

EQulP Rubric for Science

Plants

How can plants grow in different places?

Curriculum Developer: OpenSciEd

GRADE 2 | FEBRUARY 2026

Category I Rating

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

Score Category I: 3

Category II Rating

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

Score Category II: 3

Category III Rating

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

Score Category III: 3

UNIT 2.4

Sum Categories	9
Rating	E

Overall Summary Comments

This unit is designed for the *Next Generation Science Standards (NGSS)*, it is strong in all three categories evaluated on the EQuIP rubric including clear and compelling evidence of the following criteria:

Category I

- **I.A Explaining Phenomena:** Students have opportunities to make sense of plants growing in unusual places. Individual lessons consistently return to the phenomenon as students add layers of understanding by returning to, answering, and generating new student questions.
- **I.C Integrating the Three Dimensions:** Grade-appropriate elements of the three dimensions are used together (integrated) in every lesson as students make sense of plants growing in unusual places.

Category II

- **II.A Relevance and Authenticity:** Students have opportunities to experience phenomena as directly as possible and to connect their explanations to questions from their own experiences.
- **II.B Student Ideas:** Students have opportunities throughout the unit to express their ideas in a variety of ways, get feedback from their peers and teacher, and
- **II.F Teacher Support for Unit Coherence:** Teachers are provided with tools and strategies to link student engagement across lessons.

Category III

- **III.B Formative Assessment:** Formative assessments are embedded into the instructional sequence and evaluate student thinking in all three dimensions.
- **III.E Coherent Assessment:** The unit provides a variety of assessment types (pre-, formative, summative) that target all three dimensional learning goals.

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:

Category II

- **II.C Building Progressions:** While the materials explicitly identify prior learning expected for all three dimensions, it is not at the element level.

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	6
I.B.	Three Dimensions	14
I.C.	Integrating the Three Dimensions	36
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I.F.	Math and ELA	43

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 drives student learning. Materials are organized so that students are figuring out the central phenomenon: a tree growing on top of a courthouse. Student questions and prior experiences related to the phenomenon or problem extensively motivate sense-making and/or problem-solving. Students are supported to return to the phenomenon of plants growing in unusual places. Teachers are supported to use connections between students' questions and prior experiences to motivate learning when lesson-level phenomena are introduced. For example, instruction focuses on supporting students make sense of why plants can grow in unusual/unexpected places. Students have frequent opportunities to feel as if they are driving the learning sequence through their questions and emerging understanding, rather than primarily following the teacher's lead. Almost all of the student learning in the three dimensions targeted by the materials is in service of students making sense of phenomena.

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

Student-centered focus on phenomena or problems

The materials focus on a central phenomenon: a tree growing from the top of a building.

- Lesson 1, Connect, Step 1: "Tell students that you recently read a newspaper article about a plant growing in an unusual place that you would like to share with them." This comes after the teacher shares an experience of her own, noticing a plant growing in an unusual place. "Invite some students to share their own or their partner's experiences noticing plants growing around them." (Lesson 1, Teacher Guide)
- Lesson 2, Navigate, Step 1: "Recognize with students that many of us have experiences with seeds, yet almost all of our experiences were different and happened with different seeds and in different places. This means that we cannot easily compare our experiences with seeds or use them to directly answer our class's lesson question. So, we need to do what scientists do! We need to gather more information about seeds together!" (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: "Then, invite students to turn and talk about what they observe and what experiences they may have had that are like these images." "This step ensures that all students are aware of seeds that can stick (and therefore be moved to new places), even if they haven't directly had this experience." "Acknowledge and appreciate students' observations and their sharing their experiences and stories, affirming for students that our observations and experiences suggest that seeds can stick to surfaces." Lesson 3, Teacher Guide)
- Lesson 4, Navigate, Step 7: "Acknowledge with students that we have figured out a lot about how seeds with different structures can be moved, but that we might still have things we wonder about seeds. Remind students that scientists regularly generate new questions after they figure some things out! Invite students to ask new questions about seeds. Record students' questions on sticky notes to be added to the Notice and Wonder chart (refer to slide P)." (Lesson 4, Teacher Guide)

- Lesson 5, Connect, Step 2: “Invite students to turn and talk with a partner about how they think pollen might move. The purpose of this turn-and-talk is to provide an initial opportunity for students to share ideas and make connections between the text and their experiences.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 5: “Draw students’ attention to the Lesson 2 row of Our Growing Ideas chart (refer to slide I), inviting students to think first, then pair with a partner to consider whether the ideas we figured out in Lesson 2 could help us explain how a seed that grew into the Tower Tree could have gotten to the top of the courthouse. Then, invite a few students to share ideas as a class and ensure the class is in agreement.” (Lesson 6, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Review Plant Investigation Plan and discuss what to do next. Then, use the following prompts and the class’s Plants Investigation Plan (refer to slide A) to decide what to do next in carrying out our investigation.” Prompts include: “Do you think we have answered our investigation question, “Do plants need light and water to keep growing and stay healthy?” yet? Why or why not?” “What do we still need to do to figure out an answer to our investigation question?” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Step 4: “Turn and talk about plants growing in different places. Invite students to turn and talk with a partner about our Lesson Set 2 Question. How does our investigation evidence help us answer our lesson set question? What new questions do you have about how plants keep growing in different places?” Prompts include: “How does our investigation evidence help us answer our lesson set question?” “What new questions do you have about how plants keep growing in different places?” (Lesson 9, Teacher Guide)
- Lesson 10, Connect, Step 2: “Tell students that we can return to these now to share the plants we found in unusual places!...Display slide H and tell students that they will share their experiences with plants growing in unusual places around their home or community in small groups. If available, students can use their Out-of-School Plants in Unusual Places community connection. Each person should 1) choose one plant, 2) show or tell where the plant was growing, and 3) share why we think this is an “unusual” place for the plant to grow.” (Lesson 10, Teacher Guide)

Consistent student-driven learning over time

Co-construction of lesson questions used for lesson and unit investigations. Evidence includes

- Lesson 1, Navigate, Step 7: “Co-construct a Lesson Set 1 Question. Suggest we start with one of these 2 groups—the one about how seeds get to different places to start growing.” (Lesson 1, Teacher Guide)
- Lesson 2, Navigate, Step 1: “Co-construct the lesson question. Build on students’ questions from the Notice and Wonder chart about seeds and how seeds get to different places to start growing in order to co-construct a lesson question similar to, How can seeds get to new places? Revise the question on slide B to match the words used by your class and then display it.” (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: “Co-construct the lesson question. Summarize students’ wonders by restating how our questions suggest we are wondering whether seeds sticking to surfaces is another way that they could get moved to new places.” (Lesson 3, Teacher Guide)
- Lesson 4, Navigate, Step 1: “Co-construct the lesson question. Use the discussions the class has had so far to co-construct the lesson question. Work with students to develop a question like, “Can seeds be moved by animals when using them for food? If so, how?” Feel free to use terms and phrasing that reflect your class’s ideas.” (Lesson 4, Teacher Guide)
- Lesson 5, Connect, Step 2: “Co-construct the lesson question. Use students’ questions to co-construct your class’s version of the Lesson 5 question, ‘How can pollen be moved in order to make seeds?’” (Lesson 5, Teacher Guide)

- Lesson 6, Navigate, Step 1: “Co-construct the lesson question. Invite students to share a few of their ideas about what we want to figure out about seeds that are in fruits. With students’ input, use these ideas to co-construct your class’s version of the Lesson 6 Question, ‘How can seeds in fruits be moved to new places?’” (refer to slide E).” (Lesson 6, Teacher Guide)
- Lesson 7, Explore, Step 4: “In small groups, develop a question to investigate. Provide each student with a Planning Our Plants Investigation handout and writing utensil. Give students a few minutes to work with their group to co-construct a plant investigation question. Circulate and ask students what we are trying to figure out. Listen for ideas that we are trying to figure out if plants need light and water to keep growing and stay healthy. Once the students have identified their own version of the investigation question, have them write the question on their Planning Our Plants Investigation handout.” (Lesson 7, Teacher Guide)
- Lesson 9, Explore, Step 2: “Craft the lesson question. Remind students that we have been working over the last few lessons to answer our investigation question from Lesson 7...*Do plants need light and water to keep growing and stay healthy?* Suggest to students that we compare plant data across the whole class to try to answer that together. Propose a question...that indicates the work in the rest of our lesson...This will likely be something like, *Did plants need light and water to keep growing and stay healthy? How do we know?* However, feel free to use terms and phrasing that reflect your class’s ideas.” (Lesson 9, Teacher Guide)

Notice and Wonder Charts were developed using student ideas.

- Lesson 1, Explore, Step 2: “Introduce the class Notice and Wonder chart. Display the Notice and Wonder chart (refer to slide D) in a place where students can all see it and participate in this discussion. Share with students that this Notice and Wonder chart will be a place to record and return to our observations (details we notice using our senses) on the “Notice” side and questions (what we wonder) on the “Wonder” side, so we can use these to figure out what to do next. This is important scientific work!” (Lesson 1, Teacher Guide)
- Lesson 2, Navigate, Step 7: “Wonder about other seeds being moved to new places. Use the following prompts to support students in reconnecting to the Seeds Observations data table to surface new questions about seeds with structures that we did not identify as being moved by the wind. Record students’ questions on sticky notes to be added to the Notice and Wonder chart (refer to slide M). New wonders generated and recorded here are likely to support students’ data motivation into both Lesson 3 and Lesson 4.” (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: “Review wonders about seeds moving. Using the Seeds Observations data table (refer to slide A) and the Notice and Wonder chart (refer to slide B) or preselected stickies (including those from the final Navigate of Lesson 2), review questions that students have asked related to how seeds can be moved to new places, besides by the wind.” (Lesson 3, Teacher Guide)
- Lesson 4, Navigate, Step 1: “Recall where we left off. Gather students in a Scientist Circle to revisit the Notice and Wonder chart and the Seeds Observations data table (refer to slide A). Use the following prompts and have students turn and talk with a partner about what they figured out during the previous lesson. Then invite a few students to briefly share what they discussed.” (Lesson 4, Teacher Guide)
- Lesson 5, Navigate, Step 1: “Display the class’s Notice and Wonder chart (refer to slide A) and read the unit question, How can plants grow in different places? Remind students that we have been working to answer our unit question by first trying to figure out our Lesson Set 1 Question, How do seeds get to different places to start growing into plants? Remind students that we have figured out a variety of ways that seeds can get to different places to start growing, but we still have questions about seeds!” (Lesson 5, Teacher Guide)
- Lesson 6, Navigate, Step 7: “Use the following prompts to engage students in a discussion about the other group of questions on our Notice and Wonder chart; our unanswered questions about how plants keep growing in different

places and to invite students in sharing their related experiences.” “Add new wonders. Build on students’ experiences to generate new questions we can add to the Wonder side of the Notice and Wonder chart, using the suggested prompt below.” (Lesson 6, Teacher Guide)

- Lesson 7, Navigate, Step 7: “Add new questions to our Notice and Wonder chart. Add the questions students share to the Wonder side of the chart now, along with new questions or ideas that came up during this lesson.” (Lesson 7, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Use our Notice and Wonder chart to recall where we left off. Display slide A and remind students how we added some new questions to our Notice and Wonder chart last time, after we planned our Plants Investigation and started carrying it out. Use the following prompt to invite students to recall these questions.” (Lesson 8, Teacher Guide)
- Lesson 9, Connect, Step 5: “Take stock of questions on the Notice and Wonder chart. Display slide Q and point out that some of our questions on our Notice and Wonder chart may be answered now that we have evidence that light and water cause plants to keep growing and stay healthy.” (Lesson 9, Teacher Guide)
- Lesson 10, Navigate, Step 1: “Recall where we left off. Display slide A and refer to our Notice and Wonder chart to remind students that we left off identifying questions we have answered and ones that we still need to answer. Invite students to help you recall the remaining questions, which are the questions about the Tower Tree growing on top of the courthouse from Lesson 1.” (Lesson 10, Teacher Guide)

When multiple phenomena and /or problems are used

Phenomena are clearly connected to each other in a logical way from the student’s perspective and build on each other coherently.

- Lesson 1, Explore, Step 2: “Remind students that we decided to take a closer look at the Tower Tree by using photographs that other people have taken and shared.” “Provide Tower Tree photographs and make observations. Organize students into pairs and provide each partnership with 1 prepared card from the Tower Tree Cards set (refer to slide C) to observe and discuss together.” (Lesson 1, Teacher Guide)
- Lesson 1, Explore, Step 3: “Remind students that we wanted to gather more observations of plants growing in different places, so we decided to go outside into our own schoolyard. We might even find plants growing in unusual places, like the Tower Tree from the Mystery Tower Tree Still Growing Strong newspaper article!” “Go outside and make observations. Bring students outside to your pre-determined location/s and have students find, observe, and record plants growing in different places.” (Lesson 1, Teacher Guide)
- Lesson 2, Navigate, Step 1: “Remind students how (in our last lesson) we organized our wonders on our Notice and Wonder chart into two groups and decided to focus first on wonders about seeds and how seeds get to different places to start growing, including questions about how a seed got to the top of the courthouse to start growing into the Tower Tree.” Explore, Step 2: “Hold up 1 bag of assorted seeds and tell students that they will have some time with a partner to explore with seeds. Remind students that exploring with seeds together will allow us to gather more information about seeds before returning to our lesson question about how they get to new places.” (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: “Summarize students’ wonders by restating how our questions suggest we are wondering whether seeds sticking to surfaces is another way that they could get moved to new places. We’re wondering about different seeds and different surfaces and—in general—how “sticking together” might work. Use this summary and students’ questions to co-construct a lesson question, likely something similar to, How can seeds be moved to new places by sticking?” “Use images to further connect to seeds that stick. Display slide C and provide a moment for students to make observations of the images on the slide.” (Lesson 3, Teacher Guide)

- Lesson 4, Navigate, Step 1: “Connect Lesson 3 experiences with animals being near plants. Elevate ideas that students just shared to affirm that we have figured out that some seeds—for example, ones with spikes—can be moved to new places when they get stuck to animals. As you do so, consider pointing to that row on the Seeds Observations data table (refer to slide A).” “Wonder aloud with students about why an animal might be near a plant, anyway. The purpose of this moment is to prepare students to generate connections to how animals might use seeds as food, next.” “Display images of animals with seeds. Display slide B, with images of two animals that use seeds for food, a squirrel and a blue jay.” (Lesson 4, Teacher Guide)
- Lesson 6, Navigate, Step 1: “Confirm with students that we do not yet know about the seeds that could have grown into the Tower Tree! You might say something like, Wow! We have figured out so much about how seeds can be moved to new places, but we don’t yet know about the seeds that grew into the Tower Tree. If we don’t know what type of seeds grow into this type of tree, then we don’t know what structures they have, and we need that information to know how they might be moved!” “Display slide C and share with students that you found some pictures of an aspen tree and a mulberry tree and we can look at these trees and an image of the Tower Tree. Connect to mulberries, berries, and fruit. Display slide D and share with students these images of mulberry tree branches with fruit, and a close-up of mulberries.” (Lesson 6, Teacher Guide)
- Lesson 7, Navigate, Step 1: “Display slide B and remind students what the class has figured out so far (pane 1) and what the class needs to figure out next (pane 2) to fully answer our Unit Question: How can plants grow in different places? Give students a minute to look at the model and discuss the prompts with a partner. Use the following prompts to review students’ wonderings about what a plant needs to grow.” Explore, Step 2: “Observe images of plants over time. Display slide E and tell students that the images on the slide are of the same growing plant (basil) but at two different points in time...Invite students to turn and talk to a partner about what they observe that helps them know that the plant on the slide is growing.” (Lesson 7, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Step 1, “Suggest that our work in this lesson centers around figuring out what is happening to our plants as we continue to keep them in their different conditions and make observations.” Explore, Step 2: Directions for this lesson are for students to Carry Out An Investigation Observation 2, Observation 3, and Observation 4. “In small groups, make observations of plants.” Explore, Step 4: “Gather the class’s attention and use the following prompt to engage in a brief discussion to support students in connecting observed differences between their plants in different conditions to possible causes.” “Affirm students’ ideas, and elevate that we have continued to gather more observations that we can use as evidence! Point out that, based on all of these observations, it seems like we are ready to answer our lesson question, How are our plants in different conditions similar and/or different?” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: “Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts.” Synthesize, Step 4: Teaching Tip, “Prompting students to reconnect to the Lesson Set 2 Question and share questions about plants growing in different places motivates reading a text in the next Connect in order to gather information that all plants need light and water to grow and stay healthy. During this discussion, students may share and/or ask about the unit’s anchoring phenomenon (the Tower Tree) and/or other plants growing in unusual places. Acknowledge and accept these in a way that reassures students that we will return to these phenomena; that is the putting-pieces-together work of the next lesson.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 2: “Remind students that we want to update our Initial Class Model with the evidence we have gathered that supports our answer to the question at the top, How does the Tower Tree keep growing there? Then, invite students to identify resources (charts, graphs) where we have recorded evidence we have gathered about how plants keep growing and stay healthy.” Connect, Step 6: Students read a book titled “Plants in Our Communities” that introduces students to plants growing in different places with varied success. “Remind the class that we want to use what we have figured out about plants to help people in our own communities.” “Use the

question on page 14 of the *Plants in Our Communities* book and the prompts on slide O to invite students to think first, then share with a partner about how they can use what they have figured out about plants in this unit to help their family, friends, or community. How will you help plants in your community to make sure they will keep growing and stay healthy?” (Lesson 10, Teacher Guide)

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

Close match between the phenomena/problems and the student learning objectives throughout the materials

- Lesson 1a, Students **develop an initial model to represent how the Tower Tree got (function) to an unusual place to start growing.**
 - Lesson 1, Synthesize, Step 5: “Show students an Initial Model: How is the Tower Tree growing there? handout (refer to slide K) and read the directions/prompts with them. To support students in connecting their work across this science lesson, point out how the organization of the wonders on our Notice and Wonder chart in the previous Synthesize coordinates with the two questions on our handout: “How did a seed get there to start growing?”, and “How does the Tower Tree keep growing there?” (Lesson 1, Teacher Guide)
- Lesson 1b, Students **develop an initial model to represent what causes the Tower Tree to keep growing (effect) in an unusual place.**
 - Lesson 1, Synthesize, Step 6: “Display slide M and the blank Initial Class Model with the question at the top, “How is the Tower Tree growing there?” Remind students that our class model will use words and pictures to explain beginning ideas about this question.” (Lesson 1, Teacher Guide)
- Lesson 2, Students **make observations to compare seeds’ structures and begin to relate these to how seeds can be moved to new places (function).**
 - Lesson 2, Explore, Step 4: “As a class, you will use the following discussion to co-construct the Seeds Observations data table using students’ recorded observations, first using observations of what seeds look like (e.g., size, shape) and then observations of what seeds feel like.” (Lesson 2, Teacher Guide)
- Lesson 3, Students **make observations of seeds and surfaces to compare structures that function so that seeds stick (or do not stick).**
 - Lesson 3, Explore, Step 4: “Introduce the Seeds and Surfaces data table. Tell students that—as many of them suggested at the end of investigation—using a class data table, like the one we used in Lesson 2, can help us share and compare everyone’s observations together. Display the prepared, but blank, Seeds and Surfaces data table (refer to slide M). Point out how the data table is organized into columns for each of the surfaces we investigated in our small groups. Suggest to students that we can add the seeds we investigated and record whether or not they stuck to each surface.” (Lesson 3, Teacher Guide)
- Lesson 4, Students **develop a simple model to represent animal body part/s (mouth and paws or beak) and seeds that can function together to move seeds to new places.** The phenomena is an infographic with images of chipmunks and voles with seeds in their paws and mouths.
 - Lesson 4, Explore, Step 3: “Suggest to students, now that we have decided to use tweezers to mimic bird beaks, we should figure out how to use them to gather information related to our lesson question, Can seeds be moved by animals when using them for food? If so, how? Use the following prompts to engage students in planning how to use tweezers in their investigation.” (Lesson 4, Teacher Guide)

- Lesson 4, Synthesize, Step 5: “Remind students that they have gathered information from infographics (Animal Mouths and Paws Infographics infographics, focusing on chipmunks and voles) and from an investigation (using a beak-like tool to focus on birds) about the structures of animals’ mouths, paws, and beaks and how these make it possible for animals to move seeds to new places when they use seeds for food by storing them for later. Now, we can develop a model to help us further make sense of our lesson question, Can seeds be moved by animals when using them for food?”(Lesson 4, Teacher Guide)
- Lesson 5, Students **develop a simple model to represent a bee that functions to move pollen to a new place.**
 - Lesson 5, Explore, Step 4: “Allow students time to develop and use a model representing how a bee’s legs/ body could move pollen from one flower to another. Circulate to ask students about their work and how their model is (or is not) working to move pollen from one flower to another.” (Lesson 5, Teacher Guide)
 - Lesson 5, Synthesize, Step 5: “Facilitate a discussion to collectively develop a model that represents the relationship between bee and pollen structures that function together to move pollen from one flower to another. During this discussion, support students in finding areas of agreement and follow up to ask what evidence supports those ideas.” (Lesson 5, Teacher Guide)
- Lesson 6, Students **develop a model to represent structures of a seed and animal body part/s that work together to move a seed that grew into the Tower Tree to its unusual place (function).**
 - Lesson 6, Synthesize, Step 5: “Ensure each student has a My Model: How did a seed get there to start growing into the Tower Tree? assessment and writing utensil. Encourage students to refer to the Lesson 6 Gotta-Have-It Checklist (refer to slide M) and Our Growing Ideas chart as they work, and that their Initial Class Model and the Word Wall are also resources they can reference as they individually develop their models.” (Lesson 6, Teacher Guide)
- Lesson 7, Students **plan and begin carrying out an investigation to produce data to serve as evidence that light and water cause plants to keep growing and stay healthy (effect).**
 - Lesson 7, Explore, Step 4: “Remind students to refer to their Planning Our Plants Investigation handouts during the discussion. The purpose of this discussion is for students to share the variety of ideas they have generated about how to set up an investigation that will allow for data collection about plants needing light and water to keep growing and stay healthy.” “Using the following prompt and follow-up responses to facilitate a discussion about the types of observations the class will make, adding the class’s decisions to the Plants Investigation Plan.” “The purpose of this part of co-developing the investigation plan is to support students in deciding upon the specific kinds of data—including qualitative data (described using words and images) and quantitative data (observations that can be counted or measured)—they will collect that will serve as evidence that a plant keeps growing and stays healthy (or does not).” (Lesson 7, Teacher Guide)
- Lesson 8a, Students **carry out an investigation to gather data to serve as evidence that light and water cause plants to keep growing and stay healthy (effect).**
 - Lesson 8, Explore, Step 4: “As partners make observations, use any of the following prompts to support students in collecting data, while also, as possible, posing the last question (about causation) to students. Prompts to use include, ‘What is similar and/or different between Plant ___ and Plant ___ (the two plants you are observing)? What do you think is causing that?’”(Lesson 8, Teacher Guide)
- Lesson 8b, Students **display plants’ heights (using standard units) using a line plot and compare plants in different conditions.**
 - Lesson 8, Explore, Step 6: “Gather the whole class’s attention to engage students in a brief discussion, the purpose of which is to elevate how the line plot is a useful tool for comparing plants’ height data because of

how it helps us visualize our recorded observations. Prompts to use ‘How was displaying your data as a line plot useful for comparing plants’ heights?’ (Lesson 8, Teacher Guide)

- Lesson 9a, Students **carry out an investigation to gather data and use patterns as evidence** that **light and water cause plants to keep growing and stay healthy (effect)**.
 - Lesson 9, Navigate, Step 1: “Affirm that last time, we made observations and measurements of our group’s plants, recorded data about their growth (height and number of leaves) and health (color and appearance), and compared our plant heights using a line plot. We are carrying out our Plants Investigation Plan in order to gather evidence to answer our investigation question, Do plants need light and water to keep growing and stay healthy?” (Lesson 9, Teacher Guide)
 - Lesson 9, Explore, Step 3: “Display slide M and use the prompt below to support students in using the patterns in data from both data tables to summarize the patterns in plant health (color and appearance).” (Lesson 9, Teacher Guide)
- Lesson 9b, Students **display and compare plants’ growth (height, number of leaves) using line plots** to identify evidence that **plants need light and water (cause) to keep growing (effect)**.
 - Lesson 9, Synthesize, Step 4: “Use the following prompts to invite students to think first, then talk with a partner, then share with the group to discuss each question and add to Our Growing Ideas chart.” Prompts to use include, “Let’s look back at our question, Did plants need light and water to keep growing and stay healthy? How do we know? What did we figure out about that?”, “Can a plant keep growing and stay healthy with just water or just light? How do we know?” (Lesson 9, Teacher Guide)
- Lesson 10, Students **develop a model to represent the pattern of light and water causing plants to keep growing and stay healthy (effect)**.
 - Lesson 10, Synthesize, Step 2: “Work with students to add cause-and-effect reasoning statements to the Class Consensus Model that answer the question at the top, How does the Tower Tree keep growing there (on top of the courthouse)? For example, your class may decide to add the following statements to their model...The evidence from our investigation that helps us know this is that all/most of our plants in condition A were the tallest and healthiest and they got light and water. Other evidence from our investigation that helps us know this is that the plants that did not get light and water (plants in conditions B, C, and D) did not keep growing.” (Lesson 10, Teacher Guide)
 - Lesson 10, Synthesize, Step 4: “As students develop their models, circulate and engage in brief one-on-one discussions with students. As students share their ideas, encourage the use of words, drawings, spoken language, and gestures.” Prompts to use include, “What causes the plant to keep growing and stay healthy?” “What evidence from our Plants Investigation helps you know how this plant is growing and staying healthy?” (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.

When students are designing solutions to problems (with or without connections to ETS DCIs)

- N/A - Engineering is not a learning focus in this unit

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 **extensive** evidence that the materials provide students with opportunities to build understanding of grade-appropriate elements of the three dimensions. Students regularly engage in targeted elements of all three dimensions to make sense of the anchoring phenomenon: a tree growing in an unusual location—the roof of a courthouse. These targeted elements are clearly identified and consistently addressed throughout the unit.

Rating for Criterion: SEP

EXTENSIVE

- i. Provides opportunities to *develop and use* specific elements of the SEP[s].

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

The following SEP elements are claimed as intentionally developed:

- **MOD-P3: Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).**
- **MOD-P4: Develop a simple model based on evidence to represent a proposed object or tool.**
- **MATH-P3: Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.**

The following elements were described as being used periodically to support overall development of the practice:

- **AQDP-P1: Ask questions based on observations to find more information about the natural and/or designed world(s).**
- **AQDP-P2: Ask and/or identify questions that can be answered by an investigation.**
- **MOD-P1: Distinguish between a model and the actual object, process, and/or events the model represents.**
- **MOD-P2: Compare models to identify common features and differences.**

- **INV-P2: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.**
- **INV-P4: Make observations (firsthand or from media) to collect data that can be used to make comparisons.**
- **MATH-P1: Decide when to use qualitative vs. quantitative data.**
- **MATH-P2: Use counting and numbers to identify and describe patterns in the natural and designed world(s).**
- **DATA-P1: Record information (observations, thoughts, and ideas).**
- **DATA-P2: Use and share pictures, drawings, and/or writings of observations**
- **DATA-P3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.**
- **ARG-P3: Analyze why some evidence is relevant to a scientific question and some is not.**
- **INFO-P1: Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).**

The following SEP elements are claimed as intentionally developed:

MOD: Developing and Using Models

Claimed Element: **MOD-P3 Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).**

Claimed in Lessons 1, 5, 6, and 10. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Synthesize, Step 1: “Develop a model of the phenomenon. Organize students into pairs and distribute an Initial Model: How is the Tower Tree growing there? handout and writing utensil to each student. Remind students how we are using drawing, writing, and labeling on our Initial Model: How is the Tower Tree growing there? handouts to develop a model representing our initial ideas about how a seed could have gotten to the top of the courthouse to start growing and how the Tower Tree continues to grow in that unusual place.” (Lesson 1, Teacher Guide)
- Lesson 5, Synthesize, Step 4: “Develop and use bee-pollen models. Allow students time to develop and use a model representing how a bee’s legs/body could move pollen from one flower to another.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 5: “Develop models and use resources. Ensure each student has a My Model: How did a seed get there to start growing into the Tower Tree? assessment and writing utensil. Encourage students to refer to the Lesson 6 Gotta-Have-It Checklist (refer to slide M) and Our Growing Ideas chart as they work, and that their Initial Class Model and the Word Wall are also resources they can reference as they individually develop their models.” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Next, read the prompts below the box on the My Model: How does this plant keep growing here? assessment, “How does this plant keep growing and stay healthy in this place?” and “How do you know what the plant needs to keep growing and stay healthy?”. Tell students they will write how the plant keeps growing and stays healthy and then give evidence for how their plant is growing and staying healthy. Encourage students to refer to our completed Class Consensus Model (showing the Tower Tree), Our Growing Ideas chart, the Plants Investigation Results, and any other class resources they may find helpful while they individually develop their models.” (Lesson 10, Teacher Guide and My Model: How does this plant keep growing here?, Student Materials).

Claimed Element: **MOD-P4: Develop a simple model based on evidence to represent a proposed object or tool.**

Claimed in Lessons 3, 4, and 5. Evidence was found in claimed lessons, evidence includes

- Lesson 3, Synthesize, Step 5: “With students’ input, decide to use materials from the investigation (cocklebur/s, fur-like material/s) to enact a scenario in which seeds get stuck to the dog’s fur, the dog moves somewhere new, and the seeds are released in the new location.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “After students have gathered information from infographics (Animal Mouths and Paws Infographics infographics, focusing on chipmunks and voles) and from an investigation (using a beak-like tool to focus on birds) about the structures of animals’ mouths, paws, and beaks and how these make it possible for animals to move seeds to new places when they use seeds for food by storing them for later, they develop a model using their collaboratively developed Gotta-Have-It-Checklist to help them represent seeds being moved by animals when using them for food? And how?” “Individually develop a model. Provide time for students to individually develop their models.” (Lesson 4, Teacher Guide)
- Lesson 5, Synthesize, Step 5: “Co-develop a Bee-Pollen Consensus Model. Facilitate a discussion to collectively develop a model that represents the relationship between bee and pollen structures that function together to move pollen from one flower to another. During this discussion, support students in finding areas of agreement and follow up to ask what evidence supports those ideas.” (Lesson 5, Teacher Guide)

MATH: Using Mathematics and Computational Thinking

Claimed Element: **MATH-P3: Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.**

Claimed in Lessons 8 and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 8, Explore, Step 4: “Provide time for students (in pairs) to make observations of their 2 assigned plants and record the data on the coordinating pages of their Plant Observations handouts. Continue to encourage partners to come to an agreement...Provide time for partners to show their plants, tell their group members about the observations they made, and share the data they recorded.” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 3: “You will use a series of Think, Pair, Share discussions to engage students in using the line plots on the class’s Plant Growth Data chart to analyze their investigation data and describe patterns in plants’ growth (height and number of leaves). What do you notice about our plants’ height data? Number of leaves data? In Observation 5, which plants are (usually) the tallest? The shortest?...which plants (usually) had the most leaves? The fewest? Using the Plant Height line plot, what do you notice when we compare our plants’ height data? Using the Number of Leaves line plot, what do you notice when we compare our plants’ leaf data? What patterns do you notice using our Plant Height line plot? Over and over again, what do you notice about the height of plants in different conditions? What patterns do you notice using our Number of Leaves line plot? Using both line plots, what do the patterns in our data tell us about the growth of plants in different conditions?” (Lesson 9, Teacher Guide)

The following elements were described as being used periodically to support overall development of the practice:

MOD: Developing and Using Models

Claimed Element: **MOD-P1: Distinguish between a model and the actual object, process, and/or events the model represents**

Claimed in Lesson 5. Evidence was found in 3, 4, and 5, evidence includes

- Lesson 3, Explore, Step 2: “Discuss ideas for materials that are like animals. Then, invite students’ ideas for materials we could use that might be like the outside—or surface—of an animal, such as its fur, hair, or other covering, depending on ideas students have previously generated. What materials could we use that would be like the outside—or surface—of an animal? Connect suggestions to “mimic.” Explain to students that these suggestions are examples of materials that mimic animals’ coverings...These materials they suggested are like the outside—or surface—of different animals. Point out that in science, we sometimes use materials that mimic real things so we can safely investigate our ideas.” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3: “Listen for students to share that we used objects that mimic (to act like or copy) real animals; for example, we used fur-like materials to mimic dog fur. Decide on which object/s to use to mimic bird beaks. Then, display slide H and hold up and briefly demonstrate with (by opening, closing, squeezing) tweezers, tongs, and a coin pouch, showing students possible materials they can use that can mimic a bird beak” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 3: “During the brief discussion about the material to use for a flower and this discussion—as students are using the sentence frame on slide H to consider materials to mimic pollen—they have an opportunity to engage in this work concretely, distinguishing between the materials in the model (sand, coffee filters) and the actual objects the model represents (pollen, flowers). These steps position students to continue to develop and use their model for sensemaking as they make connections to the process of pollination, using their models to explain how pollen can be moved from one flower to another.” (Lesson 5, Teacher Guide)
- Lesson 5, Synthesize, Step 4: “The purpose of this discussion is to support students in connecting structures of bee legs/bodies that function to make it possible for pollen to be moved from one flower to another.” Prompts to use include, “What is the same about the chenille stems and pom poms? In other words, what structures of bee legs/bodies make it possible for pollen to stick?” “How did the bee leg/body function? How did chenille stems and pom poms work together with the pollen to move the pollen?” (Lesson 5, Teacher Guide)

Claimed Element: **MOD-P2: Compare models to identify common features and differences.**

Claimed in Lessons 1, 6, and 10. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Synthesize, Step 5: “Motivate comparing initial models with partners. Gather the class’s attention to invite students to pause and compare their initial models with their partner. Tell students they are welcome to add to or change their own model if they see something their partner included that they now think is important or they like the way their partner chose to label or show something; however, students do not need to make additions or changes.” (Lesson 1, Teacher Guide)
- Lesson 6, Synthesize, Step 5: Students compare models with a partner to identify common features and differences, using their Lesson 6 Gotta-Have-It Checklist (slide M), when they engage in giving and receiving peer feedback using slide N when they show and tell how their model answers the question, How did a seed get to the top of the courthouse to start growing into the Tower Tree?” (Lesson 6, Teacher Edition)
- Lesson 10, Synthesize, Step 5: “Give students a few minutes to share and compare their completed My Model: How does this plant keep growing here? assessment in pairs, continuing to reference slide L. As students share and compare, support partner discussions by encouraging students to explain their thinking using their bodies, gestures, and classroom resources, including Our Growing Ideas chart and/or the Plants Investigation Results.” (Lesson 10, Teacher Guide)

INV: Planning and Carrying Out Investigations

Claimed Element: **INV-P2: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.**

Claimed in Lessons 3, 4, 7, 8, and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 3 provides opportunities for students to engage in this practice in three separate steps:
 - Lesson 3, Explore, Step 2: “We decided we wanted to investigate, or look for answers, by trying different materials to figure out which things stick together and how that works! Invite students to turn and talk with a partner about what kinds of surfaces they would like to find out if seeds stick to.” “Invite students’ ideas for materials we could use that might be like the outside—or surface—of an animal, such as its fur, hair, or other covering, depending on ideas students have previously generated. Discuss and decide on seeds. Return students’ attention to their Seeds Observations data table (refer to slide F) to review which seeds we are still wondering about and therefore which ones we will want to investigate. Invite students’ input about how to make and record our observations of seeds sticking to surfaces during their investigation.” (Lesson 3, Teacher Guide) Students go on to conduct their investigation in Lesson 3, Explore, Step 3 and use the data as evidence to answer their questions in Lesson 3, Explore, Step 4.
- Lesson 4 provides opportunities for students to engage in this practice in two separate steps:
 - Lesson 4, Explore, Step 3: “What we want to gather evidence about, is whether birds also move and store seeds, like chipmunks and voles...Invite students to turn and talk with a partner about which object or objects they think would best be used in their investigation, to figure out if and how birds can move and store seeds, and why. Use students’ input (and your own availability of materials) to use tweezers, tongs, or both, and indicate to students that you will have enough materials for them to investigate in pairs. Summarize and affirm students’ ideas for using the tweezers to mimic a bird’s beak to try to pick up, move, and bury seeds in the ground/dirt/sand. Suggest that we can also mimic a bird flying by moving our tweezers around.” (Lesson 3, Teacher Guide) Students go on to continue planning and conducting their investigation in Lesson 3, Explore, Step 4.
- Lesson 7 provides opportunities for students to engage in this practice in three separate steps. Students observe the investigation over several days and accumulate data to answer their question in a separate lesson.
 - Lesson 7, Explore, Step 4: “Give students a few minutes to work with their group to co-construct a plant investigation question. The purpose of this discussion is for students to share the variety of ideas they have generated about how to set up an investigation that will allow for data collection about plants needing light and water to keep growing and stay healthy.” (Lesson 7, Teacher Guide)
- Lesson 8 provides opportunities for students to engage in this practice in four separate steps:
 - Lesson 8, Explore, Step 2: “Provide time for students to make observations of their groups’ plants and record the data on the coordinating page of their Plant Observations handouts. [I]nvite students to use the pipette to water the plants getting water (plants in conditions A and B). Have students return all of their group’s plants to the areas designated for different conditions and return other investigation materials (e.g., rulers, water, pipettes) as well as their group’s 4 Plant Observations handouts.” (Lesson 8, Teacher Guide) Students go on to make and record their third set of observations in Lesson 8, Explore, Step 3, fourth set of observations in Lesson 8, Explore, Step 4 and begin comparing data to serve as evidence to answer their question in Lesson 8, Synthesize, Step 5.
- Lesson 9 provides opportunities for students to engage in this practice in three separate steps:
 - Lesson 9, Explore, Step 2: “Let students know that they will be responsible for individually making and recording the fifth set of observations for one plant. Provide students with time to make individual

observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts. In pairs, make line plots of height and number of leaves data.” (Lesson 9, Teacher Guide) Students go on to plot and analyze data in Lesson 9, Explore, Step 3 and use the data as evidence to answer their questions in Lesson 9, Synthesize, Step 4.

