) is named as the evidence of student learning, the Following Student Sensemaking document lists learning goals for Lessons 8-11.
- Lesson 9, Explore Section, Step 2: "This is the first opportunity to assess Learning Goal **9** with the purpose of providing feedback to students to improve their windbreak models. Focus on whether students are identifying the components and interactions when developing models. As part of this system, look for students to include a representation of a strong wind, to show what is happening to the plant (either bending, breaking, or being pushed over), and to show fruits either falling from the tree or on the ground. Refer to the Assessment Guidance at the beginning of the lesson." (Lesson 9, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

III.C. Scoring Guidance

EXTENSIVE

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 extensive 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.

Learning targets are clearly stated and incorporated into scoring guidance in the Teacher Assessment Tool documents. The other Teacher Assessment Tools list the Performance Expectations addressed in the assessment, including learning targets in a table correlating them to elements of each dimension and to specific questions on the assessment. The Lesson Assessment Guidance section of Teacher Guides offers suggestions to plan further instruction for individuals or the class. For example,

- Lesson 6, How Can I Use This Assessment Information?: "This assessment is to make a summative claim about students' understanding of science ideas and engagement with data analysis and patterns. Refer to the Scoring Guide for Pumpkin Transfer Task tool as a scoring guide for this assessment. Use this resource to help identify where students need additional support. Have this handy during the assessment for in-the-moment guidance to provide student support."(Lesson 6, Teacher Guide)

Support for ongoing feedback

- Each formative assessment opportunity provides feedback for teachers. The "What to Look/Listen For" section is included in the front matter of each lesson. This section includes guidance for when teachers should look/listen and what they should do with the information gathered during each formative assessment.
- Lesson 12, Synthesize, Step 2, Assessment Opportunity: "In the next step, you will provide an opportunity for students to revise and improve their arguments by revisiting previous data or information and incorporating feedback from you or their peers to revise their argument one more time. Give feedback to students, such as: How clear is their claim? Did they cite evidence to support the claim? Did they say how well the solution meets the criteria? Did they include evidence for how well the solution meets the constraints?" (Lesson 12, Teacher Guide)

The Lesson Assessment Guidance section of Teacher Guides offers suggestions for giving feedback to students.

- Lesson 6, How Can I Use This Assessment Information?: "You can use these tools to also focus the feedback you provide to students on their arguments. Students will have an additional opportunity to engage in arguments from evidence later in the unit, so providing feedback to students at this point will allow them to improve arguments they make in future lessons. Give students time to review and reflect on their feedback before the arguments they make later in the unit." (Lesson 6, Teacher Guide)

A range of student responses was provided or described to support teachers for summative assessments in Lessons 6 and 12:

- Lesson 6, Scoring Guidance: Pumpkin Transfer Task, the "Developing" answer for question 2:" Circles Mexico and writes, "It has good precipitation and temperature." The "Secure" answer for question 2 states:" Circles Mexico and writes, "Mexico has all the right climate for growing pumpkins. It has the right precipitation and warm enough summer and fall temperatures year after year." (Lesson 6, Scoring Guidance: Pumpkin Transfer Task)

- Lesson 12, Scoring Guidance: Choosing a Windbreak Design, the "Developing" answer for question 1: "For example, students might write: I think the fence is the best design for the farmer because it was the best for testing." The "Secure" answer for question 1 states: "For example, students might write: I think the fence is the best solution for the farmer because it will protect the fruit, but also still let animals through. It can also be built quickly and doesn't cost much. My evidence for this is the testing we did on fences and the information about how fences are better for animals and do not cost much." (Lesson 12, Scoring Guidance: Choosing a Windbreak Design)

Criterion-Based Suggestions for Improvement: N/A

III.D. Unbiased Tasks/Items

ADEQUATE

Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.

The reviewers found adequate evidence that tasks/items assess student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students. The materials include limited suggestions for assessing through multiple modes of communication and do not explicitly call out a choice of modality on one major assessment. Also, the final summative assessment does not include multiple methods of communicating the expectation for student performance.

