

Why is Our Corn Changing? EQIP Rubric for Science Evaluation

Developer/Curriculum: NextGen Science Storylines

Unit Name: Why is Our Corn Changing

Grade: 2

Date of Review: March 2020

Overall Rating (N, R, E/I, E): E/I

Category I: NGSS 3D Design Score (0, 1, 2, 3): 3

Category II: NGSS Instructional Supports Score (0, 1, 2, 3): 2

Category III: Monitoring NGSS Student Progress Score (0, 1, 2, 3): 2

Total Score (0–9): 7

Click here to see scoring guidelines

This review was conducted by the [Science Peer Review Panel](#) using the [EQIP Rubric for Science](#).

Category I Criteria Ratings		Category II Criteria Ratings		Category III Criteria Ratings	
A. Explaining Phenomena/Designing Solutions	Extensive	A. Relevance and Authenticity	Adequate	A. Monitoring 3D Student Performances	Adequate
B. Three Dimensions	Extensive	B. Student Ideas	Adequate	B. Formative	Extensive
C. Integrating the Three Dimensions	Extensive	C. Building Progressions	Inadequate	C. Scoring Guidance	Inadequate
D. Unit Coherence	Extensive	D. Scientific Accuracy	Extensive	D. Unbiased Tasks/Items	Adequate
E. Multiple Science Domains	Adequate	E. Differentiated Instruction	Adequate	E. Coherence Assessment System	Extensive
F. Math and ELA	Extensive	F. Teacher Support for Unit Coherence	Extensive	F. Opportunity to Learn	Adequate
		G. Scaffolded Differentiation Over Time	Extensive		

Summary Comments

Thank you for your commitment to students and their science education. Achieve is glad to partner with you in this continuous improvement process. This unit is strong in several areas, including the use of an anchoring phenomenon, a coherent storyline, learning tasks that require three-dimensional thinking, a thorough assessment system, and integration of mathematics and English Language Arts standards into the science lessons.

The anchor phenomenon of harvest corn that has gotten wet is interesting to students and brings up many student questions. The lessons return to the anchoring phenomenon throughout the lessons, and students figure out different pieces that fit together into a complete explanation of what is happening to

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the corn. The storyline follows a logical sequence and the lessons are linked by using strategies at the end of each lesson to discuss the lesson and formulate questions and ideas for the next lesson. Each lesson contains a Lesson Level Performance Expectation (LLPE) that outlines specific elements of each of the dimensions that will be used in the lesson. Tasks performed by students during the lesson require the use of at least two of the dimensions, and most are three-dimensional, although use of Disciplinary Core Ideas (DCIs) in the lessons are most often below the targeted Grade 2 level. Kindergarten and Grade 1 content is a focus in most of the unit.

Many forms of assessment are included in the unit and teachers are provided with guidance, sample responses, and scoring guides to evaluate student work. Quality formative assessments are widely used and ideas on how to support students based on the results of formative assessment are provided. The lessons have an emphasis on writing and discussing, and many other ELA standards are used as well and can inform teachers on student competencies on many ELA standards. The CCSS mathematics standards help students to apply what they have learned during mathematics lessons.

During revisions, the reviewers recommend paying close attention to building a progression of learning for the SEPs and CCCs, identifying what students already know and can do with individual elements of the SEPs and CCCs and explaining how the lessons build and develop knowledge and skills in these areas. In addition, an increased emphasis on Grade 2-level DCIs throughout the unit would be helpful to teachers' efforts to support students in learning all the required DCIs in the Grade 2 school year.

As written, this unit only addresses one second grade DCI. In addition, there is a section of the unit that addresses one Grade 1 DCI. If this unit is planned for students with little experience with NGSS, consider providing an explanation of why the unit covers both Grades 1 and 2 science ideas. Because the second grade NGSS includes 11 DCIs, the number of DCIs used and developed in this unit is appropriate for a unit that will be used in a full year science curriculum.

Note that in the feedback below, black text is used for either neutral comments or evidence the criterion was met and purple text is used as evidence that the criterion was not met.