Claimed Element: **INV-P4: Make observations (firsthand or from media) to collect data that can be used to make comparisons.**

Claimed in Lessons 2, 3, 7, 8, and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 2, Explore Section, Step 3, Students make firsthand observations of seeds’ size, shape, and texture in order to collect data that can be used to make comparisons among seeds’ structures. (Lesson 2, Teacher Guided and My Seed Observations handout, Student Materials).
- Lesson 3, Explore, Step 3: “Provide hand lenses to students and provide time for students to make observations of their surface using their senses of sight and touch...Invite students’ ideas for how we can share and compare our observations so that we also have lots of them together to use as evidence to answer our questions about which seeds and surfaces stick together.” (Lesson 3, Teacher Guide)
- Lesson 7, Explore, Step 2: “Observe images of plants with a partner. Invite students to turn and talk to a partner with a different card about what they observe that helps them know if the plant is healthy or unhealthy. Remind students that we can share observations (the details we notice using our senses) in many ways, including using words to describe details we notice, by pointing to images, gesturing, and/or moving our bodies.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 2: “Use the Plants Investigation Plan (refer to slide C) to recall with students how we decided to make observations of the plants. For each of our 4 plants, Make and record observations: a. Measure height, b. Count leaves, c. Describe the plant’s color, Describe how the plant looks. Provide time for students to make observations of their groups’ plants and record the data on the coordinating page of their Plant Observations handouts. To make comparisons of their plants A-D for Observation 2, students can reference the recorded data in the “Observation 2” column of their 4 Plant Observations handouts and/or refer to their Plants A-D. Use the prompts on slide G to help small groups engage in this conversation. For Observation 2, what is similar for Plants A, B, C, and D? What is different? Then, have students recall how the plants were very similar last time, in Observation 1.” (Lesson 8, Teacher Guide)
- Lesson 8, Explore, Step 4 “Provide time for students (in pairs) to make observations of their 2 assigned plants and record the data on the coordinating pages of their Plant Observations handouts. As partners make observations, use any of the following prompts to support students in collecting data. Invite small groups to compare their plants A-D for Observation 4. For Observation 4, what is similar for Plants A, B, C, and D? What is different?” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: “Remind them that they will make and record their final set of observations of their group’s plants as we continue to gather data we can use as evidence for what plants need to keep growing and stay healthy. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts. Suggest students first compare their plants’ health data by showing their plants and the observations they recorded,” (Lesson 9, Teacher Guide)
- Lesson 9, Explore, Step 3: “Invite students to share and discuss their and their partner’s ideas using the prompts below. Using the Plant Height line plot, what do you notice when we compare our plants’ height data? Using the Number of Leaves line plot, what do you notice when we compare our plants’ leaf data? Using the Plant Color data table, what do you notice when we compare our plants’ colors? Using the Plant Looks... data table, what do you notice when we compare how our plants look?” (Lesson 9, Teacher Guide)

MATH: Using Mathematics and Computational Thinking

Claimed Element: **MATH-P1: Decide when to use qualitative vs. quantitative data.**

Claimed in Lesson 7. Evidence was found in the claimed lesson, evidence includes

- Lesson 7, Explore, Step 4: “Using the following prompt and follow-up responses to facilitate a discussion about the types of observations the class will make, adding the class’s decisions to the Plants Investigation Plan. As needed, refer back to the Adjectives for Plants chart that the class created in the first Explore. The purpose of this part of co-developing the investigation plan is to support students in deciding upon the specific kinds of data—including qualitative data (described using words and images) and quantitative data (observations that can be counted or measured)—they will collect that will serve as evidence that a plant keeps growing and stays healthy (or does not).” (Lesson 7, Teacher Guide)

Claimed Element: **MATH-P2: Use counting and numbers to identify and describe patterns in the natural and designed world(s).**

Claimed in Lesson 9. Evidence was found in claimed lesson, evidence includes

- Lesson 9, Explore, Step 3: “First, provide students with a quiet moment to observe the line plots and consider each question (Think) before discussing with a partner (Pair). What do you notice about our plants’ height data? Number of leaves data? In Observation 5, which plants are (usually) the tallest? The shortest?...which plants (usually) had the most leaves? The fewest? Invite students to think and pair about patterns in the first line plot, Plant Height. What patterns do you notice using our Plant Height line plot? Over and over again, what do you notice about the height of plants in different conditions? [I]nvite students to share the patterns they are noticing in the plant height data. Invite students to think and pair about patterns in the other line plot, Number of Leaves. What patterns do you notice using our Number of Leaves line plot? Over and over again, what do you notice about the number of leaves on plants in different conditions? [I]nvite students to share the patterns they are noticing in the number of leaves data.” (Lesson 9, Teacher Guide)

The following elements were described as used, but not intentionally or explicitly developed:

AQDP: Asking Questions and Defining Problems

Claimed Element: **AQDP-P1: Ask questions based on observations to find more information about the natural and/or designed world(s).**

Claimed in Lesson 1. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Synthesize, Step 4: “Invite students’ questions about the plants they observed growing in the schoolyard. To further support students in generating questions for the Wonder side of the Notice and Wonder chart, consider building on multiple differing ideas that were just shared, as these reflect areas of uncertainty among the class. What questions do you have about the plants growing in our schoolyard? Co-construct the unit question...Then summarize students’ noticings and wonders in a way that leads into a related, overarching unit question. For example, it is likely that there will be student questions related to how the Tower Tree and trees/plants in the schoolyard started and continue to grow in these different places. Using your students’ words and ideas, suggest a question that will guide our work in this unit; this may be something like How can plants grow in different places?” (Lesson 1, Teacher Guide)
- Lesson 1, Navigate, Step 7: “Add questions from our Initial Class Model. Using the Initial Class Model as a reference, invite students to notice areas of uncertainty...and support students in making these into questions to add them to the Notice and Wonder chart. For example, a question mark near a seed in the class model could be added to the Wonder column as “Where did a seed come from?” with a picture of a seed next to it.” (Lesson 1, Teacher Guide)

Claimed Element: **AQDP-P2: Ask and/or identify questions that can be answered by an investigation.**

Claimed in Lesson 7. Evidence was found in claimed lesson, evidence includes

- Lesson 7, Explore, Step 4: “In small groups, develop a question to investigate. Provide each student with a Planning Our Plants Investigation handout and writing utensil. Give students a few minutes to work with their group to co-construct a plant investigation question. Circulate and ask students what we are trying to figure out. Listen for ideas that we are trying to figure out if plants need light and water to keep growing and stay healthy. Once the students have identified their own version of the investigation question, have them write the question on their Planning Our Plants Investigation handout.” (Lesson 7, Teacher Guide)

DATA: Analyzing and Interpreting Data

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

Claimed in Lessons 1, 2, 3, 7, 8, and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Explore, Step 3: “Discuss how to record observations outside. Invite students’ ideas for how we can record their observations, using this as an opportunity to review with students how scientists record their observations so that they can compare the details they notice, and also to emphasize how recorded observations help scientists remember the information they observe later. Go outside and make observations. Bring students outside to your pre-determined location/s and have students find, observe, and record plants growing in different places.” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 2: “Make and record seed observations. Organize students into pairs and distribute the needed materials to each student: 2 different seeds, a hand lens, a writing utensil, and a copy of the My Seed Observations handout. Ensure that both students in the partnership receive the same set of 2 different seeds. Review the directions with students (refer to slide G): 1. Use our senses and the hand lens to make observations of the seeds. 2. Discuss our seed observations with our partner. 3. Draw and write our observations on our My Seed Observations handouts.” (Lesson 2, Teacher Guide)
- Lesson 2, Explore, Step 3: “Make and record seed observations. Organize students into pairs and distribute the needed materials to each student: 2 different seeds, a hand lens, a writing utensil, and a copy of the My Seed Observations handout. “ (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 8: “Update the Seeds Observations data table. Ensure students can view their Seeds Observations data table (refer to slide Q). Invite students to share which observed seeds’ structures (how the seed looks, including its shape, as well as its texture (how it feels) we have figured out in this lesson can be moved by sticking to surfaces. Listen and look for students’ to suggest the spiky seeds (cocklebur) and/or point to that row.” “Ask students how we might indicate on this chart that we have figured out how these structures of seeds function (work) to make it possible to be moved to new places (by sticking to surfaces), listening for students to suggest circling (like in Lesson 2), circling in a different color, marking the row by using a different shape, etc. In a way that reflects your students’ ideas, indicate this decision on the Seeds Observations data table.” (Lesson 3, Teacher Guide)
- Lesson 7, Explore, Step 5: “Make observations of plants in groups. As they make observations, remind students to discuss them with others in their group and record them on the corresponding Plant Observation 1 handout. Circulate the room and use the following prompts to support students in collaboratively making initial observations.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 2: “Have students match each plant to the associated page of the Plant Observations handout so they can make and record observations of each plant in the appropriate space. Provide time for students (in pairs) to make observations of their 2 assigned plants and record the data on the coordinating pages of their Plant Observations handouts.” (Lesson 8, Teacher Guide)

- Lesson 9, Explore, Step 2: “Have students distribute the plants and associated page of the Plant Observations handouts to each member of the group based on the decisions they made about who would make and record observations of each plant. Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts.” (Lesson 9, Teacher Guide)
- Lesson 9, Explore, Step 3: “Distribute 8 dot stickers to each group—2 of each color. Invite 1-2 groups at a time to use their Plant Observations handouts to place their dot stickers on the line plots, encouraging them to align their stickers in a vertical line, one on top of the previous sticker, for any measurements with more than one data point.” “Build data tables together as a class. Rather than inviting 1-2 groups at a time, invite all students who made observations of plants in condition A to record their observations in each data table. This will allow multiple students to write on the chart simultaneously across columns. Continue by inviting groups of students to record their observations for plants in conditions B, C, and D, respectively.” “After all colors and adjectives have been added to the class’s Plant Health Data chart, ask students what we could add to our data tables that might make it easier to see patterns. If helpful, refer to the Plant Growth Data chart to support students in identifying that the colors on the line plots helped us more easily recognize patterns.” “Invite students to use colored pencils to add color to their recorded observations. If helpful, have the Adjectives for Plants chart available from Lesson 8 for students to reference to support them in identifying how to color their observation (green for healthy; brown for unhealthy).” (Lesson 9, Teacher Guide)

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

Claimed in Lessons 1, 2, and 3. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Explore, Step 3: “Review directions with students, which include, “Draw and/or write your observations of the plant and the place where it is growing. Use labels.” Remind students that adding labels to our drawings is one way we can record details and remember our observations.” (Lesson 1, Teacher Guide)
- Lesson 1, Synthesize, Step 5: “Suggest to students that they share with their partner to show what they included in each box on their Initial Model: How is the Tower Tree growing there? handouts. Use suggested “Prompts” and “Possible follow-up prompts” to support students in comparing both their initial ideas and their initial ways of representing these ideas in their models. How do you think a seed got to the top of the courthouse to start growing there? How did you show that on your model? How could we show that on our class model?” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 4: “After this brief discussion, invite students to describe or point to where, on the Seeds Observations data table, we could add the word structure. Listen for students to suggest adding this as a label to the first column—our observations. The observations we made are of different seeds’ structures; we used our senses to carefully notice details about the shape and material of the seed.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “Once students have completed investigating the seeds using their surface, have small groups share and compare their findings with each other. Each student should share their results testing seeds with their surface, referencing their yes/no observations recorded on their My Surface Observations handouts.” (Lesson 3, Teacher Guide)
- Lesson 3, Explore, Step 4: “Suggest that students share their observational data with the class by standing (or raising their hand) if they observed the cocklebur sticking to their surface. Moving through each surface, invite students to stand if the cocklebur stuck to that surface. Invite students to share another seed that they investigated (e.g., bean), and add that seed to the first column of the Seeds and Surfaces data table, in the row underneath the cocklebur. As before (with the cocklebur), move through each surface, inviting students to stand up (or raise their hand) if they observed that seed sticking to their surface.” (Lesson 3, Teacher Guide)

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

Claimed in Lessons 2, 3, and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 2, Explore, Step 4: “Provide a brief opportunity for students to analyze the data related to seed size, shape, and texture (and any other characteristics that your students may have named/suggested and added to the data table). Then, use the following prompts to engage students in a brief discussion with the goal of recognizing that our careful observations provide evidence that different seeds vary in characteristics.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 4: “This prepares students for naming patterns in their data next. Support students in naming patterns. Point out to students that our data show, over and over again—through the number of us that stood up (represented by tally marks)—that cockleburs stuck to fabric, fur-like material, and shoelaces. Also, over and over again—through the number of us that did not stand up (represented by no tally marks)—the cockleburs did not stick to leather-like material and radishes, beans, and peas did not stick to any surface. Notice structures that do and do not stick together. Continue the discussion by using the following prompts to support students in identifying how the patterns in their data can help them notice structures that do or do not work stick together. So, what seems to be true for all of the seed-and-surface combinations that stuck together? What about the seed-and-surface combinations that did not stick; what are those structures like?” (Lesson 3, Teacher Guide)
- Lesson 9, Explore, Step 3: “Share discussions to engage students in using the line plots on the class’s Plant Growth Data chart to analyze their investigation data and describe patterns in plants’ growth (height and number of leaves). Think and Pair to identify patterns in the plant height data. Invite students to think and pair about patterns in the first line plot, Plant Height. What patterns do you notice using our Plant Height line plot? Over and over again, what do you notice about the height of plants in different conditions? Invite students to share the patterns they are noticing in the plant height data; what is happening over and over again? As students make sense of the patterns they are identifying, record these ideas under the line plot.” (Lesson 9, Teacher Guide)

ARG: Engaging in Argument from Evidence

Claimed Element: **ARG-P3: Analyze why some evidence is relevant to a scientific question and some is not.**

Claimed in Lesson 6. Evidence was found in claimed lesson, evidence includes

- Lesson 6, Synthesize, Step 4: “Inviting students to think first, then pair with a partner to consider whether the ideas we figured out in Lesson 2 could help us explain how a seed that grew into the Tower Tree could have gotten to the top of the courthouse. Could these ideas from Lesson 2 help us explain how the Tower Tree’s seed was moved to the top of the courthouse? Why do you think that? Affirm for students that ideas we figured out in Lesson 2 do not help us explain how a seed got to the top of the courthouse to start growing into the Tower Tree, because the Tower Tree’s seeds do not have structures that make it possible to be moved by the wind. Continue to invite students to think first, then pair with a partner to consider whether the ideas we figured out in the lesson are helpful in explaining (are relevant to) how a seed got to the top of the courthouse to start growing into the Tower Tree. Then, invite a few students to share ideas as a class and ensure the class is in agreement before moving to the next lesson row. The outcome of these discussions should be that Lesson 3 is not helpful/useful for explaining the Tower Tree phenomenon (since mulberry seeds are in fruit, and therefore do not have structures that students have identified as sticking to animals’ surfaces) and should be “crossed out,” Lessons 4 and 6 are relevant, and Lesson 5 is not directly helpful/useful and should be crossed out.” (Lesson 6, Teacher Guide)

INFO: Obtaining, Evaluating, and Communicating Information

Claimed Element: **INFO-P1: Read grade-appropriate texts and/or use media to obtain scientific and/or technical information to determine patterns in and/or evidence about the natural and designed world(s).**

Claimed in Lessons 2, 4, 5, and 6. Evidence was found in claimed lessons, evidence includes

- Lesson 2, Connect, Step 5: The class reads *Seeds on the Move*. “Read pages 1-15 and use the following prompts to discuss. Page 1: What are some places where you have observed plants growing? Page 2: What are some ideas we had about how seeds can get to new places? Page 5: Did we observe seeds that are tiny or have spikes? What other structures did we observe? Page 7: What do you observe about the maple tree seeds? Does this remind you of anything you’ve seen before? How do you think their structures make it possible to be moved by the wind? Page 9: What do you observe about the dandelion seeds? Does this remind you of anything you’ve seen before? How do you think their structures make it possible to be moved by the wind? Page 13: What do you observe about the foxtail barley seeds? Does this remind you of anything you’ve seen before? How do you think their structures make it possible to be moved by the wind? Page 14. So, what have we found out about how seeds can be moved to new places by the wind?” (Lesson 2, Teacher Guide)
- Lesson 4, Connect, Step 2: “Introduce the *Animal Mouths and Paws* infographics. Display slide D and tell students you were able to find some infographics about different animals and their body parts that might be related to using seeds for food; we can use these to gather information.” “Facilitate a discussion about mouths. Then, use the following prompts to support students in sharing and making sense of information they have gathered about chipmunk and vole mouths—their structures and functions—as a whole class.” Prompts include: “What did you and your partner find out about chipmunks’ and voles’ mouths? What did you notice about the structure of the mouths?” (Lesson 4, Teacher Guide)
- Lesson 5, Connect, Step 2: The class reads *Plants, Pollen, and Pollinators*. “Read a book and discuss the associated prompts. As a class, read pages 1-7 aloud, using the prompts below to support students in gathering information about plants making seeds through pollination.” Prompts include: “Page 2: Why are flowers important for plants? Page 5: Have you seen or touched pollen before? What was that like? What are some places where you may have seen pollen? Page 6: How do these new words and ideas (pollen, pollination) connect to experiences or ideas that you have had before?” (Lesson 5, Teacher Guide)
- Lesson 6, Connect, Step 2: The class reads, *Meet the Expert: Taal Levi*. “Introduce a *Meet the Expert* book. Tell students that you have or were able to find a book that has some information that we can use to help us figure out how seeds in fruits can be moved to new places, because it will connect us to a scientist who studies this! Then, use the following prompts to facilitate an interactive read-aloud.” Prompts include: “Page 3: We talked about fruits and berries earlier when we decided the Tower Tree is a mulberry tree! What are some experiences we have had with berries? Page 5: Before, in Lesson 4, what did we find out (besides berries) that squirrels, chipmunks, and birds eat? What do you remember? What similarities or differences do you notice about these animals using seeds for food and using berries for food? Page 6: What kind of observations might Taal and his team make? How could they make those observations? Page 8: So, what is one more way that animals can move seeds from plants to new places? How does that work? Page 10: What body parts do these animals use to carry seeds away from bear scat? Page 10: If animals can pick up seeds that were in the berries and carry them away from the scat, what must the seeds’ structures be like? How do you know that? Page 12: Why do you think it might be important for seeds to be moved to new places? Page 14: Why can’t the plants just move themselves or their seeds?” (Lesson 6, Teacher Guide)

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.

There is a close match between the claimed DCI elements and evidence of their development and use in unit materials. There is a close match between the science ideas developed in each lesson and the explanations of the targeted pieces of the DCI elements in the Plants SEP-DCI-CCC-ELA-Math-Matrix. Students have multiple opportunities to build the following science ideas:

- **LS2.A-P1 Plants depend on water and light to grow.** (Claimed in Lessons 1, 7, 8, 9, and 10)
- **LS2.A-P2 Plants depend on animals for pollination or to move their seeds around** (Claimed in Lessons 1, 2, 3, 4, 5, and 6)

LS2.A Interdependent Relationships in Ecosystems

Claimed Element **LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1)**

Claimed in Lessons: 1, 7, 8, 9, and 10. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Explore, Step 3: “Go outside and make observations. Bring students outside to your pre-determined location/s and have students find, observe, and record plants growing in different places. While students are making and recording observations outside, engage partners in brief discussions using the following prompts. What do you observe about the plant and where it’s growing? How do you think the plant keeps growing here?” (Lesson 1, Teacher Guide)
- Lesson 7, Explore, Step 5: “While providing this direction, reference the Plants Investigation Plan to draw students’ attention to the plants’ labels (A, B, C, D) corresponding to each specific condition (A=light, water; B= no light, water, etc.) in the “What we will test” side. Make observations of plants in groups. Listen for ideas about how plants should now be given the different combinations of light and water (conditions) that we decided on under “What we will give plants” on our Plants Investigation Plan. Pass out a cup of water and a pipette to each group. Demonstrate to students how to use the pipette to water the plants that will get water. Suggest that each person in the group give one pipette of water to each of the plants getting water (plants A and B). Point out the designated areas to put the plants that get light (Plants A and C) and not light (Plants B and D), and have students place the plants in the appropriate location.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 4: “Tell students that they will make and record their fourth set of observations (Observation 4) of their group’s plants as we continue to gather data that we can use as evidence about what plants need to keep growing and stay healthy. Provide time for students (in pairs) to make observations of their 2 assigned plants.” “As previously, this sharing is important for ensuring that all students in the small group are aware of observations for each plant and can therefore engage in comparisons between plants in different conditions next. In small groups, discuss what is similar and/or different between plants A, B, C, and D, and possible causes.” (Lesson 8, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Remind students that we decided to compare the heights of their Plants A, B, C, and D between groups. In small groups, make line plots of height data. In small groups, compare plants’ heights. Organize into 2-3 small groups and compare plant heights using line plots. How was displaying your data as a line plot useful for comparing plants’ heights?” (Lesson 8, Teacher Guide)

- Lesson 9, Synthesize, Step 4: “Summarize patterns in growth and health data for plants in Condition A. Use the prompts below to support students in first summarizing the growth and health data for plants in condition A. What do the patterns in our data tell us about the growth (height and number of leaves) and health (color and appearance) of plants in condition A? Why did plants in condition A keep growing and stay healthy? What caused this? Support students in connecting the patterns in plants in Condition A’s growth and health (effects) to their cause (water and light). Use the prompts below to continue summarizing the patterns in growth and health data for plants in Conditions B, C, and D with students. [same prompts used for plant A, just substitute the correct plant letter]. Read the investigation question at the top of the Plants Investigation Results, Do plants need light and water to keep growing and stay healthy? Ask students if they think we have gathered data that we can use as evidence to answer our investigation question. Did plants need light and water to keep growing and stay healthy? How do we know? What did we figure out about that? Can a plant keep growing and stay healthy with just water or just light? How do we know?” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 2: “Display Our Growing Ideas chart (refer to slide D) and suggest to students that we start with this resource, where we have been keeping track of what we have been figuring out. Who would like to share about Lesson 7: What did we figure out about how to gather evidence that plants need light and water to keep growing and stay healthy? Who would like to share about Lesson 8: What did we figure out about how our plants in different conditions were similar and/or different? Who would like to share about Lesson 9: What did we figure out about if plants needed light and water to keep growing and stay healthy? Begin the Consensus Discussion about light.” “Pause to address any uncertainty and/or disagreement around plants receiving light but not water (plants in condition C).” “What do our data show about the growth and health of plants in conditions C and A? How can we use that as evidence about what the Tower Tree needs to keep growing and stay healthy? Continue the Consensus Discussion about water. Use students’ ideas about plants in condition C, not getting water, to reconnect students to the Class Consensus Model and continue facilitating the Consensus Discussion.” “What causes the Tower Tree to keep growing and stay healthy (the effects)? What is our evidence? How do we know? Work with students to add cause-and-effect reasoning statements to the Class Consensus Model that answer the question at the top, How does the Tower Tree keep growing there (on top of the courthouse)?” (Lesson 10, Teacher Guide)

Claimed Element: **LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2)**

Claimed in Lessons: 1, 2, 3, 4, 5, and 6. Evidence was found in 1, 2, 3, 4, 5, and 6 evidence includes

- Lesson 2, Explore Step 4 “Use the prompts below to pose to students a question to ensure that students are in agreement that seeds (and plants)—unlike animals—do not move themselves to new places. Do plants move themselves to new places; do plants just get up and move somewhere new? So, do seeds move themselves to new places; do they just get up and move?” This Lesson makes observations of seeds’ structures that will be used in Lesson 3 to support students’ understanding that plants depend on animals to move their seeds around.
- Lesson 3, Explore, Step 4: “Using a class data table, like the one we used in Lesson 2, can help us share and compare everyone’s observations together. “Use the following prompts to engage students in a discussion. What do you notice about the data on our Seeds and Surfaces data table; where are there tally marks? Where are there no tally marks? And, what do you notice about the different seeds and surfaces we tried: which ones stuck together and which ones did not? So, what seems to be true for all of the seed-and-surface combinations that stuck together?” (Lesson 3, Teacher Guide)
- Lesson 3, Navigate, Step 6: The class read the book, *Seeds on the Move*, starting on page 17. The following portions of the text directly support the DCI: “Other seeds move to new places because they stick to surfaces, like people’s clothes or animal’s fur.” (p. 17) “These structures make it possible for the seeds to poke into the surface of clothing and fur.” (p. 19) “These structures make it possible for the seeds to attach onto surfaces like an animal’s fur!” (p. 22) Page 22 and page 27 show an image of a dog with Tick Trefoil seeds stuck to it.” (*Seeds on the Move*).

- Lesson 3, Synthesize, Step 7: “What did we figure out about our lesson question, How can seeds be moved to new places by sticking? And, specifically, what did we figure out about the structures of seeds and surfaces that make it possible to stick together? How did we figure all of this out?” (Lesson 3, Teacher Guide)
- Lesson 4, Navigate, Step 2: “Provide students with time to analyze the Animal Mouths and Paws Infographics.” “Continue the discussion, now supporting students in making sense of how chipmunks and voles use their mouths and paws together to store seeds for later... The purpose of this discussion is to ensure students realize they have evidence that chipmunks and voles do move seeds to new places when using them for food and to sequence how the animals use their mouths and paws to 1) pick seeds up, 2) hold seeds while the animal moves to a new place, and 3) store the seeds for later by burying them in the ground.” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3: “Invite students to use the image on the slide and turn and talk with a partner about the following prompts: How might birds use those body parts when they use seeds for food? How do you think birds could use their body parts to move and store seeds? We are interested in how beaks might relate to our lesson question...Which of these tools do you think would be best to mimic a bird beak? Why do you think that?” (Lesson 4, Teacher Guide)
- Lesson 4, Synthesize, Step 6: “Engage students in a discussion to answer this lesson’s question on Our Growing Ideas chart. What did we figure out about how seeds can be moved by animals when using them for food? What happens first? What happens next? What happens last? Invite students to turn and talk with a partner, and then share about what they figured out in this lesson about the structure (look, shape, texture) of an animal’s body parts (mouth, paws, beak) and seeds that make it possible to be moved to a new place when using them for food.” (Lesson 4, Teacher Guide)
- Lesson 5, Navigate, Step 2: The class reads the book, *Plants, Pollen and Pollinators*, pages 1-7 and Navigate, Step 6: The class reads pages 8-15. Page seven includes an image of a bee with pollen on its body (p.7). “Animals can move pollen from plant to plant as well.” (p. 8) “Bees, butterflies, and hummingbirds can move pollen. Animals who move pollen are called pollinators.” (p. 9) “Pollinators move pollen while they get food from flowers. When pollinators get food from flowers, pollen can stick to their bodies.” (p. 11) “Then, pollinators fly away to different flowers to eat more food. They carry the pollen with them as they move. Then, the pollen falls off or rubs off onto new flowers.” (p. 12) (Lesson 5, Teacher Guide and *Plants, Pollen, and Pollinators*)
- Lesson 5, Synthesize, Step 5: “Facilitate a discussion to collectively develop a model that represents the relationship between bee and pollen structures that function together to move pollen from one flower to another.” “After students have co-developed the 3 steps of the Bee-Pollen Consensus Model, use the following prompt to support students in focusing on the structures of the bee and pollen that function together to make it possible for the pollen to stick together and move the pollen. What did we figure out about the structures of pollen and bees that makes it possible to stick together and move the pollen?” (Lesson 5, Teacher Guide)
- Lesson 5, Synthesize, Step 7: “Read the lesson question in the first column of Our Growing Ideas chart, How can pollen be moved in order to make seeds? and direct students to think first, then talk with a partner, and finally share with the group...Support students in recognizing how the relationships between pollinators and plants benefit both living things; pollination is important for plants (so they can make seeds that grow into new plants) and the plants’ pollen and nectar are important for animals (as food). Why do animals, like bees, visit flowers? How does that help the animals? Remember that flowers (the part of a plant that can make seeds to grow new plants) are part of plants. So, how do animals visiting flowers help plants?” (Lesson 5, Teacher Guide)
- Lesson 6, Navigate, Step 2: The class read the book, *Meet the Expert, Taal Levi*. “Animal poop is called scat. Animals travel all over the forest and poop in different places. Seeds from berries that animals, like bears, eat are in their scat.” (p. 8) “Taal studies bear scat to understand how animals move seeds from berries through the forest” (p. 9) “He observes small animals like mice, voles, and birds carrying the seeds in bear scat away.” (p. 10) “Small animals

can use the seeds in the bear scat for food and eat them right away. Other times, they carry seeds away to store for later.” (p. 11) “Seeds get moved to new places by animals and sometimes those seeds will grow into new plants!” (p. 12) “Plants depend on animals, like bears and mice, to move their seeds to new places in the forest.” (p. 14) “ (Meet the Expert, Taal Levi)

- Lesson 6, Synthesize, Step 4: “Invite students to think first, then pair with a partner to consider whether the ideas we figured out in the lesson are helpful in explaining (are relevant to) how a seed got to the top of the courthouse to start growing into the Tower Tree. Could these ideas from Lesson 4 help us explain how the Tower Tree’s seed was moved to the top of the courthouse? Why do you think that? Could these ideas from Lesson 6 help us explain how the Tower Tree’s seed was moved to the top of the courthouse? Why do you think that?” (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 6: “Facilitate a discussion to provide an opportunity for students to share the different ways that they and their classmates developed models representing how a seed that grew into the Tower Tree could have gotten to the top of the courthouse. Our Gotta-Have-It Checklist includes Step 1: Seed + animal. What are some different ways we showed that? In this step, how do the structures of the seed and animal’s body parts function together so that the seed can be moved to a new place? Our Gotta-Have-It Checklist includes Step 2: Animal moves with seed. What are some different ways we showed that? In this step, how do the structures of the seed and animal’s body parts function together so that the seed can be moved to a new place? Our Gotta-Have-It Checklist includes Step 3: Seed is in a new place. What are some different ways we showed that? In this step, how do the structures of the seed and animal’s body parts function together so that the seed can be moved to a new place?” (Lesson 6, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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. Materials require students to explicitly use the CCC elements to make sense of the Tower Tree growing in an unusual place phenomenon. The number of elements that students use and develop in the materials is appropriate for the length of the unit.

Students have multiple opportunities to build the following crosscutting concepts:

- **PAT-P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.**
- **CE-P1: Events have causes that generate observable patterns.**
- **SPQ-P2: Standard units are used to measure length.**
- **SYS-P2: Systems in the natural and designed world have parts that work together.**
- **SF-P1: The shape and stability of structures of natural and designed objects are related to their function(s).**

The following elements are claimed as intentionally developed:**CE: Cause and Effect**

Claimed Element: **CE-P1: Events have causes that generate observable patterns.**

Claimed in Lessons 1, 7, 8, 9, and 10. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Connect, Step 1: Students are introduced to a tree growing in an unusual place as they see images and read about it. Students may share about trees or plants they noticed in unusual places in their community. In the Explore Section, Step 3, students go outside and observe plants and trees growing in unusual places. In the Synthesize Section, Step 4, students are given the Out-of-School Plants in Unusual Places handout for them to record trees or plants in unusual places in their community. They ask questions throughout the lesson about how trees grow and keep growing in unusual places. This sequence in the Lesson creates an observable pattern that students investigate for its cause. (Lesson 1, Teacher Guide)
- Lesson 7, Navigate, Step 6: “With students, review the lesson question recorded on Our Growing Ideas chart, How can we gather evidence that plants need light and water to keep growing and stay healthy?, and direct students to think first, then talk with a partner, then share what they figured out with the group. Consider using the following prompts to facilitate this discussion.” Prompts include: “Let’s look back at our question, “How can we gather evidence that plants need light and water to keep growing and stay healthy?” What kind of evidence did we figure out we need to gather?” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 3: “Discuss possible causes. Introduce or remind students that a cause is the reason something happens. Invite students to turn and talk with a partner about what they think is causing their 4 plants to be different from each other. Then use the following prompt to engage in a brief discussion. The purpose of this discussion is to provide an opportunity for students to begin to connect observed differences between their plants in different conditions to possible causes and to ensure all students are familiar with “cause” so that students can continue using this idea through the rest of the investigation.” (Lesson 8, Teacher Guide)
- Lesson 8, Explore, Step 4: “As partners make observations, use any of the following prompts to support students in collecting data, while also, as possible, posing the last question (about causation) to students. Encourage partners to continue to support each other by sharing what they agree or disagree on and why; asking each other to explain/clarify; and/or suggesting something the other might not have thought of.” Prompts include: “What is similar and/or different between Plant ___ and Plant ___ (the two plants you are observing)? What do you think is causing that?” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 3: “Students engage in this crosscutting concept by analyzing the observable patterns in the height, number of leaves, color, and appearance of plants in different conditions. Support students in beginning to consider what caused the patterns in their investigation results as they Think, Pair, Share about the data.” “You will use a series of Think, Pair, Share discussions to engage students in using the line plots on the class’s Plant Growth Data chart to analyze their investigation data and describe patterns in plants’ growth (height and number of leaves). This discussion is organized so that students first make sense of the line plots by noticing the data that is represented. Then, students are reconnected to “patterns” and identify patterns using the Plant Height line plot and, finally, the Number of Leaves line plot.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 2: “Reconnect to cause and effect. Summarize student’s ideas that the plants in our Plants Investigation that received both light and water (plants in condition A) grew and were healthy, while the plants that got only light (plants in condition C), only water (plants in condition B), or neither (plants in condition D), did not keep growing or did not stay healthy. Remind students that the growth and health of the plants are the effects; they explain what happened. The conditions the plants were in were the causes; they explain why something happens.