The assessments contain grade-appropriate text volume and vocabulary. These tasks are also frequently accompanied by graphics or videos to help students express their understanding of the content. For example,

- Lesson 2, Connect Section, Assessment Opportunity Callout Box: "This is your first opportunity to assess learning goal 2. While students are working in their research groups, circulate to groups to listen to their discussions. Keep the Instructional Guidance for Lesson 2 tool on a clipboard to jot down evidence of student understanding." (Lesson 2, Teacher Guide) Students are also provided with Plant Life Cycle Infographic Cards to help them complete this formative assessment.
- Lesson 4, Explore Section, Assessment Opportunity Callout Box: "Small group graph-making provides the first opportunity to gather evidence about Learning Goal 4. with the purpose of providing feedback and supporting students in representing data sets on graphs to reveal patterns. Circulate among the groups to provide support to students." (Lesson 4, Teacher Guide)
- Lesson 6, Synthesize Section, "Where do all the pumpkins grow?" The assessment contains several pictures and visual representations to assist students in the analysis and interpretation of typical rainfall and temperature data for a play and at certain times of the year. (Lesson 6, Teacher Guide)
- Lesson 12, Synthesize Section, step 2: "Distribute Choosing a Windbreak Design and read aloud the design problem, criteria, and constraints on the first page. Explain to students that they can choose an existing design from the class Evaluating Design Solutions chart or they can propose a new design that combines features of the ones they tested.... "Read aloud Part 2. Display slide E. Use Part 2 on the assessment to set the context for the design solutions. Read aloud the scenario of the students and the principal trying to solve the problem. As the class reads Part 2, encourage students to take notes or highlight/underline important information about the criteria, constraints, and possible solutions...Tell students that it sounds like they will have to consider several options as they think about the best

solution. Give students time to ask any clarifying questions about the solutions before completing Part 3." (Lesson 12, Teacher Guide). While the instructions are read aloud by the teacher, the assessment is not accompanied by other methods (e.g. visual representations, graphs, video) of communicating the expectation for student performance.

The materials support success for all students. Examples include:

- Lesson 1, Synthesize Section, Broadening Access Callout Box: "This discussion will look different based on your teaching context. For classrooms in agricultural areas, students may bring more prior experiences and ideas to share in this discussion. If students do not bring much prior experience or ideas to some of the questions, use this as an opportunity for the class to investigate this more to find out. Say something like, It's OK if we are not sure about why these plants grow in a certain place. This is something we can investigate together in this unit." (Lesson 1, Teacher Guide)
- Lesson 6, Connect Section, Step 2, Broadening Access Callout: "Students may share traumatic experiences and stories where they or someone close to them was harmed in a weather-related event. Use these 3 steps to guide the interaction to reduce threats and create a safe space to share: 1) Be curious (e.g., what was that like for you?), 2) Validate (e.g., it makes a lot of sense why that would be scary.), and 3) Thank the student (e.g., thank you for sharing with us.). Modeling this structure of responding creates a predictable routine that students will learn to expect. This supports engagement and provides boundaries for how to share personal experiences in a group discussion." (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize Section, Step 4, Broadening Access Callout: "It is important to organize activities in ways that create opportunities to support student engagement by emphasizing socially safe activity structures (e.g., small-group or partner work before a whole-class discussion). This is especially beneficial to multilingual students. For this reason, partner talk or small-group talk should precede whole-group discussion whenever possible to give students an opportunity to share their ideas with peers before speaking to the whole class". (Lesson 7, Teacher Guide)

The broadening access sidebars throughout lessons include limited suggestions for assessing through multiple modes of communication. For example:

- Lesson 5, Explore Section, Step 4 during the Key Formative Design A Farm Challenge: "Broadening Access: As students write their claims, provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. You can gain a much richer level of what students are thinking by allowing multiple ways of communicating their ideas." (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize Section, Step 5, during the Summative Assessment Where Do All Those Pumpkins Grow: "Broadening Access: Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. This allows for multiple means of action or expression. Encourage students to use the Our Growing Ideas chart and the class argument just written to help them think about the questions on the transfer tasks." (Lesson 6, Teacher Guide)
- Lesson 9 How Can I Use This Assessment Information, referencing the Formative Assessment Model: Wind and Tree: "During the Explore, for students who might need support or encouragement to draw, remind them that a model can also include words, phrases, and sentences." (Lesson 9, Teacher Guide)
- Lesson 12, Synthesize Section, Broadening Access sidebar, referencing the Lesson 12 Summative Assessments: "Consider offering alternatives to the written assessment, such as making a video recording or having a one-on-one conference (with opportunities to point to and engage with class charts)." (Lesson 12, Teacher Guide) The choice of responses across modalities is optional.
- Lesson 12, Teacher Guide Preparation Checklist: "Decide which assessment opportunity to use with your students. They can either apply their learning across lessons 9-11 to argue from evidence for a windbreak design solution for a