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Category I. NGSS 3D Design

Score: 3

3: At least adequate evidence for all of the unit criteria in the category; extensive evidence for criteria A–C

2: At least some evidence for all unit criteria in Category I (A–F); adequate evidence for criteria A–C

1: Adequate evidence for some criteria in Category I, but inadequate/no evidence for at least one criterion A–C

0: Inadequate (or no) evidence to meet any criteria in Category I (A–F)

I.A. Explaining Phenomena/Designing Solutions: Making sense of phenomena and/or designing solutions to a problem drive student learning.

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

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

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

Rating for Criterion I.A Explaining Phenomena/Designing Solutions: Extensive

The reviewers found extensive evidence that learning is driven by students making sense of phenomena because the materials are organized with a clear storyline that drives student learning around a series of related phenomena to help students make sense of the driving anchor phenomenon. Students regularly return to the phenomenon to add layers of learning and explanation.

Examples of student sensemaking and related phenomena exploration found in the unit include:

- In the Teacher Handbook (TH), the Anchoring Phenomenon Routine is described. The purpose of this routine is to “build a shared mission for a learning community to motivate students in figuring our phenomena or solving design problems” (TH, page 10). Some examples of how this routine shows up in the series of lessons include:
 - “Create an opportunity for students to voice their initial ideas about the phenomenon.” In Lesson 1, page 6, the students observe harvest corn that was left out and got wet. They create a class “I Notice, I Wonder” chart showing their ideas about what is happening to the corn.
 - “Elicit student questions that the students want to investigate and answer throughout the unit, which the teacher will be able to use to motivate students and connect the lessons in the unit.” In Lesson 2 page 6, the class looks at the questions generated and decides what to investigate.
- The anchoring phenomenon is interesting to students and familiar to many students. (Harvest corn is a widely used fall decoration in many places.) The display of the harvest corn that has gotten wet along with the dry harvest corn provides an interesting contrast and leads to many student questions.
- The unit is organized around a storyline with several related pieces that lead to an understanding of the anchoring phenomenon. The unit storyline is explained in the Unit Front Matter on pages

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4–5.

- Lesson 1 provides the anchoring phenomenon “Is something going to happen to this corn cob that got wet?” Students observe the corn cobs, ask questions, and utilize “I notice, I wonder” structures to begin the sensemaking process.
- Lesson 2 develops investigations around questions developed from the introduction of the anchor phenomenon. Some of these questions are “Is this corn real or fake?” and “What will happen to the wet corn?”
- In Lesson 3 students have the opportunity to figure out that the wet corn is definitely changing, little white things are coming out of the corn, and the kernels are plumping. These observations provide the first piece of evidence to help students determine if the corn is real or fake.
- In Lessons 4a, 4b, and 4c, students design and conduct investigations to determine what part of the corn the little white things are growing from and also investigate the growth of other seeds.
- Lesson 5 loops back around to the wet harvest corn and investigates how much the wet harvest corn has changed since their last set of observations.
- Lessons 6a and 6b give students the opportunity to investigate if plants need light to continue growing.
- Lesson 7 reviews all the previous phenomena from Lessons 1–6 to deepen understanding of what they have figured out so far. Students develop CERs around the questions: “Is the harvest corn alive?” and “Is the stuff that has been growing one plant or many plants?”
- Lesson 8 investigates how water is related to the changes happening in the plants.
- Lesson 9a returns to an experiment from Lesson 6 and supports students in designing investigations around unanswered questions about what plants need to grow.

Suggestions for Improvement

None

I.B. Three Dimensions: 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.

Provides opportunities to *develop and use* specific elements of the SEP(s).

Provides opportunities to *develop and use* specific elements of the DCI(s).

Provides opportunities to *develop and use* specific elements of the CCC(s).

Rating for Criterion I.B. Three Dimensions: **Extensive**

The reviewers found extensive evidence that the materials give students opportunities to build understanding of grade-appropriate elements of the three dimensions.

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Science and Engineering Practices (SEPs): Extensive

The reviewers found extensive