Use the prompts below to have students turn and talk with a partner to connect the evidence from their Plants Investigation to what causes the Tower Tree to keep growing and stay healthy (refer to slide G).” “What causes the Tower Tree to keep growing and stay healthy (the effects)?” “What is our evidence? How do we know?” (Lesson 10, Teacher Guide)

SF: Structure and Function

Claimed Element: **SF-P1: The shape and stability of structures of natural and designed objects are related to their function(s).**

Claimed in Lessons 1, 2, 3, 4, 5, and 6. Evidence was found in claimed lessons, evidence includes

- Lesson 1, Synthesize Section, Step 5: Discussions with students while developing their initial models provides an opportunity to gather evidence about Learning Goal 1a (aligned to Assessment Statement 1) and Learning Goal 1b (aligned to Assessment Statement 2), with the purpose of determining any support students may need in upcoming lessons as they continue to develop models to represent how plants grow in different places. Addressing the model’s questions (How did a seed get there to start growing into the tree? How does the Tower Tree keep growing there?) provides a context for students’ figuring out structure-and-function relationships between seeds and animals involved in dispersal over the next lessons (Lessons 2-6) as well as gathering evidence from investigations to support cause-and-effect relationships between plants and their needs (light, water) starting in Lesson 7.” (Lesson 1, Teacher Guide) *While this task primes students to use structure and function in future lessons, there is no evidence that all students will use this element.*
- Lesson 2, Explore, Step 4: “Explain that scientists use the word structure to describe how an object looks, including its shape, as well as its texture (how it feels). Our observations are evidence that different seeds have different structures: they look different; they are different shapes, and they feel different (have different textures)! Have students briefly turn and talk to identify a structure that 2 seeds share and a structure that 2 seeds differ in. What is an example of a structure that 2 seeds share? What is an example of a structure that 2 seeds have different? [D]o seeds move themselves to new places; do they just get up and move? What ideas do you have now about our lesson question, How can seeds get to new places? Do you think a seed’s structure might be related to how it gets to a new place? (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 4: “Use the following prompts to engage students in a discussion, the purpose of which is for students to first notice the data they have recorded and then name the combinations of seeds and surfaces that stuck together (cockleburr with fabric, fur-like material, and shoelaces) and those that did not. What do you notice about the different seeds and surfaces we tried: which ones stuck together and which ones did not? How do you think that some seeds and surfaces stick together, while others do not? many of our ideas are about what our seeds and surfaces looked and felt like; we are thinking about their structures. Remind students that structure refers to how an object looks, including its shape, as well as its texture (how it feels). Suggest that we add information about the structure of the seeds and surfaces to our data table to help us consider how some seeds and surfaces stuck together while others did not. The discussion is organized so that students name and add seeds’ structures, then surfaces’ structures. Use the following prompts to invite students to describe each seed’s structure, as you point to that row on the Seeds and Surfaces data table. How can we describe the structure of the cockleburr? What does it look and feel like? We put the radish and bean in the same row here; how are their structures the same? So, what seems to be true for all of the seed-and-surface combinations that stuck together? What about the seed-and-surface combinations that did not stick; what are those structures like? Remind students that function refers to how something works or how it is used. Connect students’ observations to the idea that some seeds and surfaces functioned—or worked—to stick together!” (Lesson 3, Teacher Guide)

- Lesson 3, Synthesize, Step 5: “Gather students together in a shared meeting space and reconnect to the lesson question, How can seeds be moved to new places by sticking? Invite students to first think and then turn and talk with a partner about their ideas for how seeds sticking to the dog could move the seeds to new places. How do you think that seeds sticking to the dog can move the seeds to new places? How do you think a dog could get seeds stuck to their fur? How is that like an experience you may have had? As students enact their seed-and-dog model, use the following prompts to support students using their model to make sense. How does the seed get stuck to the dog? How does the seed get moved to a new place? How does the seed come off somewhere new? What structures of the seed and fur make that possible?” (Lesson 3, Teacher Guide)
- Lesson 3, Connect, Step 6: The class continues reading *Seeds on the Move*. “Remind students that our purpose for reading this section of the book is to gather information about how seeds that stick can get moved to new places. Page 17: What are some examples of seeds and materials from our investigation that we found out stick together? How do you think their structure makes it possible to stick to someone or something? How do you think their structure makes it possible to stick to someone or something? Page 21: What do you observe about the tick trefoil seeds? How do you think their structure makes it possible to stick to someone or something? Page 24: What do you observe about the burdock seeds? How do you think their structure makes it possible to stick to someone or something?” (Lesson 3, Teacher Guide)
- Lesson 3, Synthesize, Step 7: Review the lesson question recorded on Our Growing Ideas chart, How can seeds be moved to new places by sticking?, and direct students to think first, then talk with a partner. What did we figure out about our lesson question, How can seeds be moved to new places by sticking? And, specifically, what did we figure out about the structures of seeds and surfaces that make it possible to stick together? How can we connect what we figured out to our lesson set question, How do seeds get to different places to start growing into plants?” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 4: “As students investigate, circulate, and ask the following questions to support students in making observations that can be used to answer their question. What about the structure of the beak-like tool (tweezers) makes it possible (or not possible) to move and bury the seed? What about the structure of the seed makes it possible (or not possible) to be moved and buried? Use the following prompts to discuss students’ Bird Beak investigation observations. The purpose of this discussion is to identify evidence from the investigation that supports birds can move seeds to new places using their beaks and to identify structures of beaks and seeds that work together to do so. What about the structure of the beak-like tool (tweezers) makes it possible to move and store the seed, or not? What about the structure of the seed makes it possible to be moved and stored, or not?” (Lesson 4, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “Remind students that we have been paying attention to the structures of seeds and animals’ body parts in this (and previous lessons)—structure refers to how an object looks, including its shape, as well as its texture. Add the heading “Structures” and use the following question to support students in identifying that the structures of the seed and the animal’s body part/s (mouth and paws or beak) are important as we develop our models. What parts of our model have structures we will want to pay attention to? What seeds’ structures make it possible for them to be moved by animals using them for food? What might we include about seeds in our models? What about the structure of an animal’s mouth and paws or beak; what might we include about those body parts in our models? What are the steps in “how this works” that we want to include; what functions of the seed and animal together do we need to show in our model?” (Lesson 4, Teacher Guide)
- Lesson 4, Synthesize, Step 6: Invite students to turn and talk with a partner, and then share about what they figured out in this lesson about the structure (look, shape, texture) of an animal’s body parts (mouth, paws, beak) and seeds that make it possible to be moved to a new place when using them for food. What did we figure out about the structure of an animal’s mouth and paws or beak that makes it possible for seeds to be moved when animals use them for food? What did we figure out about the structure of seeds that makes it possible to be moved when animals use them for food?” (Lesson 4, Teacher Guide)

- Lesson 4, Navigate, Step 7: “Invite students to turn and talk with a partner about what we have figured out about one example seed and how it can be moved to a new place. Pick one example seed. What is its structure? How can it be moved to a new place?” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 4: “Allow students time to develop and use a model representing how a bee’s legs/body could move pollen from one flower to another. Circulate to ask students about their work and how their model is (or is not) working to move pollen from one flower to another. What do you notice about the bee and pollen (in your model) that is making it possible (or not) to move pollen? Which bee object/s functioned (worked) to move pollen from one flower to another? Which bee object/s did not work? How did the bee leg/body function? How did chenille stems and pom poms work together with the pollen to move the pollen? What is the same about the chenille stems and pom poms? In other words, what structures of bee legs/bodies make it possible for pollen to stick? What is different about the structure of a straw that makes it not work? Why do you think the pollen did not stick to the straw?” (Lesson 5, Teacher Guide)
- Lesson 5, Synthesize, Step 5: “Use the following prompt to support students in focusing on the structures of the bee and pollen that function together to make it possible for the pollen to stick together and move the pollen. We drew and labeled the pollen and bee sticking together. What did we figure out about the structures of pollen and bees that makes it possible to stick together and move the pollen?” (Lesson 5, Teacher Guide)
- Lesson 5, Synthesize, Step 7: “Read the lesson question in the first column, How can pollen be moved in order to make seeds? Consider using the following prompts to facilitate this student-to-student discussion. Remember that function refers to how something works. How does the structure (look/shape/texture) of pollen make it possible to be moved by animals? How does the structure of pollinators’ body parts make it possible to move pollen? How is what we figured out about pollen being moved to new places by pollinators similar to what we figured out about seeds being moved to new places by other animals?” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 3: “To discuss and record what we have figured out about the lesson question, How can seeds in fruits be moved to new places? What did we figure out about the structures of seeds and animals’ body parts (mouth, paw, beak) that make it possible for seeds in fruits to be moved after they are left behind in scat?” (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 4: “Should we include structures (of the seed, mouth, paw, beak) in order to explain about the Tower Tree? Why do you think that? Should we include functions (steps 1, 2, and 3) in order to explain about the Tower Tree? Why do you think that?” (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 6: “Facilitate a discussion to provide an opportunity for students to share the different ways that they and their classmates developed models representing how a seed that grew into the Tower Tree could have gotten to the top of the courthouse. In this step, how do the structures of the seed and animal’s body parts function together so that the seed can be moved to a new place?” (Lesson 6, Teacher Guide)

The following elements were described as being used periodically to support overall development of the CCC:

PAT: Patterns

Claimed Element: **PA-P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.**

Claimed in Lesson 3. Evidence was found in the claimed lesson, and in lesson 9, evidence includes

- Lesson 3, Explore, Step 4: “Use the following prompts to engage students in a discussion, the purpose of which is for students to first notice the data they have recorded and then name the combinations of seeds and surfaces that stuck

together (cockleburr with fabric, fur-like material, and shoelaces) and those that did not. This prepares students for naming patterns in their data next. What do you notice about the data on our Seeds and Surfaces data table; where are there tally marks? Where are there no tally marks? And, what do you notice about the different seeds and surfaces we tried: which ones stuck together and which ones did not? Support students in noticing the patterns in the data displayed on our Seeds and Surfaces data table; a pattern is something that happens over and over again. Point out to students that our data show, over and over again—through the number of us that stood up (represented by tally marks)—that cockleburs stuck to fabric, fur-like material, and shoelaces. Also, over and over again—through the number of us that did not stand up (represented by no tally marks)—the cockleburs did not stick to leather-like material and radishes, beans, and peas did not stick to any surface. Ensure students recognize how the visual representation of tally marks shows us a pattern in our data; when scientists notice the same thing over and over, they can call it a pattern. Continue the discussion by using the following prompts to support students in identifying how the patterns in their data can help them notice structures that do or do not work stick together. So, what seems to be true for all of the seed-and-surface combinations that stuck together? What about the seed-and-surface combinations that did not stick; what are those structures like?” (Lesson 3, Teacher Guide)

- Lesson 9, Explore, Step 3: “Remind students that scientists use many observations and measurements to notice patterns in data; a pattern is something that happens over and over again. Patterns in data can be used as evidence to answer scientists’ questions. Recall with students that our lesson question is Did plants need light and water to keep growing and stay healthy? How do we know? Tell students that our line plots show many measurements of our plants, so we can use them to notice patterns that will help us answer our lesson question. What patterns do you notice using our Plant Height line plot? Over and over again, what do you notice about the height of plants in different conditions? Invite students to share the patterns they are noticing in the plant height data; what is happening over and over again? As students make sense of the patterns they are identifying, record these ideas under the line plot.” “As students make sense of the patterns they are identifying, record these ideas under the line plot.” “This discussion is organized so that students first make sense of the charts by noticing the data that is represented. Then, students identify patterns using the Plant Color data table and, finally, The Plant Looks... data table. What do you notice about our plants’ color data? Our data for how they look? Recall with students the purpose for making data tables: to look for patterns and compare our plant health data. Invite students to share the patterns they are noticing in the plant color data; what is happening over and over again? As students make sense of the patterns they are identifying. What patterns do you notice using our Plant Color data table? What patterns do you notice using our The Plant Looks... data table?” (Lesson 9, Teacher Guide)

SPQ: Scale, Proportion, and Quantity

Claimed Element: **SPQ-P2: Standard units are used to measure length.**

Claimed in Lessons 7, 8, and 9. Evidence was found in claimed lessons, evidence includes

- Lesson 7, Explore, Step 5: “Continue to use a sample plant, as well as a ruler, to engage in the following discussion with students. Use the prompts to agree as a class on how we will use a ruler to measure the height of plants in centimeters (cm).” (Lesson 7, Teacher Guide)
- Lesson 7, Explore, Step 5: “Continue to use a sample plant, as well as a ruler, to engage in the following discussion with students. Use the prompts to agree as a class on how we will use a ruler to measure the height of plants in centimeters (cm).” Scale, Proportion, and Quantity, “Scientists make observations and measurements that can serve as evidence and they consider these data in comparison with other data. In this unit, students’ consideration of scale, proportion, and quantity occurs as they use rulers and standard units (centimeters) to measure their plants’ heights/lengths. The standardization of these measurements allows for comparisons of each plant’s height at the beginning of the investigation (in this lesson) as well as over time (in Lessons 8 and 9). In these next lessons, students will also be able

to use their standardized measurements to compare height/length among their group's plants that are each receiving different things (light, water), as well as comparisons among plants in the whole class." (Lesson 7, Teacher Guide)

- Lesson 8, Explore, Step 2: "Use the Plants Investigation Plan (refer to slide C) to recall with students how we decided to make observations of the plants. For each of our 4 plants, Make and record observations" "Measure height." "Display slide F. Provide time for students to make observations of their groups' plants and record the data on the coordinating page of their Plant Observations handouts. Encourage students to work together to make and discuss observations, and remind students that they should come to agreement about what they record; tools and strategies to come to agreement about recorded observations include using rulers to measure height," (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: "Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts. As students make observations, circulate the room and use any of the following prompts to support them in individually collecting data (refer to slide D)." Prompts include: "What is the height of the plant?" Ideas to look and listen for include: "__cm)." (Lesson 9, Teacher Guide)

SYS: Systems and System Models

Claimed Element: **SYS-P2: Systems in the natural and designed world have parts that work together.**

Claimed in Lessons 3, 4, 5, and 6. Evidence was found in claimed lessons evidence includes

- Lesson 3, Explore, Step 4: Systems and System Models, "In this lesson, students make sense of a system made up of multiple parts (a seed and an animal) as they consider seeds sticking (or not sticking) to animal coverings as a seed-and-animal combination. This unit does explicitly use "systems" or "systems modeling" language with students, because of the repeated and explicit emphasis on using structure-and-function as a lens for sensemaking. However, you may choose to use systems language with students if it further supports their work in this lesson." (Lesson 3, Teacher Guide)
- Lesson 3, Synthesize, Step 5: "As students enact their seed-and-dog model, use the following prompts to support students using their model to make sense; the prompt, "And then what happens?" may be particularly useful and is suggested below more than once. How does the seed get stuck to the dog? And then what happens? How does the seed get moved to a new place? And then what happens? How does the seed come off somewhere new? And then what happens? Students' model should represent the following 3 sequential steps: 1. The dog and plant interact so that a seed (or seeds) sticks to the fur. 2. The dog moves to a new place. 3. The seed is released (falls off, is brushed off, is pushed/rolled off, is picked off) and lands on the ground in the new place." (Lesson 3, Teacher Guide) This is an example of the system that is described for teachers in the Lesson 3 call-out, System and System Models.
- Lesson 4, Navigate, Step 1: Invite ideas for animal body parts related to food/eating. If relevant, remind students of what they did in Unit 1.4: How do the ways plants and animals look and act help them live and grow? when they asked, What parts do plants and animals have and how do those parts help them? Connect back to how plants and animals use their external parts to survive, grow, and meet their needs, and/or invite students' personal and prior experiences. Then, have students turn and talk with a partner about animal body parts that might be related to using seeds for food and possibly moving them. Anticipate students will share ideas like mouths, paws, beaks, and teeth, among others." (Lesson 4, Teacher Guide)
- Lesson 4, Explore, Step 4: "Then, support students in connecting what they have figured out about how birds move seeds to new places when storing them for later to the same sequence of how other animals move seeds to new places. You might say something like, These steps for how animals move seeds to new places are getting pretty familiar to us; let's restate how this might work for a bird and its beak. Invite students to, again, list the steps for animals moving seeds in order, this time for birds using their beaks. If helpful, refer to this step in the Connect for

suggestions on how to invite students' participation. First, the animal and seed "get together"; from our investigation, the seed is picked up by the bird using its beak. Then, the animal moves to a new place with the seed. From our investigation, the seed is held in the bird's beak as the bird flies to a new place." (Lesson 4, Teacher Guide)

- Lesson 4, Synthesize, Step 5: "We can develop a model to help us further make sense of our lesson question, Can seeds be moved by animals when using them for food? If so, how? What parts should we include in our models? What are the steps in "how this works" that we want to include; what functions of the seed and animal together do we need to show in our model? Provide time for students to individually develop their models. As students work, use the following prompts to support them in using structure-and-function reasoning to represent and explain relationships between animals and seeds that make it possible for seeds to be moved to new places when animals use them for food by storing them for later. (Focus on the Step 1 box) What happens first? How can you show structures of the seed and animal body part (mouth, paw, beak)? (Focus on the Step 2 box) What happens next? How can you show structures of the seed and animal body part (mouth, paw, beak)? (Focus on the Step 3 box) What happens last? How can you show structures of the seed and animal body part (mouth, paw, beak)?" (Lesson 4 Teacher Guide) This is an example of the system that is described for teachers in the Lesson 3 call-out, System and System Models.
- Lesson 5, Explore, Step 4: "After students confirm which objects work (function) to move pollen from one flower to another (chenille stems and pom poms) and which object did not work (straws), use the following prompt to generate ideas about how we can use our different models to figure out how bees move pollen. Students' ideas may vary, reflecting their experiences with their own models and what they feel they do not yet know; support the class in agreeing that comparing different models that used different objects can help everyone understand how some objects worked and some didn't, as well as whether objects that did work (chenille stem and pom pom) did so in the same or different ways." (Lesson 5, Teacher Guide)
- Lesson 5, Synthesize, Step 5: "Facilitate a discussion to collectively develop a model that represents the relationship between bee and pollen structures that function together to move pollen from one flower to another. For pollen to be moved from one flower to another by the bee, what happens first? After the pollen sticks to the bee, what happens next for it to be moved to another flower? What happens last? How does the pollen get to the other flower?" (Lesson 5, Teacher Guide) This is an example of the system that is described for teachers in the Lesson 3 call-out, System and System Models.
- Lesson 6, Connect, Step 2: "Use the following prompts to facilitate an interactive read-aloud. As you read the Meet the Expert: Taal Levi book, encourage students to share ideas by talking, pointing to the book and/or its pictures, and using gestures (like showing how an animal moves a seed)." Prompts include: "Page 10: What body parts do these animals use to carry seeds away from bear scat? How do you know that?" (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 3: "Think, Pair, Share about the lesson question." Prompts include: "What did we figure out about the structures of seeds and animals' body parts (mouth, paw, beak) that make it possible for seeds in fruits to be moved after they are left behind in scat?" (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 5: "As students develop their models, circulate and engage in brief discussions in order to provide support and give feedback. (Focus on Step 1) Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree? Possible responses focused on Step 1: Seed and animal. (Focus on Step 2) Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree? Possible responses focused on Step 2: Animal moves with seed. (Focus on Step 3) Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree? Possible responses focused on Step 3: Seed is in new place" (Lesson 6, Teacher Guide) This is an example of the system that is described for teachers in the Lesson 3 call-out, System and System Models.

Criterion-Based Suggestions for Improvement: N/A

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 sense-making of phenomena requires student performances that integrate elements of the SEPs, CCCs, and DCIs. These tasks provide students with frequent opportunities to engage in three-dimensional learning across all the lessons and learning objectives. The three dimensions are not used in isolation but are generally developed in tandem, with each dimension supporting a deeper understanding of the others. The unit supports the progressive development of ideas, helping students apply the dimensions in increasingly sophisticated ways to explain phenomena, culminating in a final model in Lesson 10.

Learning is integrated to support student sense-making over time

- Lesson 1, Synthesize, Step 1: Students integrate the use of the elements of the three dimensions when they ask questions about where plants grow and organize what they wonder about where plants grow. (Lesson 1, Teacher Guide) **CCC CE-P1 Events have causes that generate observable patterns. DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2) AQDP-P1 Ask questions based on observations to find more information about the natural and/or designed world(s).**
- Lesson 2, Synthesize, Step 6: Students integrate the use of the elements of the three dimensions when they attempt to explain how seeds get to new places. (Lesson 2, Teacher Guide) **CCC SF-P1 The shape and stability of structures of natural and designed objects are related to their function(s). DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2) INV-P4 Make observations (firsthand or from media) to collect data that can be used to make comparisons.**
- Lesson 3, Explore, Step 4: Students integrate the use of the elements of the three dimensions when they make sense of data they collected in Step 3 to determine how seeds can be moved by animals. (Lesson 3, Teacher Guide) **CCC PAT-P1 Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2) DATA-P3 Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems.**
- Lesson 4, Explore, Step 3: Students integrate the use of the elements of the three dimensions when they plant and conduct an investigation to determine another way seeds can be moved by animals. (Lesson 4, Teacher Guide) **CCC PAT-P1 The shape and stability of structures of natural and designed objects are related to their function(s). CCC SF-P1 The shape and stability of structures of natural and designed objects are related to their function(s) DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2) INV-P2 Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.**
- Lesson 5, Explore, Step 4: Students integrate the use of the elements of the three dimensions when they individually develop a model of how pollen is moved by bees. (Lesson 5, Teacher Guide) **CCC SF-P1 The shape and stability of structures of natural and designed objects are related to their function(s). CCC 6.P1 The shape and stability of structures of natural and designed objects are related to their function(s) DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move**

their seeds around (2-LS2-2) MOD-P3 Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).

- Lesson 6, Synthesize, Step 5: Students integrate the use of the elements of the three dimensions when they develop a model to explain how a seed got to the top of the tower (Lesson 6, Teacher Guide) **CCC SYS-P2 Systems in the natural and designed world have parts that work together. DCI LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2) DATA-P2 Use and share pictures, drawings, and/or writings of observations.**
- Lesson 7, Explore, Step 4: Students integrate the use of the elements of the three dimensions when they conduct an investigation to determine if a plant needs light and water. (Lesson 7, Teacher Guide) **CCC2.P1 Events have causes that generate observable patterns. DCI LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1) INV-P4 Make observations (firsthand or from media) to collect data that can be used to make comparisons.**
- Lesson 8, Explore, Step 6: Students integrate the use of the elements of the three dimensions when they create line plots of the data from their investigation to compare with other groups. (Lesson 8, Teacher Guide) **CCC CE-P1 Events have causes that generate observable patterns DCI LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1) MATH-P3 Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.**
- Lesson 9, Explore, Step 2: Students integrate the use of the elements of the three dimensions when they make individual observations and compare their data with other students' data. (Lesson 9, Teacher Guide) **CCC SPQ-P2 Standard units are used to measure length. DCI LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1) MATH-P2 Use counting and numbers to identify and describe patterns in the natural and designed world(s).**
- Lesson 10, Synthesize, Step 4: Students integrate the use of the elements of the three dimensions when they make individual models to explain how plants grow and stay healthy in unusual places. (Lesson 10, Teacher Guide) **CCC PAT-P1 Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence. DCI LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1) MOD-P2 Compare models to identify common features and differences.**

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, as evidenced by the lessons' logical sequencing from the students' perspectives. Students can see how what they are trying to figure out or solve in one lesson builds on previous lessons and fits into the unit's larger goal. Students are supported to build toward all of the three-dimensional learning goals. Questions that arise from one investigation are used as the focus of the next investigation. The lessons help students develop toward proficiency in a targeted set of performance expectations:

- 2-LS2-1: **Plan and conduct an investigation** to determine if (**cause and effect**) **plants need sunlight and water to grow.**
- 2-LS2-2: **Develop a simple model** that mimics the **function of (structure and function)** an **animal in dispersing seeds or pollinating plants.**

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

- Lesson 1, Navigate, Step 7: "Point out how we organized our wonders on our Notice and Wonder chart into two groups—one set of wonders is about how seeds get to different places to start growing (including the Tower Tree on top of the courthouse) and the other is about how plants keep growing in different places (including the Tower Tree growing on top of the courthouse). Remind students that their initial models and our Initial Class Model also reflected these 2 groups, because there were 2 boxes for us to draw and write our initial ideas...Using the prompts below, engage students in a brief discussion to generate new questions about seeds as well as ideas about how to pursue answers to our new lesson set question about how seeds get to different places to start growing into plants." (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize, Step 6: "Point out to students how—as we described in our Building Understandings Discussion using Our Growing Ideas chart—we've only figured out how some seeds get to new places. Our Seeds Observation data table shows some seeds' structures circled (moved by the wind), while other structures remain not circled. Invite students to think about how these other seeds might get to new places, using the following prompt (refer to slide K)." Prompt: What are some other ways you think seeds get to new places? (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 8: "Use the following prompts to support students in noticing structures (column 1) and examples (column 2) of seeds that we have not yet figured out—the rows on the Seeds Observations data table that are not yet marked by a circle, etc. Then, invite students to generate new questions they may have about these seeds and how they get moved. Record students' questions on sticky notes to be added to the Notice and Wonder chart." (Lesson 3, Teacher Guide)

- Lesson 4, Navigate, Step 7: “Acknowledge with students that we have figured out a lot about how seeds with different structures can be moved, but that we might still have things we wonder about seeds. Remind students that scientists regularly generate new questions after they figure some things out!” “Invite students to ask new questions about seeds. Record students’ questions on sticky notes to be added to the Notice and Wonder chart (refer to slide P).” Prompts to use include: “What new questions do you have about seeds?”; Ideas to look and listen for include: “How are seeds made?, How do seeds get started?, Where do they come from?, How do plants get/make their seeds?” (Lesson 4, Teacher Guide)
- Lesson 5, Navigate, Step 1: “Display the class’s Notice and Wonder chart (refer to slide A) and read the unit question, How can plants grow in different places? Remind students that we have been working to answer our unit question by first trying to figure out our Lesson Set 1 Question, How do seeds get to different places to start growing into plants? Remind students that we have figured out a variety of ways that seeds can get to different places to start growing, but we still have questions about seeds! Then, use the following discussion prompt to help students recall what they are still wondering about seeds....As you engage with students, reference the Notice and Wonder chart or selected sticky notes that were added at the end of Lesson 4, specifically the wonders related to how seeds are made or where seeds come from. Affirm for students that quite a few of our questions are about what happens before seeds get moved to new places; we seem to be wondering about how seeds get made!” Prompts to use. “What are we still wondering about seeds?”; Ideas to look and listen for “How are the seeds made? How do seeds get started? Where do they come from? How do plants get/make their seeds?” (Lesson 5, Teacher Guide)
- Lesson 6, Navigate, Step 7: “Point out to students that we still have questions on our Notice and Wonder chart! We have figured out how a seed got to the unusual location on top of the courthouse and started growing into the Tower Tree, but we still have questions we haven’t answered!” “Facilitate a discussion about unanswered wonders. Use the following prompts to engage students in a discussion about the other group of questions on our Notice and Wonder chart; our unanswered questions about how plants keep growing in different places and to invite students in sharing their related experiences.” Prompts include: “What questions did we have about how plants keep growing in different places? (point to the Wonder side of the Notice and Wonder chart)” “What experiences have you had with plants growing (or keeping plants growing) in different places?” (Lesson 6, Teacher Guide)
- Lesson 7, Navigate, Step 7: “Display slide N and point out that although we figured out how to plan our Plants Investigation and we made our first observation, we probably have new questions. Use the following prompts to gather new wonderings about carrying out the Plants Investigation.” (Lesson 7, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Affirm students’ ideas that we have not yet answered our investigation question and that we still need to follow everything on our Plants Investigation Plan, specifically, “Make many observations over time!” Suggest that our work in this lesson centers around figuring out what is happening to our plants as we continue to keep them in their different conditions and make observations. Work with students to develop a question like, “How are our plants in different conditions similar and/or different?” However, feel free to use terms and phrasing that reflect your class’s ideas. Display slide B, updating the version on the provided slide to match your class’s decisions. Then, write the class’s version of the Lesson 8 Question on the next row of Our Growing Ideas chart.” (Lesson 8, Teacher Guide)
- Lesson 9, Navigate, Step 1: “Display slide A and refer to the Plants Investigation Plan to have students briefly turn and talk about the following questions, allowing them to recall where we left off. How did we use our Plants Investigation Plan last time? What did we do? Why did we do that? What question are we trying to answer?...Invite students to notice their classmates’ responses, which likely reflect some or many “thumbs down” around the room. Recognize that we do not all think we have completed our investigation yet and then invite a few students to share what we still need to do in order to complete our investigation. Anticipate that students will reference the blank Observation 5 column on their handouts and suggest making another set of plant observations.” (Lesson 9, Teacher Guide)

- Lesson 10, Synthesize, Step 2: “Display Our Growing Ideas chart (refer to slide D) and suggest to students that we start with this resource, where we have been keeping track of what we have been figuring out in each lesson of Lesson Set 2 (Lessons 7-9), including the evidence we gathered and how we gathered it! Invite student volunteers up to narrate each row. As needed, encourage the class to add on to what each student shares to ensure the evidence we have gathered about what causes plants to keep growing and stay healthy is elevated.” Prompts to use include: “Who would like to share about Lesson 7: What did we figure out about how to gather evidence that plants need light and water to keep growing and stay healthy?”; “Who would like to share about Lesson 8: What did we figure out about how our plants in different conditions were similar and/or different?”; “Who would like to share about Lesson 9: What did we figure out about if plants needed light and water to keep growing and stay healthy?” (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 two targeted performance expectations.

2-LS2-2: **Develop a simple model** that mimics the **function of (structure and function)** of an **animal in dispersing seeds or pollinating plants**. The materials develop student sense-making toward proficiency using the parts of the described sections from Lessons 2, 3, 4, 5 and 6. Evidence includes

- Lesson 2, Explore, Step 4: “Provide a brief opportunity for students to analyze the data related to seed size, shape, and texture (and any other characteristics that your students may have named/suggested and added to the data table). Then, use the following prompts to engage students in a brief discussion with the goal of recognizing that our careful observations provide evidence that different seeds vary in characteristics.” Prompts to use include, “Using our data table, what did you notice about the sizes [shapes/textures] of the seeds we observed? (Lesson 2, Teacher Guide)
- Lesson 3, Synthesize, Step 5: “With students’ input, decide to use materials from the investigation (cocklebur/s, fur-like material/s) to enact a scenario in which seeds get stuck to the dog’s fur, the dog moves somewhere new, and the seeds are released in the new location...As students enact their seed-and-dog model, use the following prompts to support students using their model to make sense; the prompt, “And then what happens?”...‘How does the seed get stuck to the dog? And then what happens?’, ‘How does the seed get moved to a new place? And then what happens?’, ‘How does the seed come off somewhere new? And then what happens?’, ‘What structures of the seed and fur make that possible?’” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “Remind students that we have been paying attention to the structures of seeds and animals’ body parts in this (and previous lessons)—structure refers to how an object looks, including its shape, as well as its texture. Add the heading “Structures” and use the following question to support students in identifying that the structures of the seed and the animal’s body part/s (mouth and paws or beak) are important as we develop our models.” Prompts include: “What parts of our model have structures we will want to pay attention to?” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step, 3: “With Our Growing Ideas chart and the images from page 7 of the Plants, Pollen, and Pollinators book displayed for students to reference (continue to refer to slide I), use the following prompts to support students in using evidence gathered in Lessons 2-4 for how different structures make it possible for seeds to be moved to new places to brainstorm ideas for objects they can use to mimic bee legs and/or bodies. Unlike with flowers/pollen, coming to consensus on these objects is neither expected nor encouraged. Instead, use students’ various suggestions to further motivate developing more than one model to help us figure out how different structures could function to move pollen from one flower to another. Add multiple student ideas to the bee row of the Bee-Pollen Model Ideas chart. Prompts to use include, “Based on our evidence from previous lessons, what different structures make it possible for animals to move seeds to new places?”. (Lesson 5, Teacher Guide)

- Lesson 6, Synthesize, Step 3: “Invite students to turn and talk with a partner about which of the different ways we have figured out that seeds can be moved to new places could be how the seed that grew into the Tower Tree (refer to slide H) got to the top of the courthouse: Which of these different ways could have moved the seed that grew into the Tower Tree to the top of the courthouse? Why do you think that? What is your evidence? Encourage students to reference the class’s Our Growing Ideas chart (refer to slide G) as they talk together.” (Lesson 6, Teacher Guide)

2-LS2-1: **Plan and conduct an investigation** to determine if (**cause and effect**) **plants need sunlight and water to grow**. The materials develop student sense-making toward proficiency using the parts of the described sections from Lessons 7, 8, and 9. (Plants Unit Front Matter.) Evidence includes

- Lesson 7, Explore, Step 4: “Display slide J. Use the prompts on the slide to facilitate the sharing of initial investigation ideas. Remind students to refer to their Planning Our Plants Investigation handouts during the discussion. The purpose of this discussion is for students to share the variety of ideas they have generated about how to set up an investigation that will allow for data collection about plants needing light and water to keep growing and stay healthy. Recognize that your students’ ideas may vary from those suggested here; that is OK! This initial sharing prepares students for co-creating the Plants Investigation Plan in the next discussions.” (Lesson 7, Teacher).
- Lesson 8, Synthesize, Step 5: “Draw students’ attention to the lesson question, How are our plants in different conditions similar and/or different? (refer to slide O) and suggest to students that we work in our small groups to consider our group’s answer to that question!...Suggest to students that each group can share about their group’s plants, and we can record each group’s ideas on Our Growing Ideas chart. Share with students that we can think about our lesson question by sharing ideas about similarities and differences: What is similar about your group’s plants? and What is different about your group’s plants? Then, with students, read the two sentence stems on slide P: Something similar between our plants is _____. Something different between our plants is _____.” “Provide small groups a few minutes to discuss their group’s plants’ similarities and differences...Encourage students to refer to their recorded data on their Plant Observations handouts as evidence for their ideas.” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Step 4: “Gather students in a Scientists Circle for a Building Understandings Discussion about what caused the observed patterns in plant growth (height and number of leaves) and health (color and appearance). Display slide N and the class’s Plants Investigation Plan. Also, ensure the class’s Plant Growth Data and Plant Health Data charts are visible for students to reference during the discussion. Additionally, it might be helpful to have one plant from each condition (A, B, C, and D) in the center of the Scientists Circle for students to reference and use.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Display slide I and provide a My Model: How does this plant keep growing here? assessment to each student. Point out the first prompt on the My Model: How does this plant keep growing here? assessment, “This _____ is growing _____.” Tell students that they will write the plant they choose in the first blank and where it is growing in the second. Allow students a minute or two to choose their plant and record it on their My Model: How does this plant keep growing here? assessment. Ensure students completed Out-of-School Plants in Unusual Places community connections and set(s) of Unusual Plants Cards are available for students if they need and/or want to use them as they complete their My Model: How does this plant keep growing here? Assessment.” (Lesson 10, 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. Two elements from the Life Science domains are used to explain the phenomenon of plants growing in unusual places.