farmer using ideas and information developed from those lessons. Or, they can apply their ideas in a new context to consider which design solutions would work best to solve a schoolyard flooding problem. The schoolyard flooding task is more challenging and requires additional time, as students will need to read about new, unfamiliar solutions to the problem. Alternatively, the schoolyard flooding assessment can be completed by individual students with high interest or who need a new context or an added challenge." (Lesson 12, Teacher Guide) While there is a choice of assessment tasks, the choice is made by the teacher.

- Callouts in the Following Student Sensemaking documents remind teachers that students may be using multiple modes of communication to show their thinking. In the Possible Evidence of Student Sensemaking section, sample student work is shown in three categories: "Students might say...Students might Gesture/Manipulate...Students might Write/Draw".

Criterion-Based Suggestions for Improvement

- Consider foregrounding alternate options for expressing learning for at least one major assessment. Consider offering students a choice of task for at least one major assessment. "The materials include at least one significant task that provides students with a choice of responses across multiple modalities." [Detailed Guidance, p. 43]

III.E. Coherent Assessment System

EXTENSIVE

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

The reviewers found extensive evidence that the materials include assessments within the unit—including pre-, formative, summative, and self-assessments—that create a system of assessments that work together to measure the intended student learning across the materials. The unit assessments are designed to lead from one to the next, culminating in assessment of a performance expectation.

Each lesson has a clearly identified Three-Dimensional Learning Goal that is explicitly aligned with the Lesson Assessment Guidance. For example:

- Lesson 3, Learning Goal: "**Represent and analyze data to reveal** that **fruits grow in places with different precipitation patterns that meet the fruit plant's water needs**. "Lesson 3, Synthesize Section, Step 4: "Mapping the precipitation patterns onto the Where Fruit Grows map is your second opportunity to gather evidence about Learning Goal 3 with the purpose of determining how representing data spatially can help reveal precipitation patterns in areas that grow different fruits. This map is important for showing patterns that some places in the world have more or less precipitation. This idea will continue to build in subsequent lessons." (Lesson 4, Teacher Guide)
- Lesson 8, Learning Goal: "**Obtain and combine information to identify patterns** in **weather hazards that are likely to impact fruit plants**." Lesson 8, Synthesize Section, Step 4: "This whole class discussion is your second opportunity to formatively assess Learning Goal 8. Look and listen for students to name similarities and differences between weather-related hazards, including the pattern of high winds across most of the weather hazards." (Lesson 8, Teacher Guide)

The materials contain pre-, formative, summative and self assessments.

Pre-Assessment

- Lesson 1, Synthesize Section, Assessment Opportunity Callout Box: "Developing the Where Fruit Grows Map is your assessment moment for Learning Goal 1.A with the purpose of determining students' initial ideas about why plants grow in certain places. Accept all student ideas. Use follow-up prompts to probe students' current understandings about where the fruit might grow and why it grows in places based on their prior knowledge and experiences. If students continue to focus on fruits growing in gardens, yards, or farms, push them to think more about where those gardens and farms are located on the map and what about those places might make them good places to grow fruit plants." (Lesson 1, Teacher Guide)
- Lesson 7, Synthesize Section, Assessment Opportunity Callout Box: "The Initial Designs to Protect Plants handout is your pre-assessment for learning goal **7**. Accept all design ideas and claims, since this is students' first opportunity to engage with design thinking in the new phenomenon context. Encourage students to connect the elements of hazardous weather they chose (causes) to impacts on the fruit plants (effects) and then make a claim about how their design reduces the impacts on the fruit plants." (Lesson 7, Teacher Guide)

Formative Assessment

- See Criterion III.B

Summative Assessment

- Lessons 6 and 12 are the two summative opportunities in the unit. Weather and Hazards Assessment System Overview: "Lesson 6 is an individual, written assessment and a formal opportunity to gather summative information about students' progress on Analyzing and Interpreting Data and disciplinary core ideas about some locations' weather patterns at certain times of year. Lesson 12 is a summative assessment to determine how well your students developed ideas toward the learning goals in this unit. Provide students an opportunity for peer- and teacher-feedback to revise their arguments in this lesson. Allow students to revisit data tables and texts from previous lessons to provide additional evidence for their ideas." (Assessment System Overview)

Self Assessment

Lessons 3,4,5,8,10, and 12 contain "Self-Reflection" sections.