- **LS2.A Interdependent Relationships in Ecosystems: Plants depend on water and light to grow** (LS2.A-P1)
- **LS2.A Interdependent Relationships in Ecosystems: Plants depend on animals for pollination or to move their seeds around.** (LS2.A-P2)

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

- Making sense of plants growing in unusual places only requires the development of the Disciplinary core ideas from **LS2.A Interdependent Relationships in Ecosystems**. Disciplinary core ideas from different disciplines are not required.
- The following DCI element from the Life Science Domain can explain how plants get to an unusual location phenomenon: LS2.A-P2: Interdependent Relationships in Ecosystems - Plants depend on animals for pollination or to move their seeds around. The following DCI element from the Life Science Domain can explain how plants can continue to grow phenomena: LS2.A-P1: Interdependent Relationships in Ecosystems - Plants depend on water and light to grow.

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

- Lesson 5, Synthesize Section, Step 5 “Use the following prompt to support students in focusing on the structures of the bee and pollen that function together to make it possible for the pollen to stick together and move the pollen. We drew and labeled the pollen and bee sticking together. What did we figure out about the structures of pollen and bees that makes it possible to stick together and move the pollen?” (Lesson 5, Teacher Edition)
- Lesson 8, Explore Section, Step 3 “Introduce or remind students that a cause is the reason something happens. Invite students to turn and talk with a partner about what they think is causing their 4 plants to be different from each other. Then use the following prompt to engage in a brief discussion. What do you think is causing differences between your group’s Plants A, B, C, and D?” (Lesson 8, Teacher Guide)
- Lesson 9, Explore Section, Step 3 Invite students to share the patterns they are noticing in the plant height data; what is happening over and over again? As students make sense of the patterns they are identifying, record these ideas under the line plot.” “What patterns do you notice using our Plant Height line plot? “What patterns do you notice using our Number of Leaves line plot?” “Use a series of Think, Pair, Share discussions to engage students in using the data tables on the class’s Plant Health Data chart to analyze their investigation data and describe patterns in plants’ health data (color and appearance).” “Invite students to share the patterns they are noticing in the plant color data.” (Lesson 9, Teacher Edition)

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 & Literacy in History/Social Studies, Science and Technical Subjects because the materials explicitly state the mathematics and ELA standards that are used in the unit and support students to see the connections between content areas.

ELA**Reading: Informational Text**

CCSS-ELA-LITERACY.RI.2.5 Know and use various text features (e.g., captions, bold print, subheadings, glossaries, indexes, electronic menus, icons) to locate key facts or information in a text efficiently. Claimed as being explicitly used and named with specific support for teachers in Lessons 1 and 5. Evidence includes

- Lesson 1, Connect, Step 1: “Connect to text features of the newspaper article. To support students’ literacy work, consider inviting students’ attention to the newspaper article as a nonfiction text, pointing out its title, “Mystery Tower Tree Still Growing Strong,” and asking students what they notice about the layout. Pause to help name and answer questions about different features students point out, such as the title of the newspaper, date, byline that lists the author, written text, and images with captions. Invite students’ ideas about how these text features help us understand and obtain key facts and information from the article.” (Lesson 1, Teacher Guide)
- Lesson 5, Connect, Step 6: “Continue reading a book and discuss the associated prompts. Ensure students can view the Plants, Pollen, and Pollinators book (refer to slide N) and ask students to recall where we left off. Encourage students to explain how to use the table of contents, headings, and page numbers to identify which page to read next.” (Lesson 5, Teacher Guide)

CCSS-ELA-LITERACY.RI.2.6 Identify the main purpose of a text, including what the author wants to answer, explain, or describe. Claimed as being explicitly used and named with specific support for teachers in Lesson 9. Evidence includes

- Lesson 9, Connect, Step 5: “Show students the Different Plants in Different Places book and read the title with them (refer to slide P). Tell students that, using their suggestions, you found this text that we can use to find out about different plants in different places. Use the following prompts to engage students in the interactive read-aloud and support them in making connections among their own experiences with plants, the results of their Plants Investigation, and the examples in this book to affirm that all plants in all places need light and water; light and water cause all plants to keep growing and stay healthy.” (Lesson 9, Teacher Guide and Different Plants in Different Places book)

CCSS-ELA-LITERACY.RI.2.7 Explain how specific images (e.g., a diagram showing how a machine works) contribute to and clarify a text. Claimed as being explicitly used and named with specific support for teachers in Lessons 2, 4, and 5. Evidence includes

- Lesson 2, Connect, Step 5: “Read a book and discuss the associated prompts.” Prompts include: “Page 7: What do you observe about the maple tree seeds? Does this remind you of anything you’ve seen before?” Page 9: What do you observe about the dandelion seeds? Does this remind you of anything you’ve seen before? How do you think their structures make it possible to be moved by the wind?” (Lesson 2, Teacher Guide)
- Lesson 4, Connect, Step 2: Obtaining, Evaluating, and Communicating Information, “Scientists regularly use texts and images as sources of information that they can use as evidence. As students engage with infographics in partnerships, support them in reading the sentences and making careful observations of the mouths and paws in the coordinating images. Use questions such as, What do you notice about the structure (look/shape/texture) of that mouth/paw? and, Could using its mouth/paw to ____ help the animal move seeds to new places? How do you know?, to further support students in using these infographics to gather information that can be used as evidence to address their question about how animals can move seeds to new places when using them for food.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 3: “Ensure students can view the Plants, Pollen, and Pollinators book and prepare to slowly flip through pages 1-7. Instruct students to raise their hands if they observe something in an image or notice or remember something in the sentences that could serve as evidence that pollen can be moved by wind or by animals. Prepare to stop at page 5 and then at page 7, using students’ hands as a cue (refer to slide F). For each of these pages, use the prompts below to support students in making observations of the images and text to first confirm that pollen can be moved by the wind and then to consider how animals (specifically, bees) might also move pollen to new places.” (Lesson 5, Teacher Guide)

CCSS-ELA-LITERACY.RI.2.9 Compare and contrast the most important points presented by two texts on the same topic. Claimed as being explicitly used and named with specific support for teachers in Lessons 6 and 9. Evidence includes

- Lesson 6, Connect, Step 2: Many of the prompts embedded in the Meet the Expert: Taal Levi book reference previously read texts including infographics and a newspaper article. “Then, use the following prompts to facilitate an interactive read-aloud. As you read the Meet the Expert: Taal Levi book, encourage students to share ideas by talking, pointing to the book and/or its pictures, and using gestures (like showing how an animal moves a seed). All these ways of responding show scientific thinking and support equitable, multiple means of expression. Prompts to use ‘Page 2: What are some ways we already know about, that animals could move seeds in a forest?’ ‘Page 5: Before, in Lesson 4, what did we find out (besides berries) that squirrels, chipmunks, and birds eat? What do you remember?’” (Lesson 6, Teacher Guide)
- Lesson 9, Connect, Step 5: “ Use the following prompts to engage students in the interactive read-aloud and support them in making connections among their own experiences with plants, the results of their Plants Investigation, and the examples in this book to affirm that all plants in all places need light and water; light and water cause all plants to keep growing and stay healthy.” Prompts include: “Page 2: How are the plants in these images getting the light and water they need to keep growing and stay healthy? How is this similar to our Plants Investigation?” “Page 8: What causes plants on mountaintops, like Mountain Pride plants and pine trees, to keep growing and stay healthy? How is this like our Plants Investigation?” (Lesson 9, Teacher Guide)

Speaking and Listening

CCSS-ELA-LITERACY.SL.2.1A 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 being explicitly used and named with specific support for teachers in Lessons 3 and 8. Evidence includes

- Lesson 3, Synthesize, Step 7: “Literacy Supports A Building Understandings Discussion offers students the opportunity to practice their speaking and listening skills. Reiterate for students the importance of following agreed-upon rules for discussion (e.g., listening, turn-taking) and speaking clearly with complete sentences. Practicing these speaking and listening standards helps students clearly and coherently communicate their science ideas. (SL.2.1A, SL.2.6). “With students, review the lesson question recorded on Our Growing Ideas chart, How can seeds be moved to new places by sticking?, and direct students to think first, then talk with a partner, then share what they figured out with the group. Consider providing sentence starters such as “We figured out that _____” or “We observed _____.” More discussion stems are available in the Discussion Supports handout.” (Lesson 3, Teacher Guide)
- Lesson 8, Synthesize, Step 5: “In small groups, share about plant similarities and differences. Suggest to students that each group can share about their group’s plants, and we can record each group’s ideas on Our Growing Ideas chart. Share with students that we can think about our lesson question by sharing ideas about similarities and differences: What is similar about your group’s plants? and What is different about your group’s plants?” “Then, with students, read the two sentence stems on slide P: Something similar between our plants is _____. Something different between our plants is _____.” “Provide small groups a few minutes to discuss their group’s plants’ similarities and differences, and use the sentence stems to decide on their group’s responses. Encourage students to refer to their recorded data on their Plant Observations handouts as evidence for their ideas.” (Lesson 8, Teacher Guide)

CCSS-ELA-LITERACY.SL.2.2 Recount or describe key ideas or details from a text read aloud or information presented orally or through other media. Claimed as being explicitly used and named with specific support for teachers in Lesson 3. Evidence includes

- Lesson 3, Connect, Step 6: After reading the *Seeds on the Move* book, students will be given an opportunity to retell examples of student experiences with sticky seeds in sequence. “Invite students to consider the model they “acted out” as they figured out how a seed and dog could stick together to move the seed to a new place: Did our “acted out” model of the seed and dog show all 3 of these steps, too? Invite students to first turn and talk with a partner and then share ideas with the class to review what they did first, next, and last. Your class’s responses may vary, depending on the model they enacted, but it is likely they experienced all 3 steps in this same sequence.” (Lesson 3, Teacher Guide)

CCSS-ELA-LITERACY.SL.2.4 Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences. Claimed as being explicitly used and named with specific support for teachers in Lesson 8. Evidence includes:

- Lesson 8, Synthesize, Step 5: “Literacy Supports Support students as they recount the plant similarities and differences they observed across investigations. You can extend students’ oral language by using the prompts on slide L, but you can also encourage students to include relevant, descriptive details and speak clearly so their ideas can be understood (SL.2.4). Suggest to students that each group can share about their group’s plants, Something similar between our plants is _____. Something different between our plants is _____. Provide small groups a few minutes to discuss their group’s plants’ similarities and differences, and use the sentence stems to decide on their group’s responses. [H]ave students share out their group’s plants’ similarities and differences and record these on Our Growing Ideas chart.” (Lesson 8, Teacher Guide)

CCSS-ELA-LITERACY.SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. Claimed as being explicitly used and named with specific support for teachers in Lessons 6 and 10. Evidence includes

- Lesson 6, Synthesize, Step 3: “Suggest to students that we are ready to put the ideas we have figured out together to explain how the seed that grew into the Tower Tree could have gotten to the top of the courthouse! Invite students’ ideas for what we could do next to represent our ideas, anticipating that students may suggest having a discussion, drawing/writing, acting out possible scenarios, and/or developing models. Build on students’ suggestions for, or—if needed—suggest, developing models of how a seed that grew into the Tower Tree got to the top of the courthouse. Remind students that a model is something that helps us explain and/or share our ideas about how or why something happens. We can develop individual models that share our ideas about how a seed got to the top of the courthouse to start growing into the Tower Tree!” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Review with students how they will each have an opportunity to draw and write about how a plant keeps growing and stays healthy in an unusual place.” “Tell students that they can choose which plant they want to draw and write about.” (Lesson 10, Teacher Guide)

CCSS-ELA-LITERACY.SL.2.6 Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification. (See grade 2 Language standards 1 and 3 for specific expectations.) Claimed as being explicitly used and named with specific support for teachers in Lesson 3. Evidence includes

- Lesson 3, Synthesize, Step 7: “Literacy Supports A Building Understandings Discussion offers students the opportunity to practice their speaking and listening skills. Reiterate for students the importance of following agreed-upon rules for discussion (e.g., listening, turn-taking) and speaking clearly with complete sentences. Practicing these speaking and listening standards helps students clearly and coherently communicate their science ideas. (SL.2.1A, SL.2.6). “With students, review the lesson question recorded on Our Growing Ideas chart, How can seeds be moved to new places by sticking?, and direct students to think first, then talk with a partner, then share what they figured out with the group. Consider providing sentence starters such as “We figured out that _____” or “We observed _____.” More discussion stems are available in the Discussion Supports handout.” (Lesson 3, Teacher Guide)

Language

CCSS-ELA-LITERACY.L.2.1D Form and use the past tense of frequently occurring irregular verbs (e.g., sat, hid, told). Claimed as being explicitly used and named with specific support for teachers in Lesson 10. Evidence includes

- Lesson 10, Synthesize, Step 2: Literacy Supports, Support students’ use of irregular past tense verbs while reviewing Our Growing Ideas chart. Children may use past tense to share the ideas they have already figured out. Model for students that verbs like “read” and “grew” do not follow the same patterns as other past tense verbs. If students misuse frequently occurring irregular verbs, consider repeating what they said using the correct form.” (Lesson 10, Teacher Guide)

CCSS-ELA-LITERACY.L.2.1E Use adjectives and adverbs, and choose between them depending on what is to be modified. Claimed as being explicitly used and named with specific support for teachers in Lessons 2, 7, and 8. Evidence includes

- Lesson 2, Explore, Step 3: “After students have had a few minutes to begin working, pause the class and point out that students are using lots of different words to describe their seeds. Indicate that it might be useful to keep track of some of these on an Adjectives chart (refer to slide H), so we can all refer to and use them.” “You might make connections between students’ work in ELA if they have experiences using adjectives to clearly describe details,

like places and characters, in their reading and writing. Adjectives and descriptions are also important in science so that scientists can clearly remember and communicate their observations.” “Consider organizing the list by sense (sight—“Seeds might look ...” and touch—“Seeds might feel...”)...Remember to use your students’ ideas and words—this is only a sample. (Lesson 2, Teacher Guide)

- Lesson 7, Explore, Step 3: “Use the prompt to support students in generating a list of words they can use to describe their observations of healthy and unhealthy plants; these details will be data that can serve as evidence about plants’ health. Remind students that these descriptions (adjectives) are important in science so that scientists can clearly remember and communicate their observations. Support students in recognizing that adjectives and descriptions are also important in science so that scientists can clearly remember and communicate their observations.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore Step 3: “Literacy Supports As students make observations of plants, reiterate that they can use different adjectives to communicate what they notice about each plant. Encourage students to use a variety of descriptive adjectives like green, yellow, full, wilted, or leaning to describe their observations, as well as comparative adjectives like bigger, taller, or wider. If students use comparative language, ask students, “Compared to what?” to support students in clarifying between which plants (or which Observations) they are making comparisons (L.2.1E). Pause partners in their observations and point out that you have heard some new descriptions of their plants. Indicate that it might be useful to add some new words to our Adjectives for Plants chart [T]hen ask students what new words they are using to describe their group’s plants and add these to the chart.” (Lesson 8, Teacher Guide)

CCSS-ELA-LITERACY.L.2.4B Determine the meaning of the new word formed when a known prefix is added to a known word (e.g., happy/unhappy, tell/retell). Claimed as being explicitly used and named with specific support for teachers in Lesson 7. Evidence includes

- Lesson 7, Explore, Step 2: Literacy Supports, “To ensure that all students are prepared to make observations of plant images, reinforce students’ comprehension of the word “unhealthy”. Remind students that some words can be broken up into smaller parts, and those smaller parts can be used as a clue to the meaning of the word. ‘Un-’ can be a clue to the meaning of the word unhealthy. Other words, like unhappy, unable, and unfair, also use ‘un-’ which means not or the opposite of. Use the affix ‘un-’ to emphasize that unhealthy means not healthy.” (Lesson 7, Teacher Guide)

CCSS-ELA-LITERACY.L.2.5 Demonstrate understanding of word relationships and nuances in word meanings. Claimed as being explicitly used and named with specific support for teachers in Lesson 1. Evidence includes

- Lesson 1, Connect, Step 1: “Invite students to engage in a brief turn-and-talk to share with a partner how they would explain what a seed is and/or what they already know about seeds. After hearing from several students, provide a common definition—something made in the flower that can grow into a new plant—and add it to the Word Wall.” (Lesson 1, Teacher Guide)

CCSS-ELA-LITERACY.L.2.5B Distinguish shades of meaning among closely related verbs (e.g., toss, throw, hurl) and closely related adjectives (e.g., thin, slender, skinny, scrawny). Claimed as being explicitly used and named with specific support for teachers in Lesson 2. Evidence includes

- Lesson 2, Explore, Step 4: “Discussion prompts support co-constructing the Seeds Observations data table such that rows related to one characteristic (e.g., size) are added sequentially. For example, the first prompt invites ideas about size so that a row for “small” seeds (e.g. small/tiny/little) is added to the data table and then comparisons with “small” lead to the addition of a second size-related row for “not small” (e.g., big/huge/large) seeds. Your class may choose to make different decisions; for example, a row for “medium” sized seeds would also be appropriate.” (Lesson 2, Teacher Guide)

Mathematics

CCSS-MATH-Practice.MP2 Reason Abstractly and quantitatively. Claimed in Lesson 2. Evidence was found in the claimed lesson and also lesson 7. Examples include

- Lesson 2, Explore, Step 4 “Math Supports As students compare seed characteristics (size, shape, texture), they engage in abstract and quantitative reasoning to decide how to categorize each seed and make sense of the different characteristics (later named as structures) for different seeds (MP2).” (Lesson 2, Teacher Guide)
- Lesson 7, Explore, Step 5 when students count the number of leaves during their plant observation and relate that quantity to the written symbol they use to record the number of leaves may be an example of students engaging in MP2.

CCSS-MATH-Practice.MP3 Construct viable arguments and critique the reasoning of others. Claimed in Lesson 9. Evidence was found in the claimed lesson. Evidence includes

- Lesson 9, Explore, Step 3: “Math Supports As students identify what plants need to keep growing and stay healthy, prompt them to reference specific elements of their line plot or data table as they describe what they notice and critique each other’s reasoning. (MP3): “Next, invite students to share and discuss their and their partner’s ideas using the prompts below. The purpose of this discussion is to support students in beginning to make sense of data displayed on the line plot, in preparation for noticing patterns in the next discussion. Students are likely to make sense of this data display in multiple ways; they may use numbers (___ black dots at ___ cm), comparison words (fewer/more dots at ___ number of leaves), and/or relative positions (dots are farther to the right/left) to describe the represented plant growth data. Encourage students to express their understanding of plant growth (height and number of leaves) through a variety of means, including through words in named languages they may use, pointing to the line plot, gesturing with their arms/hands, and holding up fingers to represent a number.” Prompts to use- Possible follow-up responses include, “Using the Plant Height line plot, what do you notice when we compare our plants’ height data?”-“Can you show us that on the line plot? What about the (red, yellow, blue, black) dots? What do you notice about those?”; “Using the Number of Leaves line plot, what do you notice when we compare our plants’ leaf data?”-“What about the (red, yellow, blue, black) dots? What do you notice about those? Can you tell us about that using (numbers, plant conditions)? Is that the same for the plants in other conditions (colors)?”. (Lesson 9, Teacher Guide)

CCSS-MATH-Practice.MP4 Model with mathematics. Claimed in Lesson 8, and 9. Evidence was found in the claimed lessons. Evidence includes

- Lesson 8, Explore, Step 6: Students create a line plot of their plants’ height and a line plot for their plants’ number of leaves which models how their actual plants have increased in size and structures or decreased in size and structures. “In small groups, make line plots of height data. Provide students a few minutes to make their line plots.” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 3: “Introduce and demonstrate how to build class line plots. Build line plots together as a class. Invite 1-2 groups at a time to use their Plant Observations handouts to place their dot stickers on the line plots” (Lesson 9, Teacher Guide)

CCSS-MATH-Practice.MP6 Attend to precision. Claimed in Lesson 7, 8, and 9. Evidence was found in the claimed lessons. Evidence includes

- Lesson 7, Explore, Step 5: “Math Supports Second-grade students are moving from informal units to standard units of measurement like centimeters and meters. Some may mistakenly think the numbers on rulers correspond to the marks rather than the spaces between them. To clarify, have students measure an object first with informal units

roughly a centimeter (e.g., a child's finger width, Cheerio diameter) and then with a standard ruler. As they measure plant heights, encourage students' precision by starting at 0 and using the spaces between marks to record the height to the nearest whole centimeter." (Lesson 7, Teacher Guide) Lesson 8, Explore, Step 2: "Math Supports As students measure the height (length) of their plants in Observations 2-4 to determine how much longer each plant is compared to the lengths from Observation 1 (part of 2.MD.A.4), have them attend to precision by rounding to the nearest whole number based on the object's position between ruler markings (MP6 and part of 2.MD.D.9). For measurement support, have students first estimate the length to build familiarity with centimeters, building on prior experiences with nonstandard units (part of 2.MD.A.3)."

- Lesson 9, Explore, Step 2: "Math Supports Have students attend to precision as they measure their plants' height and round to the nearest whole number based on the object's position between the ruler markings." (Lesson 9, Teacher Guide)

CCSS-MATH-2.MD.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes. Claimed in Lesson 7. Evidence was found in the claimed lesson. Evidence includes

- Lesson 7, Explore, Step 5: "Broadening Access Building Prerequisite Understandings. Show students a ruler with centimeter marks and ask how a ruler can be used to measure an object's length. Have students practice measuring objects in centimeters. Ask students what measurement should be recorded if an object's endpoint lands between two whole-number units. Discuss measuring plant height with a ruler. What tool can we use to measure the height of the plants? Make observations of plants in groups. As they make observations, remind students to discuss them with others in their group and record them on the corresponding Plant Observation 1 handout." Describes a place in the lesson where students are measuring the length of an object and using an appropriate tool" (Lesson 7, Teacher Guide)

CCSS-MATH-2.MD.A.3 Estimate lengths using units of inches, feet, centimeters, and meters. Claimed in Lesson 8. Evidence was found in the claimed lessons. Evidence includes

- Lesson 8, Explore, Step 2: "Math Support As students measure the height (length) of their plants in Observations 2-4 to determine how much longer each plant is compared to the lengths from Observation 1 (part of 2.MD.A.4), have them attend to precision by rounding to the nearest whole number based on the object's position between ruler markings (MP6 and part of 2.MD.D.9). For measurement support, have students first estimate the length to build familiarity with centimeters, building on prior experiences with nonstandard units (part of 2.MD.A.3)."

CCSS-MATH-2.MD.A.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit. Claimed in Lesson 8. Evidence was found in the claimed lesson. Evidence includes

- Lesson 8, Explore, Step 2: "Math Supports As students measure the height (length) of their plants in Observations 2-4 to determine how much longer each plant is compared to the lengths from Observation 1 (part of 2.MD.A.4), have them attend to precision by rounding to the nearest whole number based on the object's position between ruler markings (MP6 and part of 2.MD.D.9). For measurement support, have students first estimate the length to build familiarity with centimeters, building on prior experiences with nonstandard units (part of 2.MD.A.3). (Lesson 8, Teacher Guide)

CCSS-MATH-2.MD.D.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units. Claimed in Lesson 7, 8, and 9. Evidence was found in the claimed lessons.

Evidence includes

- Lesson 7, Connect, Step 3: “Display slide H and introduce the Scientists Plan Investigations book to students by reading the title. Then, read the book aloud and use the following prompts to discuss.” Prompts include: “Page 16: How could we make lots of observations and measurements?” Ideas to look and listen for include: “Use lots of plants.” “Use more than one plant.” “We probably need to try a couple of plants.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 4: Students record two plants’ height on a handout. “Have students gather needed investigation materials (their groups’ Plant Observations handouts, rulers, and plants) from the designated classroom areas. Provide time for students (in pairs) to make observations of their 2 assigned plants and record the data on the coordinating pages of their Plant Observations handouts.” (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: Students record a plants’ height on a handout “Let students know that they will be responsible for individually making and recording the fifth set of observations for one plant. Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts. Tell students that they will work in pairs to make a line plot of either their group’s plants’ heights or their number of leaves for Observation 5. In pairs, make line plots of height and number of leaves data.” (Lesson 9, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

CATEGORY II

NGSS Instructional Supports

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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 directly experience firsthand and through media representations the anchoring phenomenon and other lesson level phenomena. Students can clearly see how the phenomena and problems are relevant to them or to others they can relate to, and therefore why learning the science is necessary to explain the phenomenon. The lessons use examples accessible to all students and provide teachers with support in ensuring that students fully understand the examples and contexts. Within every lesson, there are opportunities for students to connect this unit to their own lives, communities, and cultures in meaningful ways that are authentically facilitated so it doesn't interrupt the flow of the lesson. These opportunities enrich students' sense-making by aligning with a purpose that is important to them.

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

Students experience phenomena firsthand in Lessons 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. Examples include

- Lesson 1, Explore, Step 2: "We wanted to gather more observations of plants growing in different places, so we decided to go outside into our own schoolyard. We might even find plants growing in unusual places. Bring students outside to your pre-determined location/s and have students find, observe, and record plants growing in different places." (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 2: "Hold up 1 bag of assorted seeds and tell students that they will have some time with a partner to explore with seeds." (Lesson 2, Teacher Guide)" (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: "Use images to further connect to seeds that stick. Display slide C and provide a moment for students to make observations of the images on the slide." (Lesson 3, Teacher Guide)
- Lesson 4, Connect, Step 2: "Introduce the Animal Mouths and Paws Infographics. Display slide D and tell students you were able to find some infographics about different animals and their body parts that might be related to using seeds for food; we can use these to gather information." (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 3: "Prepare to stop at page 5 and then at page 7, using students' hands as a cue (refer to slide F). For each of these pages, use the prompts below to support students in making observations of the images and text to first confirm that pollen can be moved by the wind and then to consider how animals (specifically, bees) might also move pollen to new places." (Lesson 5, Teacher Guide).
- Lesson 6, Navigate, Step 1: "Turn and talk to decide the Tower Tree is a mulberry tree. Invite students to turn and talk with a partner about whether they think the Tower Tree is likely an aspen tree or a mulberry tree, using the

images on slide C. Then, invite students' ideas about which kind of tree they think the Tower Tree is more like." (Lesson 6, Teacher Guide and Slide C).

- Lesson 7, Explore, Step 5: "Introduce the plants to students by holding up 1 (or more) plants. Tell students that these are all the same kind of plant (just like they suggested) and that you grew them from seeds, giving them light and water." (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 2: "For each of our 4 plants, 1. Make and record observations: Measure height Count leaves Describe the plant's color Describe how the plant looks." (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: "Have students distribute the plants and associated page of the Plant Observations handouts to each member of the group based on the decisions they made about who would make and record observations of each plant. Have the class' Adjectives for Plants chart visible to support students as they make and record their observations." (Lesson 9, Teacher Guide)
- Lesson 10, Connect, Step 3: "Display slide H and tell students that they will share their experiences with plants growing in unusual places around their home or community in small groups. If available, students can use their Out-of-School Plants in Unusual Places community connection. Each person should 1) choose one plant, 2) show or tell where the plant was growing, and 3) share why we think this is an "unusual" place for the plant to grow." (Lesson 10, Teacher Guide)

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

- Lesson 1, Connect, Step 1: Broadening Access: "Consider asking students about specific places in the community (a park, neighborhood, or store) where they may have observed plants growing and/or inviting them to share stories they have heard from their family about plants that grow in different places, including special or unusual ones." (Lesson 1, Teacher Guide)
- Lesson 2, Navigate, Step 1: Community Connections, "Students are likely to have experiences with seeds, including finding seeds outside, planting gardens, using seeds in cooking, eating seeds, or using seeds as food for pets/animals. Sharing these experiences can strengthen students' science identities by affirming their knowledge and bring relevance to the lesson's focal topic. Consider inviting students to bring in seeds from their homes and communities; the Optional: Seeds Letter is available for use or editing. Students can bring in seeds, share about their cultural experiences through storytelling, and add examples to the class's Seeds Observations data table (co-created and used in this lesson's "Make sense of data" Explore)." (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: Broadening Access, "Inviting students to share what they've experienced in their homes, communities, or places they've been provides an opportunity for some students to recall seeds clinging to clothing, pets, or other surfaces. Consider using multiple ways to elicit these stories—such as turn-and-talks, whole-class sharing, seeds students may have brought from home, or even drawings. Sharing these stores ensures that all students, even those without direct experiences, can learn from their peers' observations and connect meaningfully to the lesson-level phenomenon of seeds sticking to surfaces. Elevating students' stories positions every student as a knowledge-builder, while making the phenomenon accessible and meaningful." (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 6 "Community Connections In Western science, animals' "purposes" are often described in terms of survival needs (e.g., "a beak is for eating" or "paws are for grabbing food"). In this framing, the movement of seeds is seen as *incidental* to the animal's purpose. However, many Indigenous and community perspectives understand purposes and relationships differently. Rather than seeing seed movement as an accident or byproduct, these perspectives may emphasize reciprocal relationships among plants, animals, land, and people. From this view,

animals are not simply helping themselves but are also participating in broader cycles of care and continuity. You can acknowledge this by: Inviting students to share family or community knowledge about how plants and animals help one another. Asking, ‘Are there other ways of thinking about what animals are doing when they move seeds?’” (Lesson 4, Teacher Edition)

- Lesson 6, Navigate, Step 1: Community Connections, “When students observe the aspen and mulberry tree images on slide C, pause to invite their stories and experiences with berries or fruit. You might ask: Have you ever seen or picked berries or fruit like these before?, Where did you see them growing?, and/or What did you notice about how they grew or who cared for them? Doing so connects science to students’ lives and communities. This can surface cultural knowledge about plants, food, and place, broadening the kinds of expertise that have meaning in your science classroom. Such connections strengthen the classroom community, affirm diverse ways of knowing, and make learning personally meaningful for each student.” (Lesson 6, Teacher Guide)
- Lesson 8, Explore, Step 4: “use the following prompt to engage in a brief discussion to support students in connecting observed differences between their plants in different conditions to possible causes. Have you had a similar experience in your home or community that makes you think that? What was that like?” (Lesson 7, Teacher Guide)
- Lesson 9, Connect, Step 5: “Community Connections To share out-of-school examples of plants growing in unusual places, remind students about and re-invite students to return their Out-of-School Plants in Unusual Places community connection. Remind students they can draw and write about a plant growing in an unusual place, take a picture of the plant, or share another kind of representation. Let students know that you’ll continue to gather and revisit these examples in the next lesson to look for patterns and share ideas about how plants can grow in many different places. This ongoing practice positions students as contributors of valuable local knowledge and deepens the relevance of the unit’s anchoring phenomenon.” (Lesson 9, Teacher Guide)
- Lesson 10, Connect, Step 3: “Provide directions for how to share community connections. Display slide H and tell students that they will share their experiences with plants growing in unusual places around their home or community in small groups.” (Lesson 10, Teacher Guide and Out-of-School Plants in Unusual Places).

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

- Lesson 4, Connect Section, Step 2: “Invite students to share their ideas about how animals use their mouths and paws, including anything they may recall from Unit 1.4: How do the ways plants and animals look and act help them live and grow? and other connections they may have from their own experiences.” (Lesson 4, Teacher Guide)
- Lesson 5, Connect Section, Step 2: “Introduce the Plants, Pollen, and Pollinators book. As a class, read pages 1-7 aloud, using the prompts below to support students in gathering information about plants making seeds through pollination.” Prompts include: “Have you seen or touched pollen before? Where was that; what was that like? What are some places where you may have seen pollen?” “How do these new words and ideas (pollen, pollination) connect to experiences or ideas that you have had before?” (Lesson 5, Teacher Guide)
- Lesson 10, Connect Section, Step 3: “Each person should 1) choose one plant, 2) show or tell where the plant was growing, and 3) share why we think this is an “unusual” place for the plant to grow. Assure students that if they have not returned their community connection, they can still share about an unusual plant they have observed or use an example card that you have available for the class.” (Lesson 10, 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 students are positioned as the central focus of classroom discussions in teacher facilitation directions, and discourse focused on explicitly expressing and clarifying student reasoning. The materials provide students with opportunities to express, clarify, justify, interpret, and represent their ideas, and to respond to peer and teacher feedback, orally and/or in writing, throughout the unit. Students have frequent opportunities to share ideas and feedback with each other directly and to use others' ideas to prove or change their own thinking. Student artifacts include elaborations, which may be written, oral, pictorial, and/or kinesthetic, of reasoning behind their answers, and show how students' thinking has changed over time. Student artifacts do show evidence of reasoning and changes in thinking over time. Students are supported in expressing their scientific ideas and in continually examining and re-examining them in light of new evidence. The teacher's guide provides support for eliciting student ideas and giving feedback on student thinking.

Student ideas are clarified, justified, and built upon

Lesson 1-10 Teacher facilitated discussions included Prompts to Use and Possible Follow-up Responses that encourage students to clarify, justify and build upon their own and their classmates' discussions. Examples include

- Lesson 1, Connect, Step 1: "What do we already know about what plants start growing from (before they grow into a plant with a stem and leaves)?" (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 3: "What other words or phrases could we use to describe what the seed looks like? How else could we describe a seed's size? Its shape? What other words or phrases could we use to describe what the seed feels like? What other details are you noticing? How is that the same as/different from your partner's observations? What other details could you add to your drawing/writing?" (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: "How else (besides wind) do you think seeds could be moved to different places? What makes you think that? Can you say more about that? Can you point to that? What else do you observe?" (Lesson 3, Teacher Guide)
- Lesson 4, Connect, Step 2: "What did you and your partner find out about chipmunks' and voles' mouths? What did you notice about the structure of the mouths? How do you know that? Can you show us that on the infographic? Is the (chipmunk, vole) mouth also like that? How do you know? How do chipmunks and voles use their mouths? What are the functions of mouths for these animals? How do you know that? Can you show us that on the infographic? What other information did you find? Does the (chipmunk, vole) also use its mouth like that? How do you know? How does the structure of the chipmunk and vole mouths make it possible to do those things? How do you know that?" (Lesson 4, Teacher Guide)

Think, Pair, Share and Partner, Turn and Talk

- Lesson 2, Navigate, Step 1: "Share initial ideas about seeds getting to new places. Briefly invite students to turn and talk with a partner to share an initial idea about how seeds might get to new places. How do you think seeds might get to new places? Invite a few students to share their or their partner's ideas." (Lesson 2, Teacher Guide)
- Lesson 4, Connect, Step 2: "For each infographic, ask students to discuss the prompts on slide E: What do you notice about your animal's mouth and paws? How does your animal use its mouth and paws?" (Lesson 4, Teacher Guide)

- Lesson 7, Explore, Step 2: Invite students to again turn and talk with a partner about how we might plan an investigation that will allow us to make observations of plants' growth and health. Invite a few students to share ideas with the class, anticipating that there will be varied suggestions." (Lesson 2, Teacher Guide)
- Lesson 8, Explore, Step 3: "Invite students to turn and talk about what they can do if they and their partner do not agree on their observations and decide as a class that partners can first remake the observation/measurement and ask the other pair in their small group (or an adult) for help next." (Lesson 8, Teacher Guide)
- Lesson 10, Synthesize, Step 2: "Recall with students the other resources they may have mentioned earlier from the class's Plants Investigation, such as the Plants Investigation Results, the Plant Growth Data chart, and/or the Plant Health Data chart. Invite students to turn and talk about which of these we should use (in addition to Our Growing Ideas chart) as we update our model of how the Tower Tree keeps growing and stays healthy." (Lesson 10, Teacher Guide)

Scientists Circle

- Lesson 1, Synthesize, Step 6: "Use the suggested prompts further below to elicit students' initial ideas, foster comparisons, surface agreement and disagreement, and add ideas and uncertainty to the Initial Class Model. To parallel students' Initial Model: How is the Tower Tree growing there? handouts (and the Initial Class Model), the suggested prompts are organized into twos ("How did a seed get there to start growing into the tree?" and "How does the Tower Tree keep growing there?"). Though it is likely that your class will approach this discussion in this order, it is not necessary. (Lesson 1, Teacher Guide)
- Lesson 4, Connect, Step 2: "Then, invite students' ideas about what we could do next to gather evidence about whether or not birds can move and store seeds, like chipmunks and voles do." (Lesson 4, Teacher Guide)
- Lesson 8, Synthesize, Step 5: "Invite students to turn and talk about how we might be able to share and compare specific similarities and/or differences between our plants with other small groups." "Appreciate students' varied ideas for what we could do to share and compare observations more easily across our small groups and build on them by suggesting we start with just one of our observations (height)." (Lesson 8, Teacher Guide)

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

The unit instructs teachers to chart students' reasoning on a Growing Ideas Chart. The chart documents students' discussions answering their lesson level investigation questions with evidence and shows their thinking over time. Examples include

- Lesson 3, Synthesize, Step 5: Teaching Tip, "Consider taking photographs of your students as they use materials from the investigation to enact a scenario in which seeds are moved to somewhere new by sticking to animal's fur. These pictures can be used as the class co-constructs the Lesson 3 row of Our Growing Ideas chart in the Synthesize. Developing and Using Models As students enact ("act out") a scenario, they are developing a model based on evidence they gathered in their investigation to further support their understanding of how seeds can be moved to new places by sticking to surfaces, such as animal fur." "In the next lesson, students will individually develop a simple model using drawing and writing, this time based on evidence from an investigation and texts, to support their sensemaking around how seeds can be moved to new places by animals using them as food." (Lesson 3, Teacher Guide) The model is evidence of the students' reasoning and changes to their thinking over time as models in Lesson 3 show different ways seeds can move than their models showed in Lesson 1, presumably.
- Lesson 4, Synthesize, Step 6: Students update their Growing Ideas Chart "Then, invite students to turn and talk with a partner, and then share about what they figured out in this lesson about the structure (look, shape, texture) of an animal's body parts (mouth, paws, beak) and seeds that make it possible to be moved to a new place when using them for food." (Lesson 4, Teacher Guide)

- Lesson 5, Synthesize, Step 7: “Explain to students that we are ready to record what we figured out about our lesson question and how we figured it out, as we work toward a more complete understanding of our lesson set question, How do seeds get to different places to start growing into plants? Read the lesson question in the first column of Our Growing Ideas chart, How can pollen be moved in order to make seeds? and direct students to think first, then talk with a partner, and finally share with the group.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 3: “Refer to the first column on the chart, “What did we figure out?” and direct students to think first, then talk with a partner, then share with the group. Repeat with the other two prompts in this discussion, recording students’ ideas on Our Growing Ideas chart. Draw students’ attention to the Lesson Set 1 Question posted at the top of Our Growing Ideas chart (refer to slide G), How do seeds get to different places to start growing into plants?, which we also revisited at the start of this lesson.” (Lesson 6, Teacher Guide)
- Lesson 8, Synthesize, Step 5: “Ensure students can see Our Growing Ideas chart (refer to slide O) and prepare to have students share out their group’s plants’ similarities and differences and record these on Our Growing Ideas chart.” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Step 4: “Use the following prompts to invite students to think first, then talk with a partner, then share with the group to discuss each question and add to Our Growing Ideas chart. How should I add that to our Growing Ideas chart?” (Lesson 9, Teacher Guide)

Initial and Final Models

- Lesson 1, Synthesize, Step 5: “Support students’ initial sensemaking by providing an opportunity to consider their own and their partner’s ideas as represented in their models’ components.” (Lesson 1, Teacher Guide)
- Lesson 1, Synthesize, Step 6: “Introduce an initial class model. Assure students that we have not yet figured out how everything works! This initial model will help us put together our different ideas and identify what we are not yet sure about.” (Lesson 1, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “In this lesson, students individually develop models based on evidence they gathered from infographics and their investigation to represent a seed-and-animal combination that can move seeds to new places when animals use seeds for food. This builds on students’ experiences in the previous lesson, when they developed a whole class model using evidence from their investigation to enact how a different seed-and-animal combination (seed stuck to dog fur) can move a seed to new places.” (Lesson 4, Teacher Guide)
- Lesson 6, Synthesize, Step 4: “Revisit parts of the model on the Gotta-Have-It Checklist. Invite students to briefly turn and talk about what parts they should include in their models in order to explain how a seed could have gotten to the top of the courthouse to start growing into the Tower Tree.” (Lesson 6, Teacher Guide)
- Lesson 6, Synthesize, Step 5: “Develop a model to show one possible way to answer the question, How did a seed get to the top of the courthouse to start growing into the Tower Tree?” Models developed during this lesson should have more (frequency and elaboration) labels, structures, etc as students continue to learn about how to use models to express their understanding.” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Individually, students develop models to represent the pattern that light and water cause plants to keep growing and stay healthy, even in unusual places. This extends students’ experiences developing models in Lesson Set 1 by now representing the cause-and-effect relationships of how a plant keeps growing and stays healthy.” Cause and Effect, “Individually, students develop models representing the pattern that light and water cause plants to keep growing and stay healthy (effect). This builds on their investigation experiences over the previous 3 lessons, positioning them to use evidence of this cause-and-effect relationship in the new context of a unique unusual place.” (Lesson 10, Teacher Guide)

Students receive feedback and revise their thinking accordingly.

- Lesson 1, Synthesize, Step 5: “Encourage students to view their partners as resources and collaborators—someone who can offer new perspectives, language, or ways of showing thinking.” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 3: “[I]nvite them to find a new partner (who made observations of different seeds) and share one observation they made and recorded on their My Seed Observations handouts. This provides students with an additional opportunity to discuss their seeds to deepen their own noticing, and can expand the variety of seed observations students can draw upon before discussing them as a whole class in the next Explore.” (Lesson 2, Teacher Guide)
- Lesson 6, Synthesize, Step 5: “As students develop their models, circulate and engage in brief discussions in order to provide support and give feedback.” “Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree? Tell me more about that. How did you show the structure of the seed? The animal? How does (label/writing) help to explain your ideas about the seed and animal (Step 1)? What could you add to help others understand your thinking? How do you know this could happen? What is your evidence? Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree? Tell me more about that.” “Provide students with additional time to return to their My Model: How did a seed get there to start growing into the Tower Tree? assessments and continue working, now improving or completing their model using feedback from their partner. Continue to interact with individuals to discuss and provide feedback and support.” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Once students have reflected on their progress, have them briefly turn and talk with a partner about what they will work on next to update or add to their model. Have a few students share with the class.” “Update or add to our models. Provide students with additional time to follow through with the next steps in developing their models while you continue to interact with individuals to provide feedback and support.” (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A**II.C. Building Progressions****EXTENSIVE**

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

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

The reviewers found **extensive** evidence that the materials identify and build upon students’ prior learning in all three dimensions. The materials explicitly identify prior learning expected for all three dimensions, although **not at the element level**. The support to teachers clearly explains how the prior learning will be built upon. The materials provide explicit support to teachers in clarifying their understanding of potential alternate conceptions that they or their students may hold during the unit.

i. Explicitly identifying prior student learning expected for all three dimensions**Disciplinary Core Ideas:****LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow.**

- 2.4 Plants Unit Front Matter: “Students come to school with many experiences related to plants, through observing plants in gardens, farms, and public spaces as well as through growing plants in family or community gardens or taking care of houseplants. These common experiences make it likely that students will enter this unit thinking that plants need light and water. Further, in Unit K.4: Do birds, other animals, and plants need people to help take care of them?, students identify a pattern in what plants need to live: light and water (as part of K-LS.C-P1). “Students may have experiences with using fertilizer or other plant supplements to grow indoor and outdoor plants. Though these ideas will not be pursued through investigations in this unit, these experiences are building blocks to use as students consider that plants have “needs.” (2.4 Plants Unit Front Matter)
- 2.4 Plants Unit Front Matter, LS2.A: Interdependent Relationships in Ecosystems, “Students come to school with many experiences related to plants, through observing plants in gardens, farms, and public spaces as well as through growing plants in family or community gardens or taking care of houseplants. These common experiences make it likely that students will enter this unit thinking that plants need light and water. Further, in Unit K.4: Do birds, other animals, and plants need people to help take care of them?, students identify a pattern in what plants need to live: light and water (as part of K-LS.C-P1).” (2.4 Plants Unit Front Matter).
- Lesson 7, Navigate, Step 1: “Anticipate that students will already recognize that plants need light and water to survive; these ideas were developed in Unit K.4: Do birds, other animals, and plants need people to help take care of them? and form the basis for the investigation that students plan and begin to carry out in this lesson. Students may also have ideas that plants need soil, and this may be included in the Initial Class Model.” (Lesson 7, Teacher Guide)
- Lesson 7, Explore, Step 2: “Students are likely familiar with the idea that living things grow and that living things that are younger tend to be smaller than their older counterparts.” (Lesson 7, Teacher Guide)

LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around

- 2.4 Plants Unit Front Matter: “Students may have experiences with seeds from home and the community, as well as previous experiences in school. Second graders will likely know that plants come from seeds and will have had experiences with seeds, including planting seeds in pots or gardens. They may have experiences observing seeds sprout. In addition, students may have experiences eating seeds (e.g., sunflower seeds, pumpkin seeds), finding seeds inside fruit (e.g., apples), or observing other animals eat seeds (e.g., birds at a bird feeder). Finally, students may have noticed seeds (e.g., burrs) stuck to an animal’s fur (e.g., a pet after they rub against a plant) or their own clothing or shoes. Students can share these experiences with seeds (e.g., planting, eating, and sticking), and these can be leveraged as students consider ways seeds could be moved to new places (seed dispersal) during this unit.” (2.4 Plants Unit Front Matter)
- 2.4 Plants Unit Front Matter: “Students may also be familiar with pollen through experiences noticing the yellow/orange “dust” on surfaces or their fingers and/or through personal or family experiences with pollen as a key contributor to common seasonal allergies. Students may be familiar with pollinators (even if they are not familiar with this word), having noticed bees or other insects and animals near or on flowers and/or due to common “butterfly/pollinator gardens” in many communities. Prior to second grade, students may have experienced pollinators and pollination, such as observing pollinators like bees and butterflies, reading a book, or watching a movie that includes pollination. Students can share these experiences with pollinators during the unit. It is important to remember that students’ experiences with pollination and pollinators may differ depending on location and

opportunities. For example, students in a city may experience pollinators and pollination primarily in green spaces like parks and gardens, whereas students in a rural community may experience pollinators and pollination in a more natural area like field edges and along streams. “They will also likely be familiar with bees as an animal that gets what it needs from flowers and students who have completed Unit K.4: Do birds, other animals, and plants need people to help take care of them? will have read about how bees are an animal that gets their food from plants. Students who have completed Unit 1.4: How do the ways plants and animals look and act help them live and grow? will be familiar with plant and animal body parts, including fruits and flowers, as well as beaks, legs, mouths, paws, surfaces/coverings (e.g., skin, fur, scales), and wings, all of which are relevant to pollen and seed dispersal in this unit.” (2.4 Plants Unit Front Matter)

- Lesson 1, Connect, Step1: “Students have prior experiences with plants growing from seeds in Unit 1.4: How do the ways plants and animals look and act help them live and grow? and Unit K.4: Do birds, other animals, and plants need people to help take care of them?. While reading the Mystery Tower Tree Still Growing Strong newspaper article and throughout the next Explore, students will use their understanding that plants grow from seeds as they generate initial ideas about how the Tower Tree got to the top of the courthouse to start growing there and/or how plants in the schoolyard started growing in their respective places.” (Lesson 1, Teacher Guide)

Science and Engineering Practices:

Developing and Using Models

- 2.4 Plants Unit Front Matter: “Students may have seen or used models before. Students may also be familiar with diagrams or other representations from books or media that try to explain how something works. Students who have completed kindergarten and first grade OpenSciEd units bring in many experiences developing and using models to explain phenomena (e.g., explaining how to read under covers when it is dark in Unit 1.1: How can we read under covers when it’s dark?) and for designing solutions to problems (e.g., developing a model to solve the problem of the hot black top in Unit K.1: Why do some surfaces get hot and how can we make them less hot?). In addition, in second grade, students used models to explain and prevent land change and solutions to explain their designs in Unit 2.1: How do wind and water change the shape of land and what can we do about it?; in Unit 2.2: How can we design a new toy?, students used design sketch models of their toy design to use when building their toy; and in Unit 2.3: What lives where?, students used models to represent land and water in a given area. Across these experiences, students figure out how to distinguish between the model and what the model represents, compare models, and develop and use models that use a variety of representations. Across this unit, students engage in developing and using models to support their sensemaking in a variety of modalities, including enacting scenarios to figure out how seeds that stick to surfaces can be moved to new places, drawing and writing to make sense of how animals using seeds for food can move them to new places, and using objects to figure out if and how animals can move pollen to new places. This unit expands on students’ experiences developing models to include representing “proposed objects” in the natural world; specifically, students develop different possible models of a bee’s body parts, based on evidence they have gathered in the unit, and use these to figure out if and how animals can move pollen to new places.” (2.4 Plants Unit Front Matter)
- 2.4 Plants Unit Front Matter, Which Performance Expectations does this unit build toward?, Intentionally Developed Science and Engineering Practices, Developing and Using Models: “In Lesson 1, students develop a class model to represent initial ideas about how a seed that grew into the Tower Tree could have gotten to the top of the courthouse to start growing and how it can keep growing in that unusual place...Students use this to represent how a seed sticking to an animal could move the seed to a new place. In the next lesson (Lesson 4), students develop another model based on evidence, this time of a seed and an animal using it for food by storing it for later. Students engage in this work individually, representing how structures of seeds and animals’ body parts (mouth and paws or beak) can work together to pick up the seed, hold it while the animal moves, and bury it in a new place. Then, in Lesson 5, students use evidence they have gathered across lessons to develop a “proposed bee” and use it to figure out

if and how bees can move pollen from one flower to another. In their work, students make connections between actual pollinators/pollination and their models. Students are then prepared to use relevant evidence in Lesson 6 to put pieces together, developing a model that represents the structure-and-function relationships between seeds and animal body parts that could have moved the seed that grew into the Tower Tree to the top of the courthouse. Across multiple lessons, students compare models to identify common features and differences, deepening their understanding of common structure-and-function relationships as they are used in different contexts. Students end the unit (Lesson 10) by developing a model to explain how the Tower Tree keeps growing on top of the courthouse, representing patterns in plant growth and health (effects) caused by light and water.” (2.4 Plants Unit Front Matter)

- Lesson 1, Synthesize, Step 5: “Developing and Using Models Students develop initial models to represent their ideas about how a seed got to the top of the courthouse to start growing into the Tower Tree and how the tree continues to grow in its unusual place. This engagement with a partner prepares students for an Initial Ideas Discussion as they co-construct an Initial Class Model in the next Synthesize. These experiences build on students’ work developing and using models in other Grade 2 units and students will continue to develop this practice throughout this unit, including when the[y] return to their Initial Class Model in Lessons 6, 7, and 10.” (Lesson 1, Teacher Guide)
- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

Planning and Carrying Out Investigations

- 2.4 Plants Unit Front Matter: “Students may have planned and carried out investigations before. In Unit 2.1: How do wind and water change the shape of land and what can we do about it?, students planned and investigated the cause of land changing and solutions to prevent the problem. In Unit 2.2: How can we design a new toy?, students planned and investigated materials to use when building their toy. In Unit 2.3: What lives where?, students observed plants and animals to investigate the locations where they are found. When planning the investigation in this unit, students use previous experiences to test the conditions that may be needed for a plant to grow. Students may have observed plants being watered, placed near windows, growing in different types of land or areas. Students can use these ideas to generate ideas for what they can test in the investigation. Students can also use prior experiences of what healthy (and unhealthy) plants look like, alongside observations they make as a class using prepared images, to decide on the kinds of evidence they plan an investigation to gather. For example, students may have observed healthy plants and identified them as being green and larger, and not healthy plants as being yellow and wilting.” (2.4 Plants Unit Front Matter)
- 2.4 Plants Unit Front Matter “Students have many opportunities to make and record observations of the natural and designed worlds as part of kindergarten and first grade OpenSciEd units. They can build on those experiences, as well as their experiences outside of school, noticing the world around them and questioning what they experience. During this unit, students make a wide variety of observations and use these to make comparisons. Students use hand lenses to make careful observations of seeds and surfaces, identifying structures of seeds and surfaces and then using these observations to make comparisons that support them in building structure-and-function reasoning about what makes it possible for animals to move seeds and pollen to new places. Students make observations of animal body parts to make comparisons across mouths, paws, and beaks, again connecting observable structures to their similar and different functions for seed dispersal. Students end the unit by making ongoing observations of plants growing in different conditions. In this context, comparisons are used to link effects with causes (light, water).” (2.4 Plants Unit Front Matter)
- Lesson 2, Explore, Step 3: Planning and Carrying Out Investigations, “If students have completed Unit 2.3: What lives where?, they have experiences making observations to collect data of plants and animals in different areas.” (Lesson 2, Teacher Guide)

- Lesson 7, Explore, Step 4: Planning and Carrying Out Investigations, “Scientists plan and carry out investigations to gather data that serves as evidence to address their questions. In this lesson, students work first in small groups and then as a class to collaboratively develop a multi-lesson investigation plan that will allow them to gather data they can use as evidence that plants need light and water to keep growing and stay healthy. Though students have previously planned and conducted investigations in all of their OpenSciEd units, this is their first experience considering how to plan and conduct an investigation over an extended period of time. As the class co-plans the Plants Investigation, they consider what to keep the same and what to change. These ideas form the conceptual foundation on which students will build vocabulary and experiences (e.g., “fair tests,” “variables”) in the next grade band.” (Lesson 7, Teacher Guide)
- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

Analyzing and Interpreting Data

- 2.4 Plants Unit Front Matter: “In everyday experiences and other subjects in school, students have experiences counting and comparing objects, which can be leveraged in science to support their scientific sensemaking of the world around them. Building on those experiences, Kindergarten and Grade 1 OpenSciEd units have used counting and tally charts to support students’ sensemaking in science. This includes in Unit K.2: How can we be prepared for the weather?, when students used numbers and counting to identify temperature and other measurements, used tally charts and counting to support their identification of patterns, and used a picture graph to discuss and identify patterns in local weather conditions over time. Additionally, in Unit 1.3: What patterns of the Sun, Moon, and stars can we observe, describe, and predict?, students used graphs as a way of representing data in ways that supported them in identifying seasonal patterns in daytime length and used multiple ways of making sense of mathematical data and reasoning about daytime length by considering quantitative (hours of daytime) and relative (length of yellow bars) information. In this unit, students also use multiple ways of making sense of mathematical data and reasoning. While planning their Plants Investigation, students decide when to use qualitative and quantitative data, as it relates to making observations to be used as evidence. Students use counting and numbers to identify and describe patterns in plants’ growth (height and number of leaves) in different conditions. This unit uses graphs, specifically line plots, as a way of representing data so that it can be compared and discussed concretely. Students use line plots to organize data (height and number of leaves) in their Plants Investigation to identify patterns that serve as evidence of the cause-and-effect relationship between light and water (cause) and plants’ growth and health (effect).” (2.4 Plants Unit Front Matter)
- Lesson 2, Explore, Step 3: Analyzing and Interpreting Data, “The purpose of co-creating the Seeds Observations data table with students (versus providing a fully prepared data table) is to position them as contributors in making decisions about how to use their observations as data to be compared. Recording these data on a public chart will allow students to continue to reference their firsthand observational data in this and future lessons as they eventually describe relationships between the seeds’ observed characteristics (structures) and how the seeds can be moved to new places (function) in order to answer this and other lesson questions.” (Lesson 2, Teacher Guide)
- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

Using Mathematics and Computational Thinking

- 2.4 Plants Unit Front Matter “In everyday experiences and other subjects in school, students have experiences counting and comparing objects, which can be leveraged in science to support their scientific sensemaking of the world around them. Building on those experiences, Kindergarten and Grade 1 OpenSciEd units have used counting and tally charts to support students’ sensemaking in science. This includes in Unit K.2: How can we be prepared for the weather?, when students used numbers and counting to identify temperature and other measurements, used tally charts and counting

to support their identification of patterns, and used a picture graph to discuss and identify patterns in local weather conditions over time. Additionally, in Unit 1.3: What patterns of the Sun, Moon, and stars can we observe, describe, and predict?, students used graphs as a way of representing data in ways that supported them in identifying seasonal patterns in daytime length and used multiple ways of making sense of mathematical data and reasoning about daytime length by considering quantitative (hours of daytime) and relative (length of yellow bars) information. In this unit, students also use multiple ways of making sense of mathematical data and reasoning. While planning their Plants Investigation, students decide when to use qualitative and quantitative data, as it relates to making observations to be used as evidence. Students use counting and numbers to identify and describe patterns in plants' growth (height and number of leaves) in different conditions. This unit uses graphs, specifically line plots, as a way of representing data so that it can be compared and discussed concretely. Students use line plots to organize data (height and number of leaves) in their Plants Investigation to identify patterns that serve as evidence of the cause-and-effect relationship between light and water (cause) and plants' growth and health (effect)." (2.4 Plants Unit Front Matter)

- Lesson 7, Explore, Step 5: "Broadening Access Students have experience measuring objects using non-standard length units in earlier grades. To practice measuring accurately, have students measure an object (like a desk) using repeated copies of a short object, like sticky notes, placed end-to-end. Remind students that the length of an object is the number of same-size length units that span it, with no gaps or overlaps. Show students a ruler with centimeter marks and ask how a ruler can be used to measure an object's length. Have students practice measuring objects in centimeters. Ask students what measurement should be recorded if an object's endpoint lands between two whole-number units." (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 6: Teaching Tip, "Students' previous work with graphs (especially picture graphs) and number lines will help guide them in this discussion about line plots, even if they haven't covered line plots yet in math. If your students are less familiar with line plots, consider displaying slide Q and, before engaging in the provided discussion, prompt students to make connections by using prompts like, What do you notice? How is this line plot like a number line?" (Lesson 8, Teacher Guide)
- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

Crosscutting Concepts:

Cause and Effect

2.4 Plants Unit Front Matter: "Students likely have many experiences in and outside of school with cause and effect. Outside of school experiences with cause and effect relationships that relate to this unit could include ideas about what causes something to move to a new place. For example, students are familiar with the idea that hard pushes cause things to move farther. Students who have completed other second grade OpenSciEd units will also bring experiences that support the idea that an object either has to move itself or something else has to move the object. Students make observations of an object moving in Unit 2.1: How do wind and water change the shape of land and what can we do about it?, and identify the cause (wind and water) to move land (effect). Students also explore cause and effect in Unit 2.2: How can we design a new toy?, where they apply heat (cause) to materials to gather evidence of the effects. This unit provides an opportunity to develop cause-and-effect reasoning in additionally sophisticated ways in the context of living things. As students use their incoming ideas of "what plants need" as the basis for planning an investigation, they implicitly use cause-and-effect reasoning. Then, over the course of their investigation, the class will explicitly connect observations and measurements of plants (effects) to their causes (different light/water conditions)." (2.4 Plants Unit Front Matter)

- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

Structure and Function

- 2.4 Plants Unit Front Matter “Young students have everyday ideas about the relationship between the structure of objects in the world around them and their function. For example, they may notice that objects they use in their everyday lives, like eating utensils, can have specific shapes that can influence how they work; a fork with pointed edges picks up certain foods, while a spoon with a curved cup picks up liquids. If students have had experiences with OpenSciEd units in second grade, they may bring with them additional ideas and experiences from those units. For example, in Unit 2.1: How do wind and water change the shape of land and what can we do about it?, students designed solutions with specific structures to prevent land changing (function), and in Unit 2.2: How can we design a new toy?, they designed a toy structure to function in a specific way. Through both of these experiences, students designed and built objects with particular shapes to meet a desired function. In this unit, students’ structure and function reasoning extends to the “hand-lens” level, as students make observations of structures of objects (e.g., seeds, surfaces) using that tool.” (2.4 Plants Unit Front Matter)
- 2.4 Unit Front Matter, Which Performance Expectations does this unit build toward?, Intentionally Developed Crosscutting Concepts, Structure and Function “In this unit, students use structure-and-function reasoning to make sense of how seeds (and pollen) can be moved to new places so that plants can grow there. Students make careful observations of seeds (using hand lenses) in Lesson 2 to notice differences in structures, focusing on how the seeds look, including their shape, as well as their texture (how they feel). They then use information from a book to relate some of their seed observations (e.g., wings or strings) to their function in making it possible to be moved to new places by the wind. Students make additional careful observations of surfaces in Lesson 3, this time connecting both structures of seeds and surfaces to identify those that make it possible (or not possible) to function by sticking together. In Lesson 4, students gather information (through infographics and an investigation) to figure out structures of seeds and animals’ body parts (mouths, paws, beaks) that make it possible to function by picking up the seed, holding it while the animal moves, and burying it somewhere new. Then, in Lesson 5, students use evidence of structure-and-function relationships from their work with seeds to develop a “proposed bee” with structures they think will make it possible to move pollen from one flower to another. Students figure out that structures of pollen (e.g., tiny pieces) and pollinators (e.g., fuzzy surfaces of bees) make it possible for pollen to be moved to new places. In Lesson 6, students put pieces together as they use structure-and-function reasoning to explain one possible way that a seed that grew into the Tower Tree could have gotten to the top of the courthouse to start growing.” (2.4 Plants Unit Front Matter)
- Lesson 2, Explore, Step 4: “Structure and Function The functioning of natural systems depends on the shapes and relationships of key parts and the material from which they are made. In this lesson, students begin to use structure-and-function to make sense of their firsthand observations of differences in seeds’ sizes, shapes, and textures. Using their observations alongside information from the text in the following Connect, they identify how specific shapes and textures of seeds allow some to be moved to new places by the wind. Students will continue to use this crosscutting concept to guide their reasoning about how seeds (and pollen) are moved to new places in the following 3 lessons. This definition of structure prepares students to think about different materials and substructures in the next grade-band. Students previously used ideas of structure and function in the 2nd grade in Unit 2.1: How do wind and water change the shape of land and what can we do about it? when considering the shape and stability of landforms and in Unit 2.2: How can we design a new toy? when designing a toy.” (Lesson 2, Teacher Guide)
- While these describe what prior learning teachers can expect students to leverage in the unit, it does not link the learning to individual elements.

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

- Lesson 1, Synthesize, Step 4: “Teaching Tip If this is students’ first experience with the practice of developing and using models this year, consider providing additional support by reading the Scientists Can Explain Using Models book from Lesson 1 of Unit 1.1: How can we read under covers when it’s dark?. Alternatively, if you taught other second-grade units already this year, and you still have student or class-created models available, consider showing them as examples to remind students of their experiences with developing and using models. Developing and Using Models Students develop initial models to represent their ideas about how a seed got to the top of the courthouse to start growing into the Tower Tree and how the tree continues to grow in its unusual place. This engagement with a partner prepares students for an Initial Ideas Discussion as they co-construct an Initial Class Model in the next Synthesize. These experiences build on students’ work developing and using models in other Grade 2 units and students will continue to develop this practice throughout this unit, including when they return to their Initial Class Model in Lessons 6, 7, and 10.” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 4: Structure and Function: “In this lesson, students begin to use structure-and-function to make sense of their firsthand observations of differences in seeds’ sizes, shapes, and textures. Using their observations alongside information from the text in the following Connect, they identify how specific shapes and textures of seeds allow some to be moved to new places by the wind. Students will continue to use this crosscutting concept to guide their reasoning about how seeds (and pollen) are moved to new places in the following 3 lessons. This definition of structure prepares students to think about different materials and substructures in the next grade-band. Students previously used ideas of structure and function in the 2nd grade in Unit 2.1: How do wind and water change the shape of land and what can we do about it? when considering the shape and stability of landforms and in Unit 2.2: How can we design a new toy? when designing a toy.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: Planning and Carrying Out Investigations, “Students’ careful observations (using their sense of touch and their sense of sight, enhanced using the hand lens) of 1 surface during their investigation provides data they use to make comparisons among all 4 surfaces used in their small group. These data about the observed shape and material of each surface (the surface’s structure) are compared in preparation for connecting structures of seeds and surfaces to their function in sticking together and moving seeds to new places in the next Explore. Previously, in Lesson 2, students made and compared observations of seeds’ structures in Lesson 2, and the complexity of students’ scientific work increases in this lesson as students continue to use those observations alongside their observations of surfaces and observations of any seed-and-surface combinations.” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3: Planning and Carrying Out Investigations, “This builds on students’ experiences in the previous lesson, as they take on more responsibility for making investigation-related decisions and prepares them for additional investigation planning later in the unit.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 4: Structure and Function, “As in Lesson 4, students engage with an animal’s “body parts”—in this case, a bee’s legs and body—as they figure out which structures make it possible to move (in this case, pollen) to new places as well as how this works (function). Students use a hand lens to make careful observations, supporting them in noticing different objects’ appearances (including shape), as well as textures and figure out that fuzzy/hairy objects function while smooth ones do not. This aligns with students’ experiences in Lessons 2-4 when they related structure to functionality of moving (or not moving) seeds to new places.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 5: Developing and Using Models, “In Lesson 1, students developed an Initial Class Model that represented their initial ideas about how a seed that grew into the Tower Tree could have gotten to the top of the courthouse to start growing there. Over this first lesson set, students have gathered evidence from investigations and texts about structure-and-function relationships between seeds and animals (including animals’ surfaces/coverings) that contribute to seed dispersal. Now, in this lesson, students use this evidence to individually develop a model

representing one possible way for a seed that grew into the Tower Tree to have gotten to the top of the courthouse. In doing so, students evaluate various structure-and-function relationships to determine which are relevant to this phenomenon.” (Lesson 5, Teacher Guide)

- Lesson 7, Explore, Step 5: Scale, Proportion, and Quantity, “Scientists make observations and measurements that can serve as evidence and they consider these data in comparison with other data. In this unit, students’ consideration of scale, proportion, and quantity occurs as they use rulers and standard units (centimeters) to measure their plants’ heights/lengths. The standardization of these measurements allows for comparisons of each plant’s height at the beginning of the investigation (in this lesson) as well as over time (in Lessons 8 and 9). In these next lessons, students will also be able to use their standardized measurements to compare height/length among their group’s plants that are each receiving different things (light, water), as well as comparisons among plants in the whole class.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 6: Using Mathematics and Computational Thinking, “Scientists regularly use graphs to display data so that quantitative observations (such as plants’ heights) can be more easily analyzed and compared. In their small groups, students make a single line plot to display the height data of Plants A-D and use their line plot to compare their plants’ heights and then compare heights with another small group. In the next lesson, students take on more independence as they make two line plots with a partner and then make class line plots to display and analyze larger sets of data. If students need support, remind them of their experience representing and comparing numbers on a number line in math class. To make the line plot, have students first order their data from least to greatest and then represent each data point on the line plot with a pencil mark before adding the color-coded stickers.” (Lesson 8, Teacher Guide)
- Lesson 10, Synthesize, Step 4: Developing and Using Models, “Individually, students develop models to represent the pattern that light and water cause plants to keep growing and stay healthy, even in unusual places. This extends students’ experiences developing models in Lesson Set 1 by now representing the cause-and-effect relationships of how a plant keeps growing and stays healthy. Additionally, students’ models in Lesson 10 are each unique, representing different plants growing in unusual places. If students need additional support, encourage them to refer to the Class Consensus Model of the Tower Tree growing in its unusual place.” (Lesson 10, Teacher Guide)

Suggestions provided to help students avoid misconceptions. Evidence includes

- Lesson 2, Explore, Step 4: Teaching Tip, “You will notice teacher language in this (and future) lessons uses words and phrases such as gets moved or is/are moved to describe seed dispersal. This is meant to avoid misrepresenting that seeds intentionally move themselves. It is important to value students’ contributions while also maintaining scientific accuracy. If your students use the phrase “the seed moves” to describe seed dispersal, it is not suggested that student language be corrected. Instead, you can respond using accurate language (the seed is moved) while still acknowledging students’ ideas and observations.” (Lesson 2, Teacher Guide)
- Lesson 5 Teacher Reference, “Some materials (e.g., flour and other very fine, powdery materials) may stick to bee materials (especially the straw) due to electrostatic forces (i.e., the force from static electricity)—particularly in dry environments. Avoid using those materials to mimic pollen to ensure students’ observations provide evidence of structure-and-function relationships and not electrostatic forces.” This is an example of the developers preventing misconceptions for teachers’ choices outside of the recommended materials.
- Lesson 7, Explore, Step 2: “Introduce images of healthy and unhealthy plants. Tell students that you have sets of images for 2 different kinds of plants; for each kind of plant, one image is a healthy plant, and one is not (it is unhealthy). As students share, record their ideas on a prepared, but blank, chart titled “Adjectives for Plants” (refer to slide G), under the headings ‘Healthy plants...’ or ‘Unhealthy plants...’” (Lesson 7, Teacher Guide)

- Lesson 7, Explore, Step 4: Teaching Tip, “Grow lights will be used in the Plants Investigation across Lessons 7-9 to provide the growing plants receiving light with an even and consistent amount. This will help you grow the plants over a short time span and in a small area. The investigation setup you will follow in Plants Investigation uses lights chosen to mimic sunlight and provide even intensity over the plant growing area that will not “burn” the plants. Although you may have a sunny windowsill in your classroom, it will be difficult to provide all of the class’s plants with even sunlight. Uneven light for plants may skew results since it can cause plants to exhibit physiological differences. Establishing that these lights mimic sunlight will support students in connecting to all plants in Lesson 9 and back to the initial class model in Lesson 10. Teaching Tip In the Plants Investigation, students will place plants in 4 different conditions. Although these conditions technically address whether plants need light, need water, or need both light and water, the suggested investigation question is worded more simply as, “Do plants need light and water to keep growing and stay healthy?” If your students bring this up, feel free to word your investigation question to reflect their ideas (e.g., use “and/or” in place of “and”).” (Lesson 7, Teacher Guide)

Criterion-Based Suggestions for Improvement:

- Ensure that “[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]

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.

Student-facing materials use precise, grade-appropriate wording to help students scaffold their understanding of concepts across all three dimensions, avoiding the creation of misconceptions. Evidence includes

Mystery Tower Tree Still Growing Strong Newspaper Article

- Lesson 1, Connect, Step 1: “Last week, tree experts, called arborists, went up to the roof of the courthouse. They wanted to check on the Tower Tree to find out if it is still doing well. The arborists took measurements and made many observations.” (Lesson 1, Newspaper Article “Mystery Tower Tree Still Growing Strong”).

Seeds on the Move book from Lesson 2 and 3, presents science ideas with accurate and grade-appropriate scientific information and representations to support students’ three-dimensional learning.

- Lesson 2, Connect, Step 5: “As a class, identify important text features such as the table of contents, bold print, and headings. Affirm the purpose of reading this text together is to find information about how seeds can be moved to new places. Read pages 1-15 and use the following prompts to discuss.” For example
 - Page 6, “A seed’s structure makes it possible for the seed to be moved somewhere new and grow into a plant. Let’s look carefully at some seeds and notice how seed structures make it possible for seeds to be moved.”