- Lesson 3, Navigate Section, Step 6:: "Reflect on our work with data. Display slide N, and use the prompts for students to reflect on how they feel about working with data and making the graphs. Students can show their responses using their fingers or writing it on a piece of paper. Use this quick self-assessment to offer more support to a student who may feel uncertain about working with data" (Lesson 3, Teacher Guide) While the self-reflection relates to the student graphing and looking at data, the focus is asking the students how they feel instead of having them analyze an artifact they created to determine their progress toward the learning goal.
- Lesson 4, Navigate Section, Step 8: "Reflect on our work. Display slide T. Briefly give students a minute to consider how their work with data has changed now that they have worked with data, graphs, and information again. Have students share with a show of fingers (1, 2, 3) or some other way, such as a sticky note with the number. Then, ask a volunteer to share why they feel they have gotten better at graphs and data since the rainfall lesson. Additionally, ask for volunteers to share why data and graphs might still be hard to make or interpret." (Lesson 4, Teacher Guide) Here, students are offered a second opportunity to self-assess the same one dimension:

- Lesson 5, Navigate Section, Step 5: "Reflect on our work with data. Display slide L, and use the prompts for students to reflect on how they feel about developing a claim and using evidence to support it. This is their first individual claim for the unit, so use this assessment to encourage students to reflect on what went well and where they want to improve. Students can show their responses using their fingers or writing their number on a piece of paper." (Lesson 5, Teacher Guide) Here, slide L offers a two-dimensional self-assessment opportunity to consider the practice of argumentation and the DCI of fruits needing different climates.
- Lesson 8, Explore Section, Step 3: "Show slide G. When students are finished researching their weather hazard, have them respond to the self-assessment question on the slide. Have students complete the reflection independently, but read the prompt aloud as needed." (Lesson 8, Teacher Guide) This self-assessment offers a gestural check-in (thumbs up, down, sideways) to let students consider the two dimensions of the practice of Gathering Information and the DCI of natural hazards

The Assessment Overview document shows and describes the overall assessment system for the unit, including the lesson, the assessment tools, and a statement of their purpose. Each lesson's teacher guide has a Lesson Assessment Guidance table linking the 3-dimensional Lesson Goal to the assessment opportunities in that lesson. In some cases, the Assessment Guidance clarifies where and how assessment opportunities in other lessons are related and how the different types of assessment work together to provide regular feedback. For example:

- Lesson 4, How can I use this Assessment Information: "This is a formative assessment opportunity (aligned with 3-ESS2-1). Developing and interpreting the graphs can be challenging for some students, particularly when working with graphs across many locations. Model how to make a graph first as a whole class using seasonal temperature data from Michigan. Circulate among the groups as they make their graphs to clarify how to represent the data and what the data means for seasonal temperature patterns. Ask questions, such as What is winter like in this place? How do you know? What is summer like? Does it change much from winter to summer?" (Lesson 4, Teacher Guide)
- Lesson 8, How can I use this Assessment Information: "This is a formative assessment opportunity (aligned with 3-ESS3.B.1 and 3-5-ETS1.B.1). In this lesson, students will obtain and combine information across written text and images to identify patterns in weather hazards and their effects on fruit plants. If a student needs additional support, remind the student that patterns are something that repeats. Work with the student to identify types of patterns that can be things we see (such as in shapes or number sequences) or events that happen over and over (such as a 2-week break from school every December)." (Lesson 8, Teacher Guide)
- Lesson 12, Synthesize Section, Step 2: "In the next step, you will provide an opportunity for students to revise and improve their arguments by revisiting previous data or information and incorporating feedback from you or their peers to revise their argument one more time. Give feedback to students, such as: How clear is their claim? Did they cite evidence to support the claim? Did they say how well the solution meets the criteria? Did they include evidence for how well the solution meets the constraints?" (Lesson 12, Teacher Guide)

Criterion-Based Suggestions for Improvement

- Although called out as a Key Formative Assessment moment, the model is developed in a teacher-led whole-class discussion, rather than by individual students. Detailed Guidance, p. 44, states that "open discussion that doesn't intentionally draw out responses from all students would not be strong evidence for this criterion."
- Consider adding elements of Crosscutting Concepts to student self-assessment opportunities so that students can track their learning in all three dimensions.