- Page 16, “Seeds that are moved by the wind can have very different structures, from the wings of a maple tree seed to the tails of the foxtail barley seed! All of these structures make it possible for them to be carried by the wind, so they can grow into plants somewhere new.”
- Lesson 3, Connect, Step 6: “Show students the table of contents, inviting them to notice the headings (“Seeds and Wind” and “Seeds that Stick”) and to identify the page that we will want to begin our reading on today (page 17)... Facilitate an interactive read-aloud.” “Read the book aloud with the class, pausing to discuss the following prompts in ways that support students in making sense of the text, including making connections to their investigations of seeds and materials as well as continuing to make connections to their experiences.” (Lesson 3, Teacher Guide)

Animal Infographics

- Lesson 4: “Chipmunks use their paws to dig holes and bury seeds for later.”; “Voles use their mouths to hold seeds.” (Animal Infographics)

Plants, Pollen, and Pollinators Book

- Lesson 5, Connect, Step 2: “Refer to slide C and introduce the Plants, Pollen, and Pollinators book. As a class, read pages 1-7 aloud, using the prompts below to support students in gathering information about plants making seeds through pollination.” (Lesson 5, Teacher Guide)
- Lesson 5, Connect, Step 6: “Continue reading a book and discuss the associated prompts. Ensure students can view the Plants, Pollen, and Pollinators book (refer to slide N) and ask students to recall where we left off.” (Lesson 5, Teacher Guide) *The wording on pages 10, 11, and 12 has the potential to lead to misconceptions.* Evidence includes
 - Page 10, “Bees, butterflies, and hummingbirds eat pollen and drink nectar inside of flowers. Nectar is a sugary liquid found inside some flowers.” *While bees sometimes consume pollen, butterflies and hummingbirds primarily visit flowers to drink nectar and rarely consume pollen. This wording may lead students to incorrectly conclude that all pollinators eat pollen.*
 - They carry the pollen with them as they move. Then, the pollen falls off or rubs off onto new flowers. Flowers use the pollen to make seeds, which can grow into new plants!

Meet the Expert: Taal Levi Book

- Lesson 6, Connect, Step 2: “Introduce the Meet the Expert: Taal Levi book by showing the cover and reading the title (refer to slide F). Share with students that Taal Levi is a scientist who studies animals and plants—specifically, bears in forests—and he has figured out a lot about how plants’ seeds can be moved to new places.” (Lesson 6, Teacher Guide)
 - Page 8, “Just like other animals, after bears eat, they poop! Animal poop is called scat. Animals travel all over the forest and poop in different places. Seeds from berries that animals, like bears, eat are in their scat.”
 - Page 12, “Seeds get moved to new places by animals and sometimes those seeds will grow into new plants!”

Scientists Plan Investigations Book

- Lesson 7, Connect, Step 3: “Ask students what they learned from the book that we can do to plan our investigation with plants. Listen for ideas to create an investigation question, figure out what data we need to answer our question, decide what to test and how to test it, and collect multiple observations and measurements. Suggest we start by developing an investigation question and reviewing what observations we need to gather.” (Lesson 7, Teacher Guide)

- Page 6, “The class decides their investigation will answer the question, What kind of ramp and push will move a toy car the farthest? First, the class thinks about what kinds of observations and measurements will help them know if hard pushes and tall ramps work the best. This information can be used as evidence to answer their question.”
- Page 17, “The second graders will use the observations and measurements they gather from their investigation as evidence to support or change their ideas. They think that a hard push from a tall ramp will make a toy car move the farthest. The investigation that they plan will allow them to carefully test this idea!”
- Lesson 7, Explore, Step 4: “Add a “Give plants different things” step. Refer to the “What we will give plants” part of the Plants Investigation Plan and say something like, We said that to test if plants need light and water, we need to give plants different combinations of those things. How can we describe that as our next step?” (Lesson 7, Teacher Guide and Co-constructed table).
- Plant 8, Explore, Step 2: “Display slide D and provide 4 copies of the Plant Observations handout to each small group, ensuring that there is 1 handout for each plant. Read the title with students and point out the spaces to fill in their group number, the plant’s label(e.g., A, B, C, or D), and the condition that it is in (e.g., light and water).” (Lesson 8, Teacher Guide)
 - Plant Observations handout, “Growth Observations (numbers) Observation 1 Observation 2 Observation3 Observation 4 Observation 5Height (cm) Number of Leaves””; “Health Observations (adjectives) Observation 1 Observation 2 Observation3 Observation 4 Observation 5 Plant Color The plant is/looks”

Different Plants in Different Places Book

- Lesson 9, Connect, Step 6: “Tell students that you have a book about students who help their families and community members keep plants growing and healthy. Introduce the Plants in Our Communities book (refer to slide N) and read the title.”
 - Page 5: “Hannah and Ridge tell their grandfather that the plant needs light. They put the mint plants on the kitchen window sill so that it can get the light it needs to grow and be healthy.”

Possible students’ ideas about plants needing soil to grow appears in several lessons within this unit. Suggestions for addressing the idea are provided in Lesson 10. Examples include

- Lesson 1, Synthesize, Step 6: Teaching Tip, “Your students may have ideas and/or areas of uncertainty, such as plants needing soil/dirt, fertilizer, or “plant food” to grow, that are not reflected on this sample Initial Class Model. If these (or other) ideas come up in your classroom, acknowledge them and add them to your class’s initial model so that it reflects your students’ thinking. These ideas are not directly pursued in this unit, as learning goals reflect only plants’ needs for light and water. More information is available in the Unit Front matter.” (Lesson 1, Teacher Guide)
- Lesson 7, Navigate, Step1: Teaching Tip, “Students may also have ideas that plants need soil, and this may be included in the Initial Class Model. Pursuing these ideas is outside of the learning goals for this unit; students further explore ideas about other needs plants have in Unit 5.1: How does a nurse log help other things live and grow?. To support your own science understandings, see the unit front matter.” (Lesson 1, Teacher Guide)
- Lesson 10, Navigate, Step 1: Teaching Tip. “If your Initial Class Model includes students’ initial ideas and questions about plants needing soil/dirt, fertilizer, or other ideas that were not directly pursued in this unit, and students refer to these ideas during the turn and talk, validate and acknowledge these ideas. Students will have an opportunity to address these ideas as they update their Initial Class Model with evidence gathered from their Plants Investigation during the next Synthesize.” (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement:

- Ensure “the student-facing materials have precise, grade-appropriate wording to help students scaffold their understanding of concepts in all three dimensions, avoiding creating misconceptions” [Detailed Guidance, p. 26]
 - Consider editing the *Plants, Pollen, and Pollinators* book to revise the language so that it consistently emphasizes that pollinators visit flowers to obtain nectar and that pollen sticks to their bodies as they feed. Making nectar the explicit focus will improve scientific accuracy and support students in developing a correct understanding of pollination.

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 teacher support for differentiated instruction, including materials that provide a common learning sequence for all learners, ensuring students with diverse needs and abilities can access instruction. The materials included specific support for learners who may struggle to complete primary learning tasks, as well as differentiation strategies to support communication and peer-to-peer interactions. The materials offer a variety of facilitation tools to support discourse. Additionally, the materials offer extensive ways to support students in demonstrating their understanding through multi-modal expressions. Teaching materials include detailed guidance describing how individual students with a variety of needs can be supported to access and engage in each specific learning activity. There is evidence that the materials provide support for students with vision impairment, fine-motor skill challenges, language barriers, and writing difficulties. Differentiation supports are provided to help students access learning for all targeted learning objectives, including all three dimensions and their use together. There are many examples of extensions for students with high interest and **limited extensions for students who have already met the performance expectation to deepen their understanding of the practices, disciplinary core ideas, and/or crosscutting concepts.**

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 all students to access instruction, using a variety of modalities and engagement opportunities. Examples include

- Elementary Teacher Handbook, in the section that describes the “Universal Design for Learning” there is a chart that is described as “The UDL framework is organized both horizontally and vertically based on neuroscience research regarding how human beings learn. The neuroscience research shows that learning involves a multistep process,

a trajectory to support deep understanding. Horizontally, the UDL framework is organized to support student engagement in the learning context or environment and build deep understanding during the process of learning. Vertically, the Guidelines are “organized around three principles, which are aligned with three networks in the brain that involve the learning processes.” (Elementary Teacher Handbook, Draft June 2024) The 2.4 Plants Unit Front Matter refers teachers to the handbook.

- Additional Accessibility Resources provides seven detailed strategies for providing science instruction for students. “Making OpenSciEd Accessible Educator Guidance OpenSciEd elementary lessons have been designed in a way to allow for students to provide multiple ways to engage, represent, and communicate their learning. While these opportunities exist within the current materials, there may be needs in your classroom that will require additional customized adaptation to make them more accessible for learner needs.” (Additional Accessibility Resources, Field Test Version, May 2024)
- Lesson 1, Materials and Preparation, “Some students may benefit from additional support as they record observations and ideas on their Plants Outside and Initial Model: How is the Tower Tree growing there? handouts. Please see the “Supporting Literacy for All Students” section of the Teacher Handbook for ways to scaffold literacy tasks for students based on their individual needs.” (Lesson 1, Teacher Guide)
- Lesson 3, Synthesize, Step 7 “Broadening Access A Building Understanding Discussion provides an authentic opportunity for you to enhance students’ language learning and language use for sensemaking work. You might find it helpful to use the Discussion Type Prompts reference during the discussion. This handout provides teacher prompts that you could use to encourage students to discuss what they figured about how seeds move from plants to new places. Validate all the ways students might express their ideas and allow them access handouts or classroom materials when appropriate.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: Teaching Tip, “Students may benefit from different amounts and kinds of scaffolding as they individually develop models. For a class or group of students who may need more support, consider adding additional details to the Gotta-Have-It Checklist, either in advance or through discussion with students. A sample is provided in Unit 2.4 Chart Examples, slide 32. Additionally, consider providing a “student-sized” version of this checklist as a resource for individual students. This provides students with more guidance and may be especially appropriate if this is the first time your students are using a Gotta-Have-It-Checklist.” (Lesson 4, Teacher Guide)
- Lesson 7, Explore, Step 4: Broadening Access, “When forming groups of four for a multi-lesson investigation, consider grouping students intentionally to maximize collaboration and promote equitable participation. Mix students with complementary strengths (e.g., combine students who are strong in drawing, writing, or oral explanation) so each member can contribute their unique skills.” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 5: “Teaching Tip Consider coloring, underlining, or otherwise marking adjectives that describe healthy plants as green and adjectives that describe unhealthy plants as brown on the class’s Adjectives for Plants chart to provide additional support for students as they color in their data. As students collaborate to identify patterns in these data next, the patterns can be expressed using the color (all green), the adjective (mostly upright), or the health (all unhealthy). Use the language that best summarizes the patterns in your class data.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 5: Broadening Access, “Support equitable discussions by providing students with sentence starters. Consider adding these, as appropriate, to the lesson slides or other public place in the classroom for students to reference while they share their models with a partner. If applicable and as needed, provide sentence stem translations in your students’ home language(s) to support peer discussions. Partners can share their models: I included ____ because it shows _____. or, I think ____ because _____. Partners can compare their models: I included something similar: _____. or, I included something different: _____.” (Lesson 10, Teacher Guide)

- The use of turn-and-talk as a strategy for engagement is used throughout the entire unit. The explanation appears in Lesson 6, Navigate Section, Step1 in a Teaching Tip.” (Lesson 6, Teacher Guide). Examples of using the turn-and-talk strategy include
 - Lesson 1, Connect, Step1: “Invite students to first think and then turn and talk with a partner about where they have noticed plants growing before. The purpose of this turn-and-talk discussion is to support students in generating initial connections with this common phenomenon (plants growing in places around us) and to motivate engaging with an unusual example using a newspaper article next.” (Lesson 1, Teacher Guide)
 - Lesson 2, Navigate, Step1: “Briefly invite students to turn and talk with a partner to share an initial idea about how seeds might get to new places. [I]nvite students to turn and talk with a partner about their own experiences with seeds.” (Lesson 2, Teacher Guide)
 - Lesson 6, Navigate, Step1: “Invite students to turn and talk with a partner about whether they think the Tower Tree is likely an aspen tree or a mulberry tree, using the images on slide C.” (Lesson 6, Teacher Guide)
- The use of a Word Wall and Adjectives Chart supports students to use vocabulary and more precise language in just-right moments. There are suggestions for teachers about when to post words that will be referred to in future lessons. Examples include
 - Lesson 2, Explore, Step 3: “Use the prompts below to support students in generating a list of words they can use to describe their observations; the details about their seeds that they are noticing using their senses.” (Lesson 2, Teacher Guide)
 - Lesson 3, Explore, Step 3: “After students have had a few minutes to begin making observations, pause the class and point out that students are using lots of different words to describe the surface they are observing and—just like in Lesson 2—it might be useful to keep track of some of these words on our class’s Adjectives chart.” (Lesson 3, Teacher Guide)
 - Lesson 6, Connect, Step 2: “Add scat to the Word Wall. Point out that “scat” might be a new word for many of us and we can add it to our Word Wall so that we can continue to reference and use it, like experts do. Scat means animal poop.” (Lesson 6, Teacher Guide)
 - Lesson 7, Explore, Step 2: “Use the prompt to support students in generating a list of words they can use to describe their observations of healthy and unhealthy plants. Support students in recognizing that adjectives and descriptions are also important in science so that scientists can clearly remember and communicate their observations.” (Lesson 7, Teacher Guide)
 - Lesson 9, Explore, Step 2: “Have the class’ Adjectives for Plants chart visible to support students as they make and record their observations. Encourage them to refer to the class’ Adjectives for Plants chart as they record their plant health data.” (Lesson 9, Teacher Guide)

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

- Lesson 1, Connection, Step 1: Broadening Access, “Encourage discussion in students’ home or preferred language before share-outs and consider spending additional time eliciting students’ own experiences with plants growing in different places.” (Lesson 1, Teacher Guide)
- Lesson 3, Navigate, Step 1: “The purpose of the images and discussion is to ensure all students’ access to seeds sticking to surfaces on people (clothes, socks, shoes, jackets, backpacks) or animals (fur of a pet dog, farm animal, or wild animal). This step ensures that all students are aware of seeds that can stick (and therefore be moved to new places), even if they haven’t directly had this experience; this positions all students equitably to engage in the work

of this lesson. The images provide a shared anchor point that ensures all students can refer to the same observable example, reducing reliance on prior experience alone.” (Lesson 3, Teacher Guide)

- Lesson 7, Explore, Step 4: “Teaching Tip Providing clear symbols on the table helps students quickly see at a glance what each plant is receiving, supporting organization, and reducing confusion during investigations. Suggested symbols include a light bulb (light), a light bulb with a “no” symbol (no light), a water drop (water), a water drop with a “no” symbol (no water), and a potted plant. You can provide these images as cutouts that students can place on their Plants Investigation Plan found in *Plants Investigation Charts* reference, and/or near each plant to track conditions. This visual support benefits all learners, including multilingual students and those who benefit from clear, consistent visual cues, by making experimental variables immediately recognizable and accessible.” (Lesson 7, Teacher Guide)
- Lesson 9, Explore, Step 2: Using Mathematics and Computational Thinking, “If students need additional support in making line plots, encourage them to order their data from least to greatest and then represent each data point on the line plot with a pencil mark before adding the color-coded stickers. As students use the line plots to make comparisons, remind them of their work with number lines and comparing numbers on number lines.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 2: Broadening Access, “When inviting volunteers to share ideas, we risk hearing from the same few students every time. For a more equitable distribution of science talk, ask students (during partner talk) who have not shared recently if they would like to share during the whole group discussion. This invites new voices in a way that feels socially safe, promoting confidence and willingness to engage in class discussions.” (Lesson 10, Teacher Guide)

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

- Lesson 1, Explore, Step 2: Broadening Access, “If any students in your class have visual impairments, consider structuring the observation of Tower Tree visuals with alternative options. For example, you can provide digital images on an electronic device that would allow students to zoom into pictures and hear audio image descriptions with alternative text. Additionally, you can offer vision heightening options such as a magnifying glass or larger print. Furthermore, you can pair students with a sighted peer who can describe each image verbally in a clear and detailed way, with attention to important factors. Give students options in how they want to access the content (audio description, peer partner, digital zoom, etc.), so they can choose what works best for them.” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 3: Broadening Access, “Students who completed Unit 1.4: How do the ways plants and animals look and act help them live and grow? will be familiar with using a hand lens to make small things appear larger and those who completed Unit K.4: Do birds, other animals, and plants need people to help take care of them? will also be familiar with using binoculars to make far away things appear closer/larger. Both of these tools support making more detailed visual observations. Consider further expanding access for all students or for any student with visual impairments by using accessible technology such as video magnifiers to project magnified images of seeds onto a screen, which will allow students to view additional details. When needed, consult a student’s IEP/504 for additional ideas.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: Broadening Access, “Offer adaptations to ensure students with fine-motor challenges can participate meaningfully; for example, consider providing a partner’s assistance, pre-attach seeds partway, and/or provide the largest available seeds of each type.” (Lesson 3, Teacher Guide)
- Lesson 6, Synthesize, Step 6: Broadening Access, “If there is a student(s) with a disability related to mobility, adjust this activity to ensure their equitable participation in the gallery tour. Some ways to do so include having students pass their assessments around the Scientists Circle or taking pictures of students’ models and projecting them on slides. Approaches such as these ensure that all students have opportunities to engage with their peers’ ideas and participate in consensus-seeking discussions.” (Lesson 6, Teacher Guide)

- Lesson 10, Synthesize, Step 5: Broadening Access, “If there is a student(s) with a disability related to mobility, adjust this activity to ensure their equitable participation in the gallery tour. Like in Lesson 6, some ways to do so include having students pass their assessments around the Scientists Circle or taking pictures of students’ models and projecting them on slides. Approaches such as these ensure that all students have opportunities to engage with their peers’ ideas and participate in the discussion to identify differences and elevate similarities across students’ models.” (Lesson 10, Teacher Guide)

Learners reading below grade level

- Elementary Teacher Handbook, “Scaffolds for Independent Reading” section has suggestions for how teachers might respond when they observe students showing signs of struggles listed in the table. The table includes sections for use Prior to Reading and During Reading. (Elementary Teacher Handbook)
- Elementary Teacher Handbook, “Scaffolds for Read Alouds” section has suggestions for how teachers might respond when they observe students showing signs of struggles listed in the table. The table includes sections for use Prior to Reading and During Reading. There is also another table labeled “Asking and Answering Questions” that may be helpful during discussions. (Elementary Teacher Handbook)
- Lesson 4, Connect, Step 2: “If needed, review the main ideas from the *Animal Mouths and Paws Infographics*. If you feel that these main ideas have not yet been clearly surfaced through the preceding discussions, pause to review them. You could do this by reading the sentences and pointing to images on infographics that you display or by inviting students to do so.” (Lesson 4, Teacher Guide)

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

- Lesson 1, Synthesize, Step 5: Teaching Tip, “If this is students’ first experience with the practice of developing and using models this year, consider providing additional support by reading the Scientists Can Explain Using Models book from Lesson 1 of Unit 1.1: How can we read under covers when it’s dark?. Alternatively, if you taught other second-grade units already this year, and you still have student or class-created models available, consider showing them as examples to remind students of their experiences with developing and using models.” (Lesson 1, Teacher Guide)
- Lesson 3, Navigate, Step1: Teaching Tip, “In this lesson, the word “surface” is used to refer to materials (i.e., animal coverings or other objects) that seeds may or may not stick to (e.g., fabric, fur-like material, leather-like material, shoelaces, etc). Students who experienced Unit K.1: Why do some surfaces get hot and how can we make them less hot? interacted with many examples of surfaces. For students that may need support recalling this word and examples of surfaces, consider revisiting the Surfaces Infographic.” (Lesson 3, Teacher Guide)
- Lesson 6, Synthesize, Step 6: Developing and Using Models, “If students need additional support identifying which features should be “the same” they make comparisons, consider referencing their Gotta-Have-It Checklist and asking them to show or tell why each part is needed using questions like, “Why should our models include a seed? How is a seed important?”” (Lesson 6, Teacher Guide)
- Lesson 8, Explore, Step 2: Teaching Tip, “If students need more support in carrying out their investigation, encourage the student/partnership/small group to reference the Plants Investigation Plan. Consider providing students with a “student-sized” copy of the class’s Plants Investigation Plan. Students can cross out each step as they or their partner/group member completes that step. Or, groups can use it to keep track of students’ roles (e.g., using initials or colors to designate themselves) for that Observation. If helpful, consider supplying a new copy for each Observation. Broadening Access The Plant Observations handouts use data tables to support students in organizing

their many observations; for each plant (handout), students record 4 different observations (height, number of leaves, color, appearance) at 5 different times (Observations 1-5). Use can suggest strategies to break the table into smaller, more manageable chunks to guide attention and help students process data more accurately and reduce cognitive load. Consider folding the Plant Observations handout into columns and/or rows, highlighting or color-coding the current section, and/or using a prepared cardstock tool, such as that in the Observations Overlay Tools reference.” (Lesson 8, 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.

- Lesson 2, Connect, Step 5: “Teaching Tip Extension Opportunity. For students who have a high interest in these ideas, consider providing seeds from their investigation and inviting them to try moving the seeds to new places (e.g., across the desk) using wind (e.g., waving a paper fan, blowing out of their mouths). Students may want to try different techniques and set-ups, which can further support their planning and carrying out investigations, which is a focus in later lessons of this unit. This extension may generate additional questions, as students may notice that some seeds without the identified structures (wings, fluff, strings) can also be moved by the wind (e.g., tiny radish seeds). Acknowledge and appreciate these questions and, as possible, add them to the class’s Notice and Wonder chart.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 2: “Teaching Tip Extension opportunity: Students may be interested in testing additional seeds and/or surfaces. Consider providing more options during the investigation, particularly for individual students or small groups who may finish the planned investigation before their classmates. For example, students may want to test seeds that have already been identified as being moved by the wind (e.g., maple tree and thistle seeds) to find out if they might also stick to surfaces and/or surfaces such as a plastic lid (to mimic a turtle shell). This engagement validates students’ curiosities and provides additional opportunities to investigate materials and make observations. Be sure to test any additional materials in advance and note that dried seeds with external appendages (e.g., wings of maple tree seed) may be fragile and prone to crumbling.” (Lesson 3, Teacher Guide)
- Lesson 5, Connect, Step 6: “Community Connections Extension opportunity: To extend your students’ learning beyond the classroom, check out the Pollinators Connect/Extend reference. This resource offers ideas for connecting students’ classroom work with pollinators to students’ local environments and cultural contexts. You’ll find community-based exploration ideas, regional and cultural examples, and reflection prompts that help students see pollination as a shared ecological and social process. These extensions offer multiple ways for students to engage, connect personally, and demonstrate understanding through place-based and culturally relevant experiences.” (Lesson 5, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Broadening Access Extension Opportunity: If students finish early or have a secure understanding of what plants need to keep growing and stay healthy, have them add another “pane” to their model (preceding their current model), addressing the question, “How did a seed get to that unusual place to start growing?” (Lesson 10, Teacher Guide). This is the **only** instance of an extension for students who have already met the performance expectation.
- Lesson 10, Synthesize, Step 5: “Broadening Access Extension Opportunity: Students who are interested could create a newspaper article they want to share with someone outside of class that includes the story of their final plant growing in an unusual place. In their newspaper article, they can create their own narrative story (in their preferred language) about how a seed could have gotten to this unusual place to start growing there, using plausible science ideas, and include how their plant continues to keep growing and stay healthy. Students can then share this article with their community.” (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement:

- Ensure that, “Differentiation strategies explicitly clarify how they address the needs of students who have already met the performance expectation[s] or who have high interest in the subject matter and are ready to develop deeper understanding in any of the three dimensions.” [Detailed Guidance, p. 28]

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. Teachers are supported to help students see how lessons fit together. The materials provide guidance for implementing routines such as convening Scientist Circles, reviewing the Notice and Wonder chart at the beginning and conclusion of lessons, facilitating Building Understanding discussions, and adding to the Our Growing Ideas chart. Through the use of the routines, students connect their daily learning to the targeted learning objective to make sense of the Tower Tree phenomenon. The routines also connect learning across lessons and serve to develop curiosity for future lessons, prompting students to ask questions that are answered in subsequent lessons.

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 use of the Navigation Sections at the beginning and ending of almost every lesson, strategies for engaging students across lessons, in a way that helps connect what students learned and apply it in coming lessons or clarifying what learning still needs to happen in next lessons. Examples include

- Lesson 1, Navigate, Step 7: “To support students in recognizing that areas of uncertainty regarding our Tower Tree phenomenon, such as how a seed got to the top of the courthouse to start growing there, are helpful tools in deciding what to investigate next, and to add questions from the Initial Class Model to the Notice and Wonder chart. Consider where to go next” (Lesson 1, Teacher Guide)
- Lesson 4, Navigate, Step 7: “Purpose: To celebrate students’ work while also positioning them to ask new questions, use their Seeds Observations data table to recognize they have figured out ways that seeds with different structures can be moved and to generate wonders about seeds that will motivate the next lesson.” (Lesson 4, Teacher Guide)
- Lesson 7, Navigate, Step 1: “Purpose: To continue to position students as contributing to science-class decisions, use the Notice and Wonder chart and Initial Class Model to reconnect them to questions they had about what plants need to grow, as well as their co-constructed Lesson Set 2 Question.” (Lesson 7, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Purpose: To support students in seeing themselves as driving science activities, reconnect them to their wonders on the Notice and Wonder chart and their Plants Investigation Plan from the last lesson, further motivating and directing new observations of students’ Plants A-D.” (Lesson 8, Teacher Guide)

- Lesson 10 Navigate, Step 1: “Purpose: Revisit students’ questions about the Tower Tree and their ideas in the Initial Model in order to motivate updating the model by adding evidence from their investigations that supports how plants depend on light and water to keep growing and stay healthy.” (Lesson 10, Teacher Guide)

The materials provide detailed support for teachers in facilitating conversations at the beginning, middle, and end of lessons to help students make sense of their ideas, connect learning across activities, and build toward understanding the unit phenomenon. Supports include prompts for teachers to use in facilitating discussion, sample student responses, and possible follow-up prompts to use to shape the discussion. Examples include

- Lesson 5, Navigate, Step 1: “Use the following discussion prompt to help students recall what they are still wondering about seeds. As you engage with students, reference the Notice and Wonder chart or selected sticky notes that were added at the end of Lesson 4, specifically the wonders related to how seeds are made or where seeds come from.”
Prompt: “What are we still wondering about seeds?” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 4: “Continue to invite students to think first, then pair with a partner to consider whether the ideas we figured out in the lesson are helpful in explaining (are relevant to) how a seed got to the top of the courthouse to start growing into the Tower Tree. Then, invite a few students to share ideas as a class and ensure the class is in agreement before moving to the next lesson row. The outcome of these discussions should be that Lesson 3 is not helpful/useful for explaining the Tower Tree phenomenon (since mulberry seeds are in fruit, and therefore do not have structures that students have identified as sticking to animals’ surfaces) and should be “crossed out,” Lessons 4 and 6 are relevant, and Lesson 5 is not directly helpful/useful and should be crossed out.” (Lesson 6, Teacher Guide)
- Lesson 8, Explore, Step 6: “Introduce line plots to make sense of our data. Ensure students are sitting with their investigation groups. Remind students that we decided to compare the heights of their Plants A, B, C, and D between groups. Suggest that we try a tool from math class, a line plot, which is a way to display data using a number line, using our most recent measurement of plants’ height (from Observation 4), and find out if this tool can help us make comparisons. Show slide Q and use the following prompts to invite students’ ideas and ensure a common class understanding. Prompts to use ‘How could we use a line plot to compare our own plants’ heights (Plants A-D) from our most recent measurement (Observation 4)?’ ‘How could we use a line plot to compare our own plants’ heights to another group’s?’” (Lesson 8, Teacher Guide)
- Lesson 10, Synthesize, Step 5: “Engage in a gallery tour. Invite students to stand up and move slowly around the Scientists Circle in the same direction, reminding them to look closely at how each model shows how the plant keeps growing in its unusual place.

Discuss similarities in all our models. Once students have returned all the way around the circle to their My Model: How does this plant keep growing here? assessment, invite students to sit back down. Engage in a discussion with students using the following prompts. The purpose of this discussion is to support students in identifying the pattern that all plants that are growing in different (unusual) places depend on water and light to keep growing and stay” Prompts to use “What were some of the different places you noticed plants growing?” “What did you notice was the same about how plants are growing in everyone’s models?” “What causes all plants to keep growing and stay healthy, in all these different places? What is our evidence?” (Lesson 10, Teacher Guide)

Lessons 2, 3, 4, 5, 6, 7, 8, 9, and 10 wrap up with a Synthesis component where students convene in a Scientist Circle to engage in a Building Understandings Discussion. Teachers are supported to facilitate these discussions using the Our Growing Ideas chart to help students connect their ideas to the lesson learning objective, reflect on what they figured out, and link that understanding to the overall unit question.

- Lesson 2, Synthesize, Step 6: “Gather students in a Scientists Circle. Gather students in a Scientists Circle for a Building Understandings Discussion about how seeds can be moved to new places.” (Lesson 2, Teacher Guide)

- Lesson 5, Synthesize, Step 7: “Revisit Our Growing Ideas chart. Display Our Growing Ideas chart (refer to slide O) and the class’s Bee-Pollen Consensus Model to engage students in an Building Understandings Discussion. Explain to students that we are ready to record what we figured out about our lesson question and how we figured it out, as we work toward a more complete understanding of our lesson set question, How do seeds get to different places to start growing into plants?” (Lesson 5, Teacher Guide).
- Lesson 7, Synthesize, Step 7: “Explain to students that we are ready to record what we figured out about our lesson question and how we figured it out, as we work toward a more complete understanding of our lesson set question, How do seeds get to different places to start growing into plants? ” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 5: “For this Lesson 8 Our Growing Ideas chart row, the “What did we figure out?” column will include a response from each small group. An example of how this chart, updated after this discussion, might look is provided here. Remember to use your students’ words and ideas—this is only a sample.” (Lesson 8, Teacher Guide)
- Lesson 10 Synthesize, Step 5: “Give directions for sharing individual models. Organize students into pairs with their completed My Model: How does this plant keep growing here? assessment. Display slide L and tell students they will each have an opportunity to share with their partner what they drew and wrote about how their plant keeps growing in an unusual place and their evidence for their ideas.” (Lesson 10, Teacher Guide)

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

- Lesson 2 Assessment Tool, Assessment Statement 2: **Plan and carry out an investigation collaboratively to produce evidence (including quantitative data displayed using line plots) that plants need light and water (cause) to keep growing and stay healthy (effect).** (aligned to 2-LS2-1), “Use recorded evidence to formatively assess students’ progress in Lessons 2-6. Additionally, use the Instructional Guidance 1 tool in Lesson 4 to plan next steps based on the evidence you have collected. You will summatively evaluate students’ progress in Lesson 6 using the Summative Guidance 1 tool. (Lesson 2 Assessment Tool, Following Students’ Sensemaking 1).
- Lesson 7 Assessment Tool, L7-9 Following Student Sensemaking, Assessment Statement 2: Students can **plan and conduct an investigation to produce data to answer a question about whether plants need water and light (cause) to grow (effect).** (aligned to 2-LS2-1), “Use recorded evidence to formatively assess students’ progress in Lessons 7-9 (see the Instructional Guidance 2 tool in Lesson 9 to plan next steps based on the evidence you have collected). You will summatively evaluate students’ progress in Lesson 10 using the Summative Guidance 2 tool.” (Lesson 7 Assessment Tool, Following Students’ Sensemaking 2).

Sidebars are used to provide strategies for ensuring sensemaking is linked to learning in all three dimensions. Examples include

- Lesson 3, Explore, Step 3: Teaching Tip, “The purpose of comparing observations in small groups is for students to recognize that the 4 surfaces used in the investigation vary in their structure. This can prepare them to make sense of their seed-and-surface investigation results by considering structures of both seeds and surfaces in the next Explore.” (Lesson 3, Teacher Guide)
- Lesson 5, Synthesize, Step 5: “Teaching Tip It is suggested that the class comes to consensus during their co-development of the class’s Bee-Pollen Consensus Model as this is the only lesson where students will have the opportunity to figure out the portion of the Disciplinary Core Idea developed in this unit, LS2.A, which centers on plants depending on animals to move pollen. Supporting students to come to consensus on how structures of a bee and pollen function together to move pollen from one flower to another will further prepare them for putting the pieces together in the next lesson.” (Lesson 5, Teacher Guide)

- Lesson 8, Explore, Step 2: “Cause and Effect Students’ Plants Investigation is designed to gather evidence (observable patterns in plant growth and health) that plants need light and water to grow and stay healthy (cause). Throughout the Plants Investigation, ensure students are engaged with plants in different conditions, including gathering and returning them from light/no light locations and providing them with water (or no water). These concrete actions provide students with experiences that build connections between their initial ideas of “what plants need,” their investigation design with “plants in different conditions,” and their firsthand observations of their plants across lessons. These connections support sensemaking around the cause-and-effect relationship between the conditions (light, water) and observations (effects).” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Step 4: Teaching Tip, “Prompting students to reconnect to the Lesson Set 2 Question and share questions about plants growing in different places motivates reading a text in the next Connect in order to gather information that all plants need light and water to grow and stay healthy. During this discussion, students may share and/or ask about the unit’s anchoring phenomenon (the Tower Tree) and/or other plants growing in unusual places. Acknowledge and accept these in a way that reassures students that we will return to these phenomena; that is the putting-pieces-together work of the next lesson (Lesson 10).” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 2: Planning and Carrying Out Investigations, “Students use the data produced from their Plants Investigation as the basis for evidence to answer their questions about how the Tower Tree keeps growing on top of the courthouse. Students will continue to use these data as evidence to support their ideas about how other plants keep growing in unusual places on their My Model: How does this plant keep growing here? assessment in the next Synthesize.” (Lesson 10, Teacher Guide)”

Criterion-Based Suggestions for Improvement: N/A

II.G. Scaffolded differentiation over time

EXTENSIVE

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 **extensive** evidence that teachers have guidance to identify the needs of individual students as they develop proficiency and independence in SEP elements. The materials support students’ engagement in the practices and gradually adjust support over time so that students are increasingly responsible for making sense of phenomena. Students become more independent when they use MOD-P1 in lessons set 1. Students use MOD-P4 from the beginning to the end of the unit and independently complete several models. The models become increasingly rigorous by adding features such as processes to demonstrate interactions among the parts of the models. Students transition from whole class to small groups, to partners, and then to independent work when using INV-P4. Students also begin by making and sharing observations, then comparing them, and finally using them as evidence to answer their questions.

MOD: Developing and Using Models

MOD-P1: Distinguish between a model and the actual object, process, and/or events the model represents

Students engage in multiple lessons where an opportunity exists for them to distinguish between a model of something and an actual object or process. The examples often refer to how the model mimics the actual object. At first, it is the teacher

making explicit the connection between the model and the actual object and in later lessons, students are asked to explain the connection between the model and the actual object. Examples include

- Lesson 2, Explore, Step 3: “Share (hold up or pass around) examples of the surfaces you were able to secure for students to investigate, making connections between the materials and students’ suggestions: fabric (like pants), a fur-like material, a leather-like material, and shoelaces.” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3: “Listen for students to share that we used objects that mimic (to act like or copy) real animals; for example, we used fur-like materials to mimic dog fur. Decide on which object/s to use to mimic bird beaks. Then, display slide H and hold up and briefly demonstrate with (by opening, closing, squeezing) tweezers, tongs, and a coin pouch, showing students possible materials they can use that can mimic a bird beak.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 4: “The purpose of this discussion is to support students in connecting structures of bee legs/bodies that function to make it possible for pollen to be moved from one flower to another. How did the bee leg/body function? How did chenille stems and pom poms work together with the pollen to move the pollen? What is the same about the chenille stems and pom poms? In other words, what structures of bee legs/bodies make it possible for pollen to stick?” (Lesson 5, Teacher Guide)
- Lesson 7, Explore, Step 4: “Share lights that can mimic the Sun. Share with students that you have some special lights that we can use to make sure that all the plants that we want to have light will get light. These mimic (*act like*) the Sun! Establishing these grow lights as mimics of sunlight will help students connect their findings from the Plants Investigation to “all plants” in Lesson 9 and to the Tower Tree in Lesson 10. If helpful, show students these lights and invite any questions they may have.” (Lesson 7, Teacher Guide)

MOD-P4: Develop a simple Model based on evidence to represent a proposed object or tool.

Students develop simple models in multiple lessons. They begin with a model in Lesson 1 to reveal their current understanding of how a seed may grow in an unusual place. Students then create models as a whole class, and continue revising and adding to the model over several lessons. During this same time, students have opportunities to create models in groups, partners and then finally individually. Students’ models begin with simple objects and some labels and then add in processes and finer details as they learn more in the unit. Examples include

- Lesson 1, Synthesize, Step 5: “Developing and Using Models Students develop initial models to represent their ideas about how a seed got to the top of the courthouse to start growing into the Tower Tree and how the tree continues to grow in its unusual place. This engagement with a partner prepares students for an Initial Ideas Discussion as they co-construct an Initial Class Model in the next Synthesize. These experiences build on students’ work developing and using models in other Grade 2 units and students will continue to develop this practice throughout this unit, including when they return to their Initial Class Model in Lessons 6, 7, and 10.” (Lesson 1, Teacher Guide)
- Lesson 3, Synthesize, Step 5: “As students enact (“act out”) a scenario, they are developing a model based on evidence they gathered in their investigation to further support their understanding of how seeds can be moved to new places by sticking to surfaces, such as animal fur.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “Develop a model to explain. Tell students that you have prepared a handout that you think can help us develop a model in order to make sense of how certain seeds are moved by animals when they are used as food. Individually develop a model. Provide time for students to individually develop their models.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 3: “So, it seems that bees could move pollen, but we need more evidence to figure this out. Explain that we can explore our ideas about how this could happen by developing a model! If needed, remind students that a model is something that helps us explain and/or share our ideas about how or why something happens.” (Lesson 5, Teacher Guide)

- Lesson 6, Synthesize, Step 5: “Now, in this lesson, students use this evidence to individually develop a model representing one possible way for a seed that grew into the Tower Tree to have gotten to the top of the courthouse. In doing so, students evaluate various structure-and-function relationships to determine which are relevant to this phenomenon.” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Individually, students develop models to represent the pattern that light and water cause plants to keep growing and stay healthy, even in unusual places.” (Lesson 10, Teacher Guide)

INV: Planning and Carrying Out Investigations

INV-P2: Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.

Students have several opportunities to engage in planning and carrying out investigations collaboratively to produce data to answer a question. During each of the investigations, students are guided through the process of developing the investigation question, procedures and materials used and how to collect data. In the final investigation, students work more independently to answer the questions of what they want to figure out, how they will figure it out, collecting data, and making observations. Examples include

- Lesson 3, Explore, Step 2: “Plan an Investigation. Invite students to turn and talk with a partner about what kinds of surfaces they would like to find out if seeds stick to. [U]se the following prompts to invite students to make and share their observations, now focusing on the surfaces to which seeds seem to be sticking (or not sticking) to. What ideas does this give you about materials we could use in our investigation? Then, invite students’ ideas for materials we could use that might be like the outside—or surface—of an animal, such as its fur, hair, or other covering, depending on ideas students have previously generated. What materials could we use that would be like the outside—or surface—of an animal? Discuss and decide on seeds. Review which seeds we are still wondering about and therefore which ones we will want to investigate. What kinds of seeds—which seeds’ structures—are we still wondering about? Affirm with students that we are interested in investigating seeds of different sizes, shapes, and textures. We are interested in investigating almost all of the seeds we made careful observations of in our last lesson. Invite students’ input about how to make and record our observations of seeds sticking to surfaces during their investigation. How could we record whether or not the seed and surface stick together?” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3: “To support students in planning an investigation focused on birds’ beaks, first affirm with students that feet and wings are important body parts for birds’ movement; birds use their feet and wings to walk, hop, fly, and land! However, share that you were only able to gather some investigation materials; these are more similar to beaks than to feet or wings, so we can focus our investigation on beaks! Invite students to turn and talk with a partner about which object or objects they think would best be used in their investigation, to figure out if and how birds can move and store seeds, and why.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Step 4: “Allow students time to develop and use a model representing how a bee’s legs/body could move pollen from one flower to another. Circulate to ask students about their work and how their model is (or is not) working to move pollen from one flower to another. Invite students to show their thinking with movement, drawing, or pointing—not just words. Tell me about and show me your model; how are you using your materials? How is it working or not working to move pollen? What do you notice about the bee and pollen (in your model) that is making it possible (or not) to move pollen?” (Lesson 5, Teacher Guide)
- Lesson 7, Explore, Step 2: “Consider how to plan an investigation using plants. Acknowledge students’ ideas for (or suggest) planning an investigation with plants. Invite students to again turn and talk with a partner about how we might plan an investigation that will allow us to make observations of plants’ growth and health.” (Lesson 7, Teacher Guide)

- Lesson 8, Explore, Step 2: “Students’ practice in collaboratively planning and conducting investigations supports their development as scientifically literate young people. Across this lesson, students take on increasing responsibility in carrying out their investigation. Before Observation 2, the teacher guides a review of the Plants Investigation Plan, and then, before Observation 3, students lead this review. Scaffolding is reduced prior to Observation 4, as students take on more responsibility for referencing the Plan as they carry out their investigation. Students also take on more responsibility as they make and record observations, first together as a small group (Observation 2) and then in partnerships (Observation 3 and 4). (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: “Scientists regularly plan and carry out long-term investigations; in this lesson, students finish carrying out the multi-lesson Plants Investigation they planned, now individually making their 5th and final observations/measurements of 1 plant.” (Lesson 9, Teacher Guide)

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

Students regularly make observations to collect data that can be used to make comparisons throughout the unit. The teacher provides guidance in early lessons so that students’ observations become more detailed and there are multiple times where the class consensus discussions include comparing the students’ observations. Guidance for teachers provides suggestions for teachers that includes removing supports when students are ready for more autonomy in making and recording their observations. Examples include:

- Lesson 1, Explore, Step 3: “Make Observations Outside. Bring students outside to your pre-determined location/s and have students find, observe, and record plants growing in different places.” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 3: “Make and record seed observations. Organize students into pairs and distribute the needed materials to each student: 2 different seeds, a hand lens, a writing utensil, and a copy of the My Seed Observations handout.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “As students carry out their investigation, testing which seeds stick (and do not stick) to their surface, they are making observations that they will use to make comparisons among their own small group, and later (in the next Explore), as a whole class.” (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Step 3: “Suggest returning to the book to make observations and decide together if we already have evidence to support these ideas.” “Revoice and elevate students’ observations (from page 7) that a bee is standing on the flower and that pollen is on the bee and ensure all students have the opportunity to make these observations.” (Lesson 5, Teacher Guide)
- Lesson 7, Explore, Step 2: “Tell students that you have sets of images for 2 different kinds of plants; for each kind of plant, one image is a healthy plant, and one is not (it is unhealthy). Observe images of plants with a partner. Invite students to turn and talk to a partner with a different card about what they observe that helps them know if the plant is healthy or unhealthy.” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 3: “During Observations 3 and 4, students work in pairs, taking on more independence in carrying out their investigation, making observations and measurements of their plants, as well as the additional responsibility for sharing these data with their investigation groups. (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: “In this lesson, students finish carrying out the multi-lesson Plants Investigation they planned, now individually making their 5th and final observations/measurements of 1 plant.” (Lesson 9, Teacher Guide)

MATH: Using Mathematics and Computational Thinking**MATH-P3: Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs.**

The unit provides opportunities for students to engage with this practice in multiple lessons. The teacher provides guidance in early lessons so that students' data collection process is very structured. There is guidance suggested to teachers about ways to support students who may need additional support and ways to give students opportunities to practice. Students regularly work in small groups and partnerships during the scaffolded parts of the lesson in order to engage with this practice. Later in the unit, students work in partnerships to create their own line plots using the data collected. Examples include

- Developing and Using Science and Engineering Practices, Lesson 8: "Students measure the height of each of their plants and display this data (from Observation 4) using a line plot (a simple graph without a y-axis). In this lesson, they make measurements in small groups and with partners, and they work as a small group to make their line plot. Using this display supports students in first describing and comparing the heights of their 4 plants growing in different conditions (quantitative attribute) and then in making comparisons to another group's plants." "In the next lesson, students will continue to engage in this practice, doing so with more independence (in pairs) and in more complex ways by using line plots to display both height data and number of leaves data for the entire class, comparing plants in different conditions to notice patterns of observable effects (growth) and connecting these to causes (light/water)." (2.4 Plants SEP-DCI-CCC-ELA-Math-Matrix, p 10)
- Lesson 8, Explore, Step 6: "Students may benefit from different amounts and kinds of scaffolding as they make line plots. For a class or group of students who may need less support, consider reducing initial scaffolding by providing groups with the prepared handout and dot stickers and having them display their data without the introductory discussion. You could also consider having students work in pairs (instead of small groups) and/or display two groups' data (8 data points) on one line plot. These options provide students with less guidance and position them to engage in the task more independently. This may be especially appropriate if your class regularly engages in mathematics and computational thinking." (Lesson 8, Teacher Guide)
- Lesson 9, Explore, Step 2: "Students finish carrying out the multi-lesson Plants Investigation they planned, now individually making their 5th and final observations/measurements of 1 plant. Students share these data with their group members, using them to make comparisons about the growth and health of their groups' four plants. Together, these data from each small group will serve as the basis for evidence to answer their question: Do plants need light and water to keep growing and stay healthy?" (Lesson 9, Teacher Guide)
- Lesson 9, Explore, Step 3: "Students use observations of plants in different conditions to describe patterns in their growth (height and number of leaves) and health (color and appearance). Students' data analysis is scaffolded through the use of 2 class charts. First, the class co-constructs their Plant Growth Data chart using simple graphs (line plots) to organize their plants' growth data. Then, the class co-constructs their Plant Health Data chart using data tables to organize their plants health data." (Lesson 9, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

CATEGORY III

Monitoring NGSS Student Progress

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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 materials elicit direct, observable evidence of three-dimensional learning and that students are using practices with core ideas and crosscutting concepts to make sense of phenomena. Student artifacts regularly require student engagement with grade-appropriate elements of the three dimensions.

Formal tasks in the materials are driven by well-crafted phenomena- and problem-based scenarios that can elicit rich student performances.

Materials elicit direct, observable evidence of three-dimensional learning and that students are using practices with core ideas and crosscutting concepts to make sense of the phenomena of a tree growing from the top of a building and local observations of plants growing in different places. Assessments are similar in style and context to student learning activities as all learning activities are accompanied by prompts posed by the teacher. Examples include

Key Formative (Lessons 4 and 9)

- Lesson 4, Synthesize, Step 5: “Individually develop a model. Provide time for students to individually develop their models. As students work, use the following prompts to support them in using structure-and-function reasoning to represent and explain relationships between animals and seeds that make it possible for seeds to be moved to new places when animals use them for food by storing them for later.” (Lesson 4, Teacher Guide)
- Lesson 9, Explore, Step 2: “Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts. As students make observations, circulate the room and use any of the following prompts to support them in individually collecting data.” Prompts include: “What is the height of the plant?” “What do you observe about the plant’s color?” (Lesson 9, Teacher Guide)

Summative (Lessons 6 and 10)

- Lesson 6, Synthesize, Step 5: Students individually develop a model to answer the question, “How did a seed get there to start growing into the Tower Tree?” “As students develop their models, circulate and engage in brief discussions in order to provide support and give feedback.” Prompts include: “Tell me about your model! How does it explain how the seed got to the top of the courthouse to start growing into the Tower Tree?” Ideas to look and listen for include: “Here’s the chipmunk near some poop and there are seeds in the poop. The bird picks up the seed with its beak. I think a mouse ate a berry.” Possible follow-up responses include: “Tell me more about that. How did you show the structure of the seed? The animal? How does (label/writing) help to explain your ideas about the seed and animal.” “What could you add to help others understand your thinking? How do you know this could happen? What is your evidence?” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Individually, students develop models to represent the pattern that light and water cause plants to keep growing and stay healthy, even in unusual places.” “Engage in one-on-one discussions while students develop models. As students develop their models, circulate and engage in brief one-on-one discussions with students.” Prompts include: “How does your model show how the plant is growing and staying healthy?” Ideas to look and listen for include: “I showed the plant getting light and water. I drew ___ and used the word ___.” Possible follow-up responses include: “Tell me more about that. How does (this part/label) help to explain your ideas? What could you add to help others understand your thinking?” (Lesson 10, Teacher Guide)

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

All lessons require students to engage with three dimensions in their sensemaking and therefore, their performance can be monitored in three dimensions. Examples include

- Lesson 4, Synthesize, Step 5: Students complete the How can seeds be moved by animals when using them for food? handout to show their understanding of the three steps for animals moving seeds. **DATA-P2: Use and share pictures, drawings, and/or writings of observations.** **DCI 2-LS2.A2 LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2), CCC4:P2 Systems in the natural and designed world have parts that work together.**
- Lesson 5, Explore, Step 4: Students individually develop a model of how pollen is moved by bees. **MOD2.P3: Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s), DCI 2-LS2.A2 LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2), and CCC6.P1 The shape and stability of structures of natural and designed objects are related to their function(s). CCC6:P1 The shape and stability of structures of natural and designed objects are related to their function(s).**
- Lesson 6, Synthesize, Step 5: Students develop a model to explain how a seed got to the top of the tower. **DATA4.P2: Use and share pictures, drawings, and/or writings of observations, DCI 2-LS2.A2 LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2), CCC4:P2 Systems in the natural and designed world have parts that work together.**
- Lesson 8, Explore, Step 6: Students create line plots of the data from their investigation to compare with other groups. **MATH5.P3: Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs, 2-LS2.A.1 LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1), CCC2:P1 Events have causes that generate observable patterns.**
- Lesson 9, Explore, Step 2: Individually, make observations of plants. Provide students with time to make individual observations of their designated plant and record the data on the accompanying page of their Plant Observations handouts.” (Lesson 9, Teacher Guide) **DATA-P1: Record information (observations, thoughts, and ideas). 2-LS2.A.1 LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1), CCC1.P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.**
- Lesson 10, Synthesize, Step 4: Students make individual models to explain how plants grow and stay healthy in unusual places. **MOD2.P2: Compare models to identify common features and differences, 2-LS2.A.1 LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1), CCC1.P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.**

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

- Lesson 4, Synthesize, Step 5: Students complete Lesson 4 Handout 1, How can seeds be moved by animals when using them for food?. “ Provide time for students to individually develop their models. As students work, use the following prompts to support them in using structure-and-function reasoning to represent and explain relationships between animals and seeds that make it possible for seeds to be moved to new places when animals use them for food by

storing them for later.” (Lesson 4, Teacher Guide) This artifact uses elements **DCI 2-LS2.A2 LS2.A-P2 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on animals for pollination or to move their seeds around (2-LS2-2 and MOD-P3: Develop and/or use a model to represent amounts, relationships, relative scales (bigger, smaller), and/or patterns in the natural and designed world(s).**

- Lesson 9, Explore, Step 2: Students make their final observations of the plants and record the height, number of leaves, color, and health descriptions. Students complete a line plot of their data from the plants’ investigation that will serve as evidence to answer the question, “Do plants need light and water to keep growing and stay healthy?” (Lesson 9, Teacher Guide) This artifact uses elements **DATA-P3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems, MATH-P3: Describe, measure, and/or compare quantitative attributes of different objects and display the data using simple graphs, and 2-LS2.A.1 LS2.A-P1 Ecosystems: Interactions, Energy, and Dynamics. Plants depend on water and light to grow. (2-LS2-1).**
- Lesson 10, Synthesize, Step 4: Students complete Lesson 10, Student Assessment 1, My Model: How does this plant keep growing here? Tell students that they will write the plant they choose in the first blank and where it is growing in the second. Tell students they will write how the plant keeps growing and stays healthy and then give evidence for how their plant is growing and staying healthy.” (Lesson 10, Teacher Guide) This artifact uses elements **DATA-P3: Use observations (firsthand or from media) to describe patterns and/or relationships in the natural and designed world(s) in order to answer scientific questions and solve problems and PAT:1P1: Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.**

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 formative assessment processes evaluate student learning to inform instruction. The materials identify formative assessment opportunities in Lessons 2-9. The Lesson Assessment Guidance section of these lessons describes where to check for understanding, what evidence of student learning looks or sounds like, and how to use evidence of student learning. Formative assessment tools and processes are embedded in instruction and routinely provide varied support for student thinking and suggestions for adjusting instruction across all three dimensions. Materials provide teachers with additional support on how to adjust instruction that extends beyond teacher questions and prompting. Students are offered a choice of modality (e.g., write or draw your ideas) to demonstrate their thinking, ensuring all learners have the opportunity to demonstrate their knowledge. Formative assessment opportunities are included in most lessons to assess students’ thinking across the three dimensions, separately and together.

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

The materials identify formative assessment opportunities in Lessons 1-9. The Lesson Assessment Guidance section of these lessons describes where to check for understanding, what evidence for student learning looks or sounds like, and how to use evidence of student learning. For example

- Lesson 4, Lesson Assessment Guidance, Where can I check for understanding, “Evidence of students’ ideas may be expressed in words, drawings, written or spoken descriptions, movement, and/or gestures as they: **Use observations as evidence when representing animal body part/s (mouth and paws, beak) and seeds that can function together to move seeds to new places. Develop models that represent the structures of animal body part/s (mouth and paws, beak) and seeds that can function together to: 1) pick up the seed. 2) hold the seed while the animal moves. 3) drop or bury the seed in a new place.**” (Lesson 4, Teacher Guide).
- Lesson 5, Lesson Assessment Guidance, Where can I check for understanding?, “Evidence of students’ ideas may be expressed in words, written or spoken descriptions, movement, and/or gestures as they: **Choose an object to mimic a bee based on evidence. Use their bee-pollen model to (attempt to) move pollen from one flower to another.**” (Lesson 5, Teacher Guide).
- Lesson 7, Lesson Assessment Guidance, Where can I check for understanding, “Evidence of students’ ideas may be expressed in words, drawings, written or spoken descriptions, movement, and/or gestures as they: **Ask an investigation question about plants needing light and water to keep growing and stay healthy (effect). Decide how to test if plants need light and water. Develop an investigation plan to make observations using plants in different conditions (light/no light, water/no water).** Decide on what we will do” “Refer to the discussion prompts and assessment callouts in this lesson, as well as the Following Students’ Sensemaking 2 tool, for detailed information.”
- Lesson 9, Lesson Assessment Guidance, Where can I check for understanding, “Evidence of students’ ideas may be expressed in words, drawings, written or spoken descriptions, movement, and/or gestures as they: **Carry out an investigation, by referencing their co-created Plants Investigation Plan, to gather evidence about plants needing light and water to keep growing and stay healthy (effect). Make and record observations and measurements of plants in different conditions,** including as they **Measure the height (effect) of a plant in a light/water condition (cause). Count the number of leaves (effect) on a plant in a light/water condition (cause). Observe the color and appearance (effect) of a plant in a light/water condition (cause).**” “Refer to the discussion prompts and assessment callouts in this lesson, as well as the Following Students’ Sensemaking 2 tool, for detailed information.”

“Key Formative Assessments” are identified in Lessons 4, and 9. These formative assessments are accompanied by Instructional Guidance Tools. For the formative assessment tasks identified as Key Formative opportunities, Instructional Guidance is provided to support teachers in attending to the needs of the class or individual students. For example

- Lesson 4, Synthesize, Step 5: “Key formative assessment: As students develop their model using their How can seeds be moved by animals when using them for food? handouts, you have an opportunity to gather evidence about Learning Goal 4 (aligned to Assessment Statement 1), with the purpose of providing feedback to students and guiding instruction in upcoming lessons. Support students in using structure-and-function reasoning to make sense of how animals can move seeds to new places, by using the possible follow-up responses in discussions with students and by encouraging them to reference their co-developed Gotta-Have-It Checklist. Refer to the Following Students’ Sensemaking 1 tool, the Instructional Guidance 1 tool, and the Assessment Guidance at the beginning of this lesson.” (Lesson 4, Teacher Guide).
- Lesson 4, Instructional Guidance 1, “Use the evidence you have gathered on students’ How can seeds be moved by animals when using them for food? handouts and on the Following Students’ Sensemaking 1 tool in Lessons 2-4 to evaluate students’ progress towards the above assessment statement (Assessment Statement 1) and plan your upcoming instruction accordingly. When you get to Lesson 6, focus on supporting students who are not yet secure in their sensemaking. Based on which of the statements below align with what you notice about your students (most of the class, some of the class, or a few students), you may choose to take some or several of the next steps suggested below.” and “If you notice students...are not yet developing a model (representing a seed and animal) based on

evidence from investigations and texts; Possible next steps students...If this applies to a few students in your class: Before Lesson 6, print an additional set of Animal Mouths and Paws Infographics and cut them into “image cards,” so that you have several sets, each with 3 images of the same animal: 1, using their paws to pick up seeds; 2, using their mouths to hold food; and 3, using their paws to dig holes and bury seeds for later. Provide these “image card sets” to students and have them sequence them to show how an animal (like a chipmunk or vole) could move a seed to a new place when using it for food by storing it for later. If this applies to most or all of your class: During Lesson 6, plan to spend more time in the first Navigate during the “Think, Pair, Share discussion about gathered evidence” referencing Our Growing Ideas chart. Throughout the discussion, emphasize the “Possible follow-up response,” “What was our evidence? How do we know that?” (Lesson 4, Instructional Guidance 1).

- Lesson 9, Explore, Step 2: “Key formative assessment: Discussions with students and their Plant Observations handouts, as they individually carry out their investigation and make and record observations and measurements during Observation 5, which will be used (later in this lesson) to identify patterns that serve as evidence about the investigation question, provide an opportunity to gather evidence about Learning Goal 9a (aligned to Assessment Statement 2), with the purpose of providing feedback to students and guiding instruction for the next lesson. Encourage students to reference their Plants Investigation Plan and use classroom resources for observing plants.” “If you have identified students who may need additional support, consider inviting partners to check each other’s work as they make and record measurements and observations.” (Lesson 9, Teacher Guide)
- Lesson 9, Explore, Step 4: “Key formative assessment: Partner discussions and students’ Line Plots, Observation 5 handouts provide an opportunity to gather evidence about Learning Goal 9b (aligned to Assessment Statement 2), with the purpose of providing feedback to students and guiding instruction for the next lesson.” (Lesson 9, Teacher Guide)
- Lesson 9, Instructional Guidance 2, “Based on which of the statements below align with what you notice about students (most of the class, some of the class, or a few students), you may choose to take some or several of the suggested next steps...If you notice students...Possible next steps If this applies to few students in your class; If this applies to most or all of your class. If you notice students...are not yet using line plots to display and compare quantitative data (plants’ height, number of leaves); Possible next steps...If this applies to a few students in your class: Before Lesson 10, provide an additional opportunity to use line plots by having students display and compare another group’s plant data. Use strategies to break the task into discrete steps. For example, have students put the data in order from least to greatest before creating the line plot. Then, have them place each data point (dot sticker) on the line plot.; If this applies to most or all of your class: Before Lesson 10, provide an additional opportunity to use line plots by having students display and compare a shared sample of plant data. Use the suggested steps and prompts above in the “If this applies to a few students in your class” section. (Instructional Guidance 2).

The L2-6, 7-9 Following Student Sensemaking Tool describes what students might write, draw, say, or gesture in response to the formative assessment tasks throughout the unit. The document also describes possible feedback

- Lesson 2 Assessment Tool, L2-6 Following Student Sensemaking 1, “Throughout each lesson, jot down evidence of a few students’ sensemaking. You can use copies of the following table, a seating chart, your class list, or another way to keep track of what students say, do, write, draw, objects they manipulate, and how, etc. to note how they are demonstrating the listen-/look-fors.
- Use recorded evidence to formatively assess students’ progress in Lessons 2-6. Additionally, use the Instructional Guidance 1 tool in Lesson 4 to plan next steps based on the evidence you have collected.” (Lesson 2, Teacher Guide and L2-6 Following Student Sensemaking 1).
- Lesson 7 Assessment Tool, L7-9 Following Student Sensemaking 2, “Throughout each lesson, jot down evidence of a few students’ sensemaking. You can use copies of the following table, a seating chart, your class list, or another

way to keep track of what students say, do, write, draw, objects they manipulate, and how, etc., to note how they are demonstrating the listen-/look-fors.

- Use recorded evidence to formatively assess students' progress in Lessons 7-9 (see the Instructional Guidance 2 tool in Lesson 9 to plan next steps based on the evidence you have collected)." (Lesson 7, Teacher Guide and L7-9 Following Student Sensemaking 2).

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

- Lesson 2, Connect, Step 5: "Assessment Opportunity If students are not relating seeds' structures to their function that makes it possible for the seed to be moved by the wind, consider organizing students into pairs and providing each pair with a maple tree seed and discuss together the seed's structure, referencing the class's Adjectives chart and the Seeds on the Move book. Use the suggested follow-up responses to help students consider these structure-and-function relationships." " Use the prompt below to invite students to turn and talk with a partner and then share their ideas about seeds' structures that make it possible for the seed to be moved to new places by wind. Which of these observed structures make it possible for a seed to be moved to a new place by the wind?" (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 4: "If students are not yet making connections between a specific object's structure and how it functions, consider highlighting one object's structure—for example, that the shoelace is made of threads/strings—and then ask students about the related function and the structure of the coordinating object (i.e., the seed), using questions such as, How do the shoelace's strings make it possible for a seed to stick to it? Which seed/s stick? What are they like? or, consider highlighting the function—for example, that the cocklebur and fur-like material stick together—and ask students about the related structures using questions such as, What about the cocklebur makes it possible to stick; what does it look and feel like? and What about the fur-like material makes it possible to stick; what does it look and feel like?" (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Step 4: "Assessment Opportunity If students are not noticing the structures of their bee and the pollen or not making connections to their functions in moving pollen (chenille stem or pom pom) or not moving pollen (straw), consider: Pausing students to have them focus on making observations of their model, with attention to structures. This can include touching the sand (pollen) and chenille stem, pom pom, or straw (bee) and describing how it feels and using their hand lenses to make visual observations. Consider providing the Adjectives chart (from Lessons 2 and 3) as a reference. Asking students to narrate as they use their model, or offering to narrate for them." "Allow students time to develop and use a model representing how a bee's legs/body could move pollen from one flower to another. Circulate to ask students about their work and how their model is (or is not) working to move pollen from one flower to another." Prompts include: "Tell me about and show me your model; how are you using your materials? How is it working or not working to move pollen?" (Lesson 5, Teacher Guide)
- Lesson 7, Lesson Assessment Guidance "Assessment Type: Formative Where to check for understanding: In the Explore 2 (slides I - K), when students are planning their investigation in small groups and co-creating their Plants Investigation Plan as a whole class." What to look and listen for includes: "investigation question about plants needing light and water to keep growing and stay healthy (effect)" "how to test if plants need light and water" "investigation plan to make observations using plants in different conditions (light/no light, water/no water)." "Refer to the discussion prompts and assessment callouts in this lesson, as well as the Following Students' Sensemaking 2 tool, for detailed information. Use these formative assessment opportunities to determine how students' three-dimensional thinking around Assessment Statement 2 (aligned to 2-LS2-1) is progressing. As you look and listen to students' ideas, notice how they use ideas from their previous experiences about what plants need to grow and/or previous experiences with planning investigations." (Lesson 7, Teacher Guide)

- Lesson 8, Explore, Step 2: “Assessment Opportunity Formative assessment: Small group discussions and students’ Plant Observations handouts during Observation 2 provide an opportunity to gather evidence about Learning Goal 8a (aligned to Assessment Statement 2), to support students in carrying out their planned investigation and making and recording observations that will provide data that can be used to make comparisons and serve as evidence to answer their investigation question. Use suggested “possible follow-up prompts” to support students in making and recording observations as they carry out their investigation.” (Lesson 8, Teacher Guide)

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

- Lesson 2, Explore, Step 3: “Discussions with partnerships as they make and record firsthand observations of seeds on their My Seed Observations handouts provide an opportunity to gather evidence about Learning Goal 2 (aligned to Assessment Statement 1), to support students in making observations using their hand lens, recording these through drawing and writing, and using these data to make comparisons of the shape and texture of different seeds.” “If students need support in using the hand lens to make visual observations, ensure the area is well lit and provide a paper/placemat of contrasting color (e.g., black or blue) and have students place the seed on the mat, moving their head/eye and lens toward the seed. Use questions to support them in noticing details, such as, What details do you notice? What shape do you notice? Are there any small parts or pieces?” “If students need support making and recording observations of the seed’s texture, encourage them to gently touch the seed or rub the seed between two fingers. Use questions such as, What does that remind you of? or When have you felt something like that? to support students in making connections to familiar objects’ textures (e.g., “it feels like a hair.”) Encourage students to discuss these familiar objects with their partner to generate descriptive words (e.g., “hairs feel smooth”), either referencing or adding to the class’s Adjectives chart. (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “As students carry out their investigation, you have an opportunity to gather evidence about Learning Goal 3 (aligned with Assessment Statement 1) and to support students in making observations of seeds and surfaces that stick (and do not stick) together, which will be used to make comparisons.” “As students investigate which seeds stick (and do not stick) to different surfaces in their small groups, circulate and ask the following questions to support students in making and recording observations on their My Surface Observations handouts.” (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Step 4: “Students individually developing their model provides an opportunity to gather evidence about Learning Goal 5 (aligned to Assessment Statement 1) with the purpose of providing support to students as they use their model to figure out how their bee can (or cannot) move pollen from one flower to another.” If students are not noticing the structures of their bee and the pollen or not making connections to their functions in moving pollen (chenille stem or pom pom) or not moving pollen (straw), consider:” Considerations include: “Pausing students to have them focus on making observations of their model, with attention to structures. This can include touching the sand (pollen) and chenille stem, pom pom, or straw (bee) and describing how it feels and using their hand lenses to make visual observations.” “asking students to narrate as they use their model, or offering to narrate for them.” (Lesson 5, 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 provide opportunities and suggestions for how students can communicate their learning, ideas, and understanding. The materials identify what a range of student performance for each assessment task looks like, from partial to complete proficiency (secure, secure with prompting, not yet secure). The student performances have written descriptions and drawings that serve as examples. Scoring rubrics assign value to students' use of the three dimensions for sense-making and problem solving, and teachers are supported to provide feedback (rather than scoring) for issues outside of the learning objectives, such as grammatical errors. The suggested feedback also guides the teacher in making observations critical to the learning objectives. The feedback also provides ways to communicate to students that more elaboration is needed or that the student has clearly communicated their ideas. Scoring guidance is provided for major formative assessments (e.g., student discussions, progress trackers, exit tickets, etc.) and summative assessments. Both teachers and students are supported in interpreting student progress over time, including revising initial models, peer review, self-reflection, and final or summative models.

Support for planning instruction

Instructional Guidance is provided for Key Formative assessment opportunities in Lessons 4, and 9. These resources provide explicit guidance for teachers to interpret a range of student progress related to the instructional materials and targeted elements of the three dimensions, and to plan instruction accordingly.

- Lesson 4 Assessment Tool Lesson 4 Instructional Guidance 1: “Use the look-for’s (below) on students’ How can seeds be moved by animals when using them for food? handouts to provide feedback to students before Lesson 6; there is an opportunity to return students’ handouts to them in the second Synthesize of Lesson 6. Consider using a feedback system to indicate to students what you did or did not notice on their How can seeds be moved by animals when using them for food? handouts; for example, you could consider using a checkmark to indicate a feature is included, use a circle to indicate a feature is missing, and use an arrow to indicate that something could be made clearer.”
 - Based on which of the statements below align with what you notice about your students (most of the class, some of the class, or a few students), you may choose to take some or several of the next steps suggested below. Look-for’s on students’ How can seeds be moved by animals when using them for food? handouts reflecting students’ **developing a model based on evidence** from their Lesson 4 infographics and investigation **to represent** how **structures of seeds and animal body parts (mouth and paws, beak) can work together to move a seed to a new place (function).** “Examples of what students might write/draw in Lesson 4, with possible feedback, are available in the Following Students’ Sensemaking 1 tool.”
 - If you notice students...”are not yet developing a model (representing a seed and animal) based on evidence from investigations and texts”
 - Possible next steps
 - “If this applies to a few students in your class: Before Lesson 6, provide students with materials from the Bird Beak investigation and invite them to work with a partner to pick up, hold, and move the seed to a new place while their partner narrates the steps. Use questions (What does the seed/beak-like tool look like? What is it shaped like? What does it feel like/what is its texture like?) to support students in considering the objects’ structures.”

- “If this applies to most or all of your class: Before Lesson 6, provide an opportunity for students to enact a scenario (like they did in Lesson 3), this time developing a model of how seeds can be moved to a new place when an animal stores them for later. Students can use their bodies and/or seeds from the Lesson 2 Seeds investigation and materials from the Lesson 4 Bird Beak investigation. As students enact their model, use the following prompts to explicitly elevate structure-and-function reasoning and support students’ sensemaking: What happens first? How does the animal get the seed? What body part/s is/are it using? What structures (of the body part and seed) make it possible to (pick up) the seed?” (Lesson 4, Instructional Guidance 1).