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 the performance of practices connected with their understanding of Disciplinary Core Ideas and Crosscutting Concepts and to receive feedback. Students also have opportunities to apply peer and teacher feedback from prior activities to help them progress in their learning. There is evidence of multiple opportunities for students to demonstrate performances of the targeted learning objectives for each of the three dimensions.

The materials have multiple, interconnected opportunities for students to demonstrate their progress to proficiency over time. For example,

Students build toward 3-ESS2-1: Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

Lesson 3, Learning Goal 3: "**Represent and analyze data to reveal** that **fruits grow in places with different precipitation patterns that meet the fruit plant's water needs**.

- Explore Section, Step 2: "Building the bar graph and noticing initial patterns is your first opportunity to gather evidence about Learning Goal **3** with the purpose of determining how representing data on graphs can help reveal precipitation patterns in fruit-growing locations. This graph is used to establish the idea that some places receive more or less precipitation and that fruits are grown in places that match their precipitation needs." (Lesson 3, Teacher Guide)

Lesson 4, Learning Goal 4: "**Represent and analyze data to reveal** that **fruits grow in places in the world with different temperature patterns that meet the plants' needs to grow fruit**."

- Explore Section, Step 4: "Small group graph-making provides the first opportunity to gather evidence about Learning Goal 4. with the purpose of providing feedback and supporting students in representing data sets on graphs to reveal patterns." (Lesson 4, Teacher Guide)

Lesson 5, Learning Goal 5A: "**Obtain and combine information** using **patterns** to develop a shared understanding of **different climate regions around the world**."

- Connect Section, Step 2: "Students obtain and combine information across the text and discussions to provide an opportunity to gather evidence about Assessment Statement 5A. Use this opportunity to support students with developing ideas about climate regions and climate data. This is a key moment in the unit where students develop a shared understanding of climate and how it is different from weather. As the class reads the book, emphasize how the expected temperature and precipitation is different from place to place." (Lesson 5, Teacher Guide)

Students also have opportunities to build towards 3-ESS3-1: Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard. For example,

Lesson 7, Learning Goal 7: "**Make an initial claim about a solution** that **reduces damage to fruit plants** (**effect**) **when weather is hazardous** (**cause**)."

- Synthesize Section, Step 4: "Encourage students to connect the elements of hazardous weather they chose (causes) to impacts on the fruit plants (effects) and then make a claim about how their design reduces the impacts on the fruit plants. Support students by reviewing how the class made claims and used evidence on the Our Growing Ideas chart to support claims." (Lesson 7, Teacher Guide)

Lesson 8, Learning Goal 8: "**Obtain and combine information to identify patterns in weather hazards that are likely to impact fruit plants.**"

- Synthesize Section, Step 4: "Look and listen for students to name similarities and differences between weather-related hazards, including the pattern of high winds across most of the weather hazards." (Lesson 8, Teacher Guide)

Lesson 10, Learning Goal 10: "**Generate and test multiple possible solutions for windbreak designs to reduce the impact of strong wind on plants.**"

- Synthesize Section, Step 6: "This is your assessment moment for Learning Goal 10 with the purpose of providing feedback and supporting students in comparing designs they have generated against the agreed-upon criteria. Listen for students comparing their design against the criteria and constraints and also comparing their design against the no windbreak results. Support students in looking at how their design compares to the no windbreak results for each of the three criteria (e.g., Did your design reduce the wobble of the trees? Did more fruits stay on the tree when using the windbreak? Was the wind speed less?)." (Lesson 10, Teacher Guide)

The Lesson 2 Learning Goal is only addressed in Lesson 2, which does not provide students with opportunities to demonstrate growth between assessment opportunities within this unit. However, the developers explain that the goal will be addressed again during unit 3.3.

- Lesson 2, Teacher Guide Lesson Assessment Guidance: "This is the only explicit opportunity in this unit to formatively assess learning goals aligned to 3-LS1-1 Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. This unit develops ideas about plant life cycles in the context of growing, reproducing, and death; animal life cycles are more fully explored in several lessons in Unit 3.3: Why do animals look and act the way that they do? Leverage students' initial learning about plant life cycles in this lesson across both units to fully assess 3-LS1-1." (Lesson Assessment Guidance, Page 2)

Students are engaged in multi-modal feedback loops.

- Lesson 5, Explore Section, Step 4: "Show students slide J and use the Tips for Giving and Receiving Feedback handout to go over how students can give feedback to one another to improve their claims. Focus students on looking for a clear prediction on where to grow a fruit and evidence about how precipitation and temperatures match the fruit's needs. Use slide K to support students in listening to the feedback and considering how to improve their claims. Once students have given and received feedback, give them time to revise their claims to improve them. In Lesson 6, they will be explicitly introduced to argumentation more fully." (Lesson 5, Teacher Guide) This explains how students will give, receive, and reflect on peer feedback to help them as they revise their work.
- Lesson 6, Lesson Assessment Guidance: "You can use these tools to also focus the feedback you provide to students on their arguments. Students will have an additional opportunity to engage in arguments from evidence later in the unit, so providing feedback to students at this point will allow them to improve arguments they make in future lessons. Give students time to review and reflect on their feedback before the arguments they make later in the unit." (Lesson 6, Teacher Guide) This instructs teachers on how to use their feedback to improve their performance on a future task.

Embedded Assessment Opportunity boxes for self-assessments include follow-up actions for teachers so that students can receive targeted feedback. For example:

- Lesson 5, Navigate Section, Step 5: "Self-assessment: This is the first opportunity for students to reflect on their work around developing a claim and supporting it with evidence. Use this self-assessment to determine which students need more support in the next lesson. Provide opportunities to annotate claims, evidence, and reasoning by suggesting they underline the claim, circle the evidence they are using, and underline their reasoning. Alternatively, provide sentence frames to support students in writing or verbally giving an argument, such as: I claim ____. The evidence ___ and ___ show ____. My reasoning for this is ___." (Lesson 5, Teacher Guide)
- Lesson 8, Explore Section, Step 3: "Self-assessment: This might be the first opportunity in 3rd grade for students to self-assess how researching a problem can provide information that is useful for designing solutions. They will work on this again in unit Unit 3.4: How do changes to ecosystems affect what lives there? Check in with students who might not feel confident in conducting research. Revisit the data cards first to ask what information is useful for understanding what happens in this type of hazardous weather. Have students point to information they think is helpful. Follow-up with questions asking how that hazard could harm or affect fruit plants. Importantly, ask students what information was easier for students to gather information from and what information was more confusing. This information can help to adjust future research options in other units. For example, some students may benefit from breaking apart information on the cards so that they work on one piece of information at a time." (Lesson 8, Teacher Guide)
- Lesson 12, Synthesize Section, Step 3: "Provide peer review and feedback. Display slide G. When students complete their individual work on the assessment, ask students to trade handouts and read each other's ideas. Using Giving and Receiving Feedback ask students to give their 1-2 feedback ideas to their partner. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints. The purpose of giving feedback is to help improve our claims by emphasizing things to look for, such as: Does the claim answer the question? Is it clear? Is there evidence to support the claim? What could make the claim or evidence easier to understand or have more support?...After the students have reviewed each other's work, give students a few more minutes to improve their arguments before turning in this work. Consider having them show their edits using a different color pencil or by writing a new claim on a separate piece of paper. This will allow them and you to see how peer feedback was used to improve their arguments." (Lesson 12, Teacher Guide) Students are prompted to give, receive, and reflect on peer feedback to help them as they revise their work.

Criterion-Based Suggestions for Improvement: N/A

Category Ratings

CATEGORY I	**NGSS 3D Design**	0	1	2	(3)
CATEGORY II	**NGSS Instructional Supports**	0	1	2	(3)
CATEGORY III	**Monitoring NGSS Student Progress**	0	1	2	(3)
TOTAL SCORE				**9**	

Overall Ratings

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