Support for ongoing feedback

- Lesson 1, Lesson Assessment Guidance: “Give feedback to students such as: Pointing out that the observations recorded on their Plants Outside handouts and ideas on their Initial Model: How is the Tower Tree growing there? handouts helped the class co-construct the Initial Class Model.” (Lesson 1, Teacher Guide)
- Lesson 2, Teacher Assessment Tool: Following Students’ Sensemaking includes possible feedback for responding to what “students might write/draw” in lessons 2, 3, 4, and 5. (Teacher Assessment Tool).” The feedback is specific to evidence collected about student performances. Examples include:
 - Possible feedback: “I love how you drew this seed! Let’s add a label; which seed were you observing? (corn) Tell me about your observations of the seed. What did it feel like? Using the hand lens, what did you see? You just said the seed was like _____. Can you say or show me more about that? What words on our Adjectives chart could we add to your observations?”
- Lesson 4, Lesson Assessment Guidance: “Plan to collect students’ completed How can seeds be moved by animals when using them for food? handouts after the final Synthesize in this lesson and plan to provide written/annotated feedback before Lesson 6; see suggestions in the Instructional Guidance 1 tool. During Lesson 6, there is an opportunity to return students’ annotated How can seeds be moved by animals when using them for food? handouts so they can take up feedback before developing new models.” (Lesson 4, Teacher Guide)
- Lesson 5, Lesson Assessment Guidance: “You can use the Following Students’ Sensemaking 1 tool to keep track of students’ developing thinking. This tool also provides a range of sample student responses and ideas for how you can provide feedback.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 4: “Revisit individual models and introduce feedback. Share with students that you have their Lesson 4 How can seeds be moved by animals when using them for food? handouts to return to them. Since we will be developing a new model that helps us share our ideas about how a seed could have gotten to the top of the courthouse to start growing into the Tower Tree next, reviewing our work from before can help us better understand our ideas now; this is like how we reviewed our ideas on the Initial Class Model.” “Tell students how you provided feedback (e.g., a checkmark indicates a feature is included, a circle indicates a feature is missing, an arrow indicates that something could be made clearer); showing them on a sample handout if needed.” “To further support students in being able to take up your feedback, support them in noticing how your feedback coordinates with their Gotta-Have-It Checklist.” “Return students’ How can seeds be moved by animals when using them for food? handouts with your feedback and provide them with a brief opportunity to review the feedback and ask questions.” (Lesson 6, Teacher Guide)
- Lesson 7, Teacher Assessment Tool: “Following Students’ Sensemaking 2 includes possible feedback for responding to what “Students might write/draw in Lesson 7, on their Planning Our Plants Investigation handouts from Lesson 7, Students might write/draw in Lesson 8, on their Plant Observations handouts (Observation 3) from Lesson 8, Students might write/draw in Lesson 8, on their Line Plot, Observation 4 handouts from Lesson 8, Students might write/draw in Lesson 9, on their Plant Observations handouts (Observation 5), Students might write/draw in Lesson

9, on their Line Plots, Observation 5 handouts.” (Teacher Assessment Tool) The feedback is specific to evidence collected about student performances. Examples include:

- Possible feedback I notice you wrote, _____. What do you mean by ____? Say more about that! I love how you drew the Sun in this box! I noticed you wrote “Give it sunshine.” Say more about that. How could we do that; how could we give a plant sunshine? What do you think will happen if we give the plant sunshine? How would that help us know about what plants need? It looks like you drew lots of water here (point to back side). Can you show me what you mean by that? How could we do that; how could we give a plant water? Let’s add your ideas about water by writing them down together.
- Possible feedback Tell me more about your question. I noticed you drew 2 plants here. Tell me about your ideas in this drawing! How could we do that; how could we give plants Sun but also no Sun? What do you think will happen if we give these plants Sun and no Sun? How would that help us know about what plants need? It looks like you drew a plant with water being poured on it (point to back side). Can you show me what you mean by that? How could we do that; how could we give a plant water? Let’s add your ideas about water by writing them down together. How could we use your ideas about “Sun” and “no Sun” when we think about plants needing water? What do you think will happen if we give the plant water? How would that help us know about what plants need?” (Lesson 7, Teacher Assessment Tool)
- Lesson 10, Assessment Tool: Summative Guidance 2 provides descriptions and look-fors to support teachers in assessing student learning around Assessment Statement 2: Plan and carry out an investigation collaboratively to produce evidence (including quantitative data displayed using line plots) that plants need light and water (cause) to keep growing and stay healthy (effect). (aligned to 2-LS2-1).

Teacher facilitated discussions are opportunities for informal feedback that could support students in understanding that their ideas need clarification and elaborations. For example,

- Lesson 2, Explore, Step 3 “Possible follow-up responses What other details are you noticing? Can you show me that about the seed? What other details could you add to your drawing/writing?” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3 “Possible follow-up responses What did you mean when you said ____? Can you show me that?” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Step 3 “Possible follow-up responses Say more about that idea. Can anyone restate ____’s idea in a different way? Can you show us what you mean by that?” (Lesson 4, Teacher Guide)
- Lesson 8, Explore, Step 2 “Possible follow-up responses What do you mean by ____? Can you say more about that?” (Lesson 8, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

III.D. Unbiased Tasks/Items

EXTENSIVE

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

The reviewers found **extensive** evidence that tasks/items assess student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students. Guidance is provided for teachers to ensure each student can fully understand and access task scenarios, and task scenarios make connections to student background knowledge and interests to make the task more engaging and interesting for students. Tasks provide opportunities for students to express their thinking through many different modalities and to choose the modality that works best for them.

Multiple modes of communication

- Lesson 1-10, Lesson Assessment Guidance, Includes “What to look and listen for” “Evidence of students’ ideas may be expressed in words, drawings, spoken descriptions, movements, and/or gestures as they” statements. For example:
 - Lesson 4, “What to look and listen for: Evidence of students’ ideas may be expressed in words, drawings, spoken descriptions, movements, and/or gestures as they: **Use observations as evidence when representing animal body part/s (mouth and paws, beak) and seeds that can function together to move seeds to new places. Develop models that represent the structures of animal body part/s (mouth and paws, beak) and seeds that can function together to: 1) pick up the seed. 2) hold the seed while the animal moves. 3) drop or bury the seed in a new place.**” (Lesson 4, Teacher Guide)
 - Lesson 9, “What to look and listen for: Evidence of students’ ideas may be expressed in words, drawings, spoken descriptions, movements, and/or gestures as they: **Carry out an investigation, by referencing their co-created Plants Investigation Plan, to gather evidence about plants needing light and water to keep growing and stay healthy (effect).**”
 - Lesson 10, “What to look and listen for: Evidence of students’ ideas may be expressed in words, drawings, spoken descriptions, movements, and/or gestures as they: **Develop models that represent the pattern of light and water causing plants to grow (effect).**”
- Lesson 1, Synthesize, Step 6: “To ensure that all students’ ideas for the initial model are seen and heard, invite students to share their ideas across modes of expression (e.g., air-drawing, using sticky notes, using gestures, using pencil, confirming in marker, using words) and validate other ways that students may choose to participate in this whole class discussion.” (Lesson 1, Teacher Guide)
- Lesson 7, Explore, Step 2: “Support students’ oral language by encouraging students to communicate their ideas using a variety of words and gestures to describe how students will take up the scientific practices in the book in their own investigations about plants (L.2.1E).” (Lesson 7, Teacher Guide)
- Lesson 9, Synthesize, Step 4: “A Building Understandings Discussion provides an authentic opportunity for you to enhance students’ language learning and language use for sensemaking work. During the discussion, encourage students to communicate their ideas in multiple ways—by referring to the class data charts, pointing to plants or visuals, using gestures to show differences in growth and health, or expressing ideas in any of their home languages.” (Lesson 9, Teacher Guide)
- Lesson 9, Connect, Step 5: “Remind students they can draw and write about a plant growing in an unusual place, take a picture of the plant, or share another kind of representation.” (Lesson 9, Teacher Guide)

- Lesson 10, Connect, Step 3: “Students who did not return their own community connection can share their own experiences/observations verbally and/or with gestures, or you can provide them with a card from the set of Unusual Plants Cards for them to share with their small group.” (Lesson 10, Teacher Guide)

Supports success for all students

- L2-6 Following Student Sensemaking 1, Evidence of Sensemaking, provides a checklist for what teachers should look and listen for relative to Assessment Statement 1: Assessment Statement 1: **Develop a model based on evidence to represent** how the **structures of seeds/pollen and animals function together to move seeds/pollen to new places**. (aligned to 2-LS2-2) . “Throughout each lesson, jot down evidence of a few students’ sensemaking. You can use copies of the following table, a seating chart, your class list, or another way to keep track of what students say, do, write, draw, objects they manipulate, and how, etc. to note how they are demonstrating the listen-/look-fors.” (Lesson 2, L2-6 Following Student Sensemaking 1).
- L7-9 Following Student Sensemaking, Evidence of Sensemaking, provides a checklist for what teachers should look and listen for relative to Assessment Statement 2: Assessment Statement 2: Students can **plan and conduct an investigation to produce data to answer a question about whether plants need water and light (cause) to grow (effect)**. (aligned to 2-LS2-1).” “(Lesson 7, L7-9 Following Student Sensemaking tool).
- Lesson 4, Synthesize, Step 5: “Not all students will best communicate their thinking through drawn or written models using the prepared How can seeds be moved by animals when using them for food? handout; some students may benefit from additional options. Encourage multiple ways of representing ideas, such as narrating while pointing to images on the infographics, manipulating materials from the investigation, or acting out their seed-and-animal model using gestures and movements. This ensures that all students’ sensemaking is valued and visible. Consider using and modifying these sample prompts for multimodal support: Can you use your hands or body to show how a bird could move a seed? Would you like to use these materials to think about and show how the seed gets moved? Can you act out what happens when a chipmunk tries to bury a seed?” (Lesson 4, Teacher Guide)
- Lesson 6, Navigate, Step 1: “The Think-Pair-Share strategy provides students with individual time for processing and sensemaking as well as an opportunity to work with a peer to use linguistic and multimodal resources to express their ideas (and learn from other students’ uses of these resources, too) before sharing their ideas in a larger discussion. Providing structured discussion routines like Think–Pair–Share helps reduce the memory and language demands when recalling earlier evidence on Our Growing Ideas chart. For students who already have strong familiarity with Our Growing Ideas chart or who may not need as much guided processing time, you can offer alternatives—such as small-group conversations—to ensure all learners can access and contribute to the discussion in ways that fit their processing needs.” (Lesson 6, Teacher Guide)
- Lesson 8, Explore, Step 3: “Provide students with multiple ways to make plant observations, beyond verbal communication. Encourage students to measure with rulers, count by pointing to leaves, and record data using numbers and drawings. Encourage students to discuss observations with peers through gestures, pointing, or drawing. Prompt students to show what they notice physically before or alongside verbal explanations. Providing these options for action and perception helps ensure equitable access to collecting and comparing data across multiple plants. This is particularly important for multilingual learners and students with visual or hearing impairments.” (Lesson 8, Teacher Guide)

Multiple modalities and student choice

- Lesson 2, Explore, Step 2: “Validate and invite all the ways students communicate their observations, such as with gestures, body movements, and words from any languages your students use. Encouraging students to share their sensemaking in these multimodal ways not only supports equitable discussions for all learners but will surface many

different observations and ways of thinking that can be used to motivate continued investigation.” (Lesson 2, Teacher Guide)

- Lesson 5, Explore, Step 4: “Giving students choice in which object to use to mimic a bee’s legs and/or body supports student autonomy and ongoing investment and interest in developing and using their bee-pollen models. Encourage students to choose an object based on their ideas of the structures they think could make it possible for bees to move pollen while also encouraging variety in students’ models so that they can compare and discuss what was similar in the instances where pollen did move (for chenille stems and pom poms) and draw conclusions about the structures of the bee’s legs and/or bodies that function to move pollen. If your students’ choices do not result in models using different objects, consider using a teacher demonstration and/or providing an opportunity for students to develop an additional model, in order to ensure the class has access to data from varied objects.” (Lesson 5, Teacher Guide)
- Lesson 6, Connect, Step 2: “Acting out how animals eat fruits and move seeds to new locations supports multiple means of action, expression, and engagement and supports students in making sense of ideas from the text. Some students may feel uncomfortable with actions like “pooping.” To maintain emotional safety, invite students to choose whether to participate or observe, encourage the use of gestures or signals to show the movement of seeds (e.g., pointing, miming the animal moving) and consider neutralizing the language: “Animals eat the berries and seeds, and then the seeds move to a new place when the animal leaves them behind” (instead of “poop”).” (Lesson 6, Teacher Guide)
- Lesson 8, Synthesize, Step 5: “Some students may benefit from sharing their plants’ similarities and differences (after Observation 4) through different modalities. Encourage students to communicate their ideas in a variety of ways, including pointing to data on their Plant Observations handouts, gesturing or miming about similarities or differences between plants, drawing their ideas, and/or writing sentences in coordination with the stems provided on slide M.” (Lesson 8, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

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

Matches three-dimensional learning objectives

Lessons 1 - 10, include “Lesson Assessment Guidance” sections that include What will students do?, Where the teacher can check for understanding?, What to look and listen for? and How the teacher can use the assessment information. For example:

- Lesson 2, Lesson Assessment Guidance,
 - What will students do?: “**Make observations to compare seeds’ structures** and begin to **relate these to how seeds can be moved to new places (function).**”

- Where to check for understanding:” In the Explore (slide G) on students’ My Seed Observations handouts, when they are making and recording observations of seeds and making comparisons, and in the Connect (slide K), when they are relating seeds’ structures to their function of making it possible to be moved to new places by the wind.”
- What to look and listen for: “Evidence of students’ ideas may be expressed in words, drawings, spoken descriptions, movements, and/or gestures as they: **Make observations of seeds’ structures.**”
- How can I use this assessment information?: “Use these formative assessment opportunities to determine how students’ three-dimensional thinking around Assessment Statement 1 (aligned to 2-LS2-1) is progressing. As students make, record, and compare observations of seeds in the Explore, they will not yet be using the term “structure” to refer to how an object looks, including its shape, as well as its texture. Instead, they will be making observations of what seeds look and feel like, which they will later recognize as the seeds’ structures.” (Lesson 2, Teacher Guide)

2.4 Plants Unit Front Matter, the unit three dimensional performance expectations are

- 2-LS2-1: **Plan and conduct an investigation to determine if plants need sunlight and water to grow.** The unit introduces the phenomena in Lesson 1 that asks students to develop a model to explain how a tree growing at the top of the tower can stay healthy and continue growing. Lesson 7, Lesson 8, and Lesson 9 provide students with robust opportunities to plan and conduct an investigation that provides evidence that plants need light and water to grow and stay healthy. Within those lessons, students contribute ideas for all parts of planning from what conditions to keep the same and which plants get water, no water, light, and no light. Students also plan for when and how to make observations, complete data analysis, and look for patterns from their own and their classmates’ data. The unit materials address that some students may already know that plants need water and light, so they work to create the evidence for that.
- 2-LS2-2: **Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.** The unit introduces the phenomena in Lesson 1 that asks students to develop a model to explain how a tree can grow at the top of the tower. Lesson 2, Lesson 3, Lesson 4, Lesson 5, and Lesson 6 support students’ understanding of how seeds are moved by the wind and by animals in a variety of ways. They learn through read-alouds, reading, mimicking the structures of seeds, and the process of animals moving those seeds. Students analyze data and make decisions about what data could help explain the tower tree and what data is not evidence they can use for their explanation. They create multiple models, each time adding additional features to their models, making them more complex in their ability to answer their unit questions.

Performance expectations align with the assessment learning objectives. Evidence includes

- Assessment Statement 1: **Develop a model based on evidence to represent** how the **structures of seeds/pollen and animals function together to move seeds/pollen to new places.** (aligned to 2-LS2-2) (2.4 Lesson 2 Teacher Assessment Tool Following Students’ Sensemaking)
- Assessment Statement 2: **Plan and carry out an investigation collaboratively to produce evidence (including quantitative data displayed using line plots) that plants need light and water (cause) to keep growing and stay healthy (effect).** (aligned to 2-LS2-1) (2.4 Lesson 7 Teacher Assessment Tool Following Students’ Sensemaking)

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

- Lesson 1, the three-dimensional learning objectives are “**Develop an initial model to represent how the Tower Tree got (function) to an unusual place to start growing.**” and “**Develop an initial model to represent what causes the Tower Tree to keep growing (effect) in an unusual place.**” Students develop their models in Step 5 of this lesson on the Initial Model: How is the Tower Tree growing there? handout after making observations outside, making observations of the tower tree, and engaging in teacher-facilitated discussions about their ideas.
- Lesson 3, the three-dimensional learning objective is “**Make observations of seeds and surfaces to compare structures that function so that seeds stick (or do not stick).**” Students make observations of seeds sticking to surfaces in Step 1 and Step 3 of the lesson. They initially observe photographs and then observe seeds sticking or not sticking to investigation materials. They make comparisons of the structures during their teacher-facilitated discussions in Step 3 and in their Scientists Circle in Step 4.
- Lesson 5, the three-dimensional learning objective is “**Develop a simple model to represent a bee that functions to move pollen to a new place.**” Students listen to a read-aloud of pages 1-7 of *Plants, Pollen, and Pollinators*, and engage in a teacher facilitated discussion about how pollen moves. Then they develop a model to investigate how pollen could be moved by pollinators by investigating materials that mimic the structures of bees. Students create a class consensus model and read the rest of the book pp. 8-15, which confirms that bees can move pollen.
- Lesson 8, the three-dimensional learning objectives are “**Carry out an investigation to gather data to serve as evidence that light and water cause plants to keep growing and stay healthy (effect).**” and “**Display plants’ heights (using standard units) using a line plot and compare plants in different conditions.**” Students carry out their investigation plan and gather data in Steps 2, 3, and 4. The data is used as evidence to determine if plants need light and water to be healthy and continue growing. Students engage in teacher-facilitated discussions in Step 3 and 4 and use their data to consider the causes of the health/growth of their plants. Students create a line plot in Step 6 to compare plants and figure out the patterns of plants in different conditions.
- Lesson 10, the three-dimensional learning objective is “**Develop a model to represent the pattern of light and water causing plants to keep growing and stay healthy (effect).**” Students develop a model of a plant growing in their community in an unusual place to explain what happened that it started to grow in its location and how it continues growing and staying healthy in Step 4. Students complete the My Model: How does this plant keep growing here? handout.

Pre-, formative, summative, and self-assessment

Pre-Assessment

- Lesson 1, Synthesize, Step 5: “Pre-assessment: Discussions with students while developing their initial models provides an opportunity to gather evidence about Learning Goal 1a (aligned to Assessment Statement 1) and Learning Goal 1b (aligned to Assessment Statement 2), with the purpose of determining any support students may need in upcoming lessons as they continue to develop models to represent how plants grow in different places. Addressing the model’s questions (How did a seed get there to start growing into the tree? How does the Tower Tree keep growing there?) provides a context for students’ figuring out structure-and-function relationships between seeds and animals involved in dispersal over the next lessons (Lessons 2-6) as well as gathering evidence from investigations to support cause-and-effect relationships between plants and their needs (light, water) starting in Lesson 7.” (Lesson 1, Teacher Guide)

Formative Assessment

- Lesson 2, Explore, Step 3: “Formative assessment: Discussions with partnerships as they make and record firsthand observations of seeds on their My Seed Observations handouts provide an opportunity to gather evidence about Learning Goal 2 (aligned to Assessment Statement 1), to support students in making observations using their hand lens, recording these through drawing and writing, and using these data to make comparisons of the shape and texture of different seeds.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “Formative assessment: As students continue to carry out their investigation to make observations of their surface, you have another opportunity to gather evidence about Learning Goal 3 (aligned with Assessment Statement 1) and to support students in making careful observations of the structures of surfaces, which will be used to make comparisons.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “Key formative assessment: As students develop their model using their How can seeds be moved by animals when using them for food? handouts, you have an opportunity to gather evidence about Learning Goal 4 (aligned to Assessment Statement 1), with the purpose of providing feedback to students and guiding instruction in upcoming lessons. Support students in using structure-and-function reasoning to make sense of how animals can move seeds to new places, by using the possible follow-up responses in discussions with students and by encouraging them to reference their co-developed Gotta-Have-It Checklist.” (Lesson 5, Teacher Guide)
- Lesson 5, Explore, Step 4: “Formative Assessment: Students individually developing their model provides an opportunity to gather evidence about Learning Goal 5 (aligned to Assessment Statement 1) with the purpose of providing support to students as they use their model to figure out how their bee can (or cannot) move pollen from one flower to another.” (Lesson 5, Teacher Guide)
- Lesson 7, Explore, Step 4: “Formative Assessment: Discussions with students during their small group collaborative planning and students’ Planning Our Plants Investigation handouts provide opportunities to gather evidence about Learning Goal 7 (aligned to Assessment Statement 2), to support students to clarify and communicate their ideas about planning an investigation to produce data to serve as evidence of what causes plants to keep growing and stay healthy (effects).” (Lesson 4, Teacher Guide)
- Lesson 9, Explore, Step 2: “Key formative assessment: Discussions with students and their Plant Observations handouts, as they individually carry out their investigation and make and record observations and measurements during Observation 5, which will be used (later in this lesson) to identify patterns that serve as evidence about the investigation question, provide an opportunity to gather evidence about Learning Goal 9a.” (Lesson 9, Teacher Guide)

Summative Assessment

- Lesson 6, Synthesize, Step 5: “Summative assessment: Students’ My Model: How did a seed get there to start growing into the Tower Tree? assessments are an opportunity to gather evidence about learning goal 6 (aligned with Assessment Statement 1) with the purpose of summatively assessing students’ use of structure-and-function relationships to explain how a seed could have been moved to a new place; specifically, how the seed that grew into the Tower Tree could have gotten to the top of the courthouse.” (Lesson 6, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Summative assessment: Students’ My Model: How does this plant keep growing here? assessments are an opportunity to gather evidence about Learning Goal 10 (aligned with Assessment Statement 2) with the purpose of summatively assessing students’ use of cause-and-effect relationships as evidence supporting how a plant can keep growing and stay healthy in an unusual place. Refer to the Summative Guidance 2 tool and the Assessment Guidance at the beginning of this lesson for more information to support and provide feedback to students.” (Lesson 10, Teacher Guide)

Self Assessment

- Lesson 10, Synthesize, Step 4 “Self reflection: These prompts offer an opportunity for students to use the class model to reflect on their My Model: How does this plant keep growing here? assessment with the purpose of supporting students in their progress so far in developing a model that shows how a plant in an unusual place keeps growing there, using evidence from their Plants Investigation. Make sure to give students time and support to use their reflections to revise their My Model: How does this plant keep growing here? assessments. Support may include: drawing their attention back to the Consensus Class Model of the Tower Tree to consider what they need to add or change. using a circle, stars, and/or labels for causes and effects (as in the Consensus Class Model of the Tower Tree) to support cause-and-effect reasoning. referencing Our Growing Ideas chart and/or the Plants Investigation Results for evidence from the Plants Investigation. Refer to the Assessment Guidance at the beginning of this lesson for more ideas.” (Lesson 10, Teacher Guide)

Coherent three-dimensional assessment system rationale is clearly described.

- Assessment System Overview, describes the three-dimensional assessment system and parts of the assessment descriptions’ rationale are clear from the sequence of assessments and materials. The purpose of each assessment, and the artifacts and look-fors are clearly identified and connected to the element descriptions of the three dimensional learning targets.
- 2.4 Plants Unit Front Matter, assessment system rational is described in each describing the intentionally developed elements and the opportunities to practice elements sections of the documents. Examples include
 - In the Intentionally Developed Science and Engineering Practices table under Developing and Using Models “Students’ development of this practice is supported by a pre-assessment opportunity in Lesson 1, multiple formative assessment opportunities in Lessons 2, 3, and 5, a key formative assessment opportunity in Lesson 4, and summative assessments in Lessons 6 and 10.” (2.4 Plant Unit Front Matter)
 - Above the cross-cutting concepts table “The elements of the concept listed in the table are often used in lesson-level learning goals because they describe the work students do in the lesson, and the lesson’s assessment opportunity(ies) will be tied to this work.” (2.4 Plant Unit Front Matter)

Criterion-Based Suggestions for Improvement: N/A

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 receive feedback. There is evidence that there are multiple opportunities for students to demonstrate performances of the targeted learning objectives of:

- Lessons 2-6, Learning Goal: Students can **develop a model based on evidence to represent** how the **structures of seeds/pollen and animals function together to move seeds/pollen to new places**. (aligned to 2-LS2-2)
- Lessons 7-9, Learning Goal: **Plan and carry out an investigation collaboratively to produce evidence (including quantitative data displayed using line plots) that plants need light and water (cause) to keep growing and stay healthy (effect)**. (aligned to 2-LS2-1)

Multiple, interconnected opportunities over time

Lessons 2-6, Learning Goal: Students can **develop a model based on evidence to represent** how the **structures of seeds/pollen and animals function together to move seeds/pollen to new places**. (aligned to 2-LS2-2)

- Lesson 2 Assessment Tool, Following Student Sensemaking 1: “Possible evidence of student sensemaking: Remember that students are often using multiple means of communication to express their sensemaking. As you are looking for evidence that students have a secure grasp of the assessment statement, look and listen for these examples.” This is followed by examples of what students might say, write, draw or gesture in Lessons 2, 3 and 4 to demonstrate understanding of the Learning Goal. (Lesson 2, Teacher Assessment Tool L2-6 Following Student).
- Lesson 2, Connect, Step 5: “Formative assessment: Discussions with students as they add “function” to the class’s Seeds Observations data table provide an opportunity to gather evidence about Learning Goal 2 (aligned to Assessment Statement 1), to support students in making connections between seeds’ observed structures and their function in making it possible for the seed to be moved to a new place, in this case by the wind.” (Lesson 2, Teacher Guide) Learning Goal: “**Make observations to compare seeds’ structures** and begin to **relate these to how seeds can be moved to new places (function)**.”
- Lesson 3 contains three opportunities for formative assessment for Learning Goal: **Make observations of seeds and surfaces to compare structures that function so that seeds stick (or do not stick)**.
 - Lesson 3, Explore, Step 3: “Formative assessment: As students carry out their investigation, you have an opportunity to gather evidence about Learning Goal 3 (aligned with Assessment Statement 1) and to support students in making observations of seeds and surfaces that stick (and do not stick) together, which will be used to make comparisons.” (Lesson 3 Teacher Guide)
 - Lesson 3, Explore, Step 3: “Formative assessment: As students continue to carry out their investigation to make observations of their surface, you have another opportunity to gather evidence about Learning Goal 3 (aligned with Assessment Statement 1) and to support students in making careful observations of the structures of surfaces, which will be used to make comparisons.” (Lesson 3, Teacher Guide)
 - Lesson 3, Explore, Step 4: “Formative assessment: As students make sense of their investigation results using the lens of structure-and-function, you have an opportunity to gather evidence about Learning Goal 3 (aligned with Assessment Statement 1) and support students in using structure-and-function reasoning.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Step 5: “Key formative assessment: As students develop their model using their How can seeds be moved by animals when using them for food? handouts, you have an opportunity to gather evidence about Learning Goal 4 (aligned to Assessment Statement 1), with the purpose of providing feedback to students and guiding instruction in upcoming lessons.” (Lesson 4, Teacher Guide) Learning Goal: **Develop a simple model to represent animal body part/s (mouth and paws or beak) and seeds that can function together to move seeds to new places**.
- Lesson 5, Explore, Step 4: “Formative Assessment: Students individually developing their model provides an opportunity to gather evidence about Learning Goal 5 (aligned to Assessment Statement 1) with the purpose of

providing support to students as they use their model to figure out how their bee can (or cannot) move pollen from one flower to another.” (Lesson 5, Teacher Guide) **Develop a simple model to represent a bee that functions to move pollen to a new place.**

- Lesson 6, Synthesize, Step 5: “ Summative assessment: Students’ My Model: How did a seed get there to start growing into the Tower Tree? assessments are an opportunity to gather evidence about learning goal 6 (aligned with Assessment Statement 1) with the purpose of summatively assessing students’ use of structure-and-function relationships to explain how a seed could have been moved to a new place; specifically, how the seed that grew into the Tower Tree could have gotten to the top of the courthouse.” (Lesson 6, Teacher Guide) Learning Goal: **Develop a model to represent structures of a seed and animal body part/s that work together to move a seed that grew into the Tower Tree to its unusual place (function).**

Lessons 7-9, Learning Goal: **Plan and carry out an investigation collaboratively to produce evidence (including quantitative data displayed using line plots) that plants need light and water (cause) to keep growing and stay healthy (effect).** (aligned to 2-LS2-1)

- Lesson 7, Explore, Step 4: “Formative Assessment: Discussions with students during their small group collaborative planning and students’ Planning Our Plants Investigation handouts provide opportunities to gather evidence about Learning Goal 7 (aligned to Assessment Statement 2), to support students to clarify and communicate their ideas about planning an investigation to produce data to serve as evidence of what causes plants to keep growing and stay healthy (effects).” (Lesson 7, Teacher Guide) Learning Goal: **Plan and begin carrying out an investigation to produce data to serve as evidence that light and water cause plants to keep growing and stay healthy (effect).**
- Lesson 8, Explore, Step 4: “Formative Assessment: Partner discussions and students’ Plant Observations handouts during Observation 4 provide an opportunity to gather evidence about Learning Goal 8a (aligned to Assessment Statement 2), to support students in carrying out their planned investigation and making and recording observations that will provide data that can be used to make comparisons and as evidence to answer their investigation question. To support students in considering possible causes for their observations of plants in different conditions, use strategies such as restating students’ observations (effects) and asking about reasons for that (i.e., causes): You shared that Plant A is green and Plant C is light green. What is different about Plant A and Plant C’s conditions that might be the reason for that (cause)? You shared that Plant C and Plant D are both only 3cm. What is the same about their conditions that might be the reason for that (cause)? Continue to check in with different groups/partnerships and/or students who may need additional support; record students’ progress on the Following Students’ Sensemaking 2 tool. Refer to that tool, the Assessment Guidance at the beginning of this lesson, and the previous assessment callouts.” (Lesson 8, Teacher Guide) Learning Goal 8a: **Carry out an investigation to gather data to serve as evidence that light and water cause plants to keep growing and stay healthy (effect).**
- Lesson 9, Explore, Step 2: “Key formative assessment: Discussions with students and their Plant Observations handouts, as they individually carry out their investigation and make and record observations and measurements during Observation 5, which will be used (later in this lesson) to identify patterns that serve as evidence about the investigation question, provide an opportunity to gather evidence about Learning Goal 9a (aligned to Assessment Statement 2), with the purpose of providing feedback to students and guiding instruction for the next lesson.” (Lesson 9, Teacher Guide) Learning Goal: **Carry out an investigation to gather data and use patterns as evidence that light and water cause plants to keep growing and stay healthy (effect).**
- Lesson 9, Explore, Step 4: “Key formative assessment: Partner discussions and students’ Line Plots, Observation 5 handouts provide an opportunity to gather evidence about Learning Goal 9b (aligned to Assessment Statement 2), with the purpose of providing feedback to students and guiding instruction for the next lesson.” (Lesson 9, Teacher

Guide) Learning Goal: **Display and compare plants' growth (height, number of leaves) using line plots** to identify evidence that **plants need light and water (cause) to keep growing (effect)**.

- Lesson 10, Synthesize, Step 4: “Summative assessment: Students’ My Model: How does this plant keep growing here? assessments are an opportunity to gather evidence about Learning Goal 10 (aligned with Assessment Statement 2) with the purpose of summatively assessing students’ use of cause-and-effect relationships as evidence supporting how a plant can keep growing and stay healthy in an unusual place. Refer to the Summative Guidance 2 tool and the Assessment Guidance at the beginning of this lesson for more information to support and provide feedback to students.” (Lesson 10, Teacher Guide) Learning Goal: **Develop a model to represent the pattern of light and water causing plants to keep growing and stay healthy (effect)**.

Multi-modal feedback loops

- Lesson 4, Lesson Assessment Guidance, How can I use this assessment information?, “Plan to collect students’ completed How can seeds be moved by animals when using them for food? handouts after the final Synthesize in this lesson and plan to provide written/annotated feedback before Lesson 6; see suggestions in the Instructional Guidance 1 tool. During Lesson 6, there is an opportunity to return students’ annotated How can seeds be moved by animals when using them for food? handouts so they can take up feedback before developing new models. Refer to the Instructional Guidance 1 tool for instructional guidance suggestions based on students’ current sensemaking.” (Lesson 4, Teacher Guide)
 - Instructional Guidance 1, Possible next steps include
 - Encourage students to narrate their sequenced cards, providing sentence stems: First ____, Next ____, Last ____
 - Use questions (What does the seed/beak-like tool look like? What is it shaped like?...
 - Provide a seed that is not smooth/hard (e.g., cockleburr) for students to describe its structure and compare it to the bean seed...
 - Before Lesson 6, provide small groups of students an opportunity to enact a scenario of how seeds can be moved to a new place when an animal stores them for later, as described below in the “If this applies to most or all of your class” section “provide students with their completed Lesson 4 How can seeds be moved by animals when using them for food? handouts, with your feedback to reference while working on their Lesson 6 My Model: How did a seed get there to start growing into the Tower Tree? Assessments.” (Lesson 4 Teacher Assessment Tool Instructional Guidance 1).
- Lesson 5, Lesson Assessment Guidance, How can I use this assessment information?, “You can use the Following Students’ Sensemaking 1 tool to keep track of students’ developing thinking. This tool also provides a range of sample student responses and ideas for how you can provide feedback. As students continue to work on related learning goals in the next lesson, check in with students for whom you have not yet gathered evidence and/or who need more support.” (Lesson 5, Teacher Guide)
- Lesson 6, Lesson Assessment Guidance, How can I use this assessment information?, “Refer to the Summative Guidance 1 tool for sample student work showing a range of student performance on this task and suggested feedback to offer as they complete the assessment. This is also an opportunity for students to give and receive feedback on their current sensemaking using their student assessments, with support from their Gotta-Have-It Checklist. Use lesson discussion prompts to support students in using peer feedback to make changes and/or additions to their models.” (Lesson 6, Teacher Guide)
- Lesson 7, Lesson Assessment Guidance, How can I use this assessment information?, “Use follow-up questions to build on students’ initial ideas on their Planning Our Plants Investigation handouts to further support them in

considering how their ideas will help them gather evidence about what plants need (i.e., cause-and-effect): How will ____ help us know if plants need light/water? You suggested we ____ (e.g., “give it light”). What if we did the opposite—how could we do that (e.g., “put it in the dark”)? What do you think would happen then? How might that help us know if plants need light/water? You can use the Following Students’ Sensemaking 2 tool to keep track of students’ developing thinking. That tool also provides a range of sample student responses and ideas for how you can provide feedback. As students continue to work on related learning goals in the next two lessons, check in with students for whom you do not yet have evidence and/or who need more support.” (Lesson 7, Teacher Guide)

- Lesson 9, Lesson Assessment Guidance, How can I use this assessment information?, “This is a key formative assessment opportunity where you will take stock of students’ progressing sensemaking around Assessment Statement 2 (aligned to 2-LS2-2) using their Line Plots, Observation 5 handouts and evidence captured on the Following Students’ Sensemaking 2 tool. Refer to the Instructional Guidance 2 tool for instructional guidance suggestions based on students’ current sensemaking.”
 - Lesson 9 Teacher Assessment Tool Instructional Guidance 2, Possible next steps include
 - “With a partner, have students discuss the healthy and unhealthy plants and write/draw what they think each plant is getting or not getting.”
 - “Have partners meet in small groups to discuss their ideas, providing sentence starters to support the discussion and students’ cause-and-effect reasoning.”
 - “Provide an additional opportunity to use line plots by having students display and compare a shared sample of plant data.”
- Lesson 9, Explore, Step 2: “Compare plant growth data in our small groups. After students have created their line plots, have them discuss the following prompts with their small group to compare the growth (height and number of leaves) of their groups’ plants and consider what may have caused the differences in the data (refer to slide H). Circulate to support this student-to-student discussion by encouraging students to use their Line Plots, Observation 5 handouts as evidence to support their ideas. The possible “Ideas to look and listen for” in the discussion tables in this lesson reflect observations and measurements from sample data in Plant Investigation Observations. Your students’ responses will vary, as they will reflect your class’s plants and investigation conditions and timeline. Prompts to use ‘How are your plants’ heights similar and/or different?’ ‘How are your plants’ numbers of leaves similar and/or different?’ Possible follow-up responses include, “Can you show me that?” (Lesson 9, Teacher Guide)
- Lesson 10, Lesson Assessment Guidance How can I use this assessment information?, “If you have not yet checked off evidence for all three boxes on the Following Students’ Sensemaking 2 tool for certain students, make sure to talk individually with those students about their student assessments so they have an opportunity to explain their thinking and inform your summative assessment of their progress.” (Lesson 10, Teacher Guide)
- Lesson 10, Synthesize, Step 4: “Engage in one-on-one discussions while students develop models. As students develop their models, circulate and engage in brief one-on-one discussions with students. As students share their ideas, encourage the use of words, drawings, spoken language, and gestures.” Prompts to use-Possible follow-up responses include “What causes the plant to keep growing and stay healthy?” - “What could you add to help others understand your thinking?”(Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

Category Ratings

CATEGORY I	NGSS 3D Design [Criteria A–F]	0	1	2	③
CATEGORY II	NGSS Instructional Supports [Criteria A–G]	0	1	2	③
CATEGORY III	Monitoring NGSS Student Progress [Criteria A–F]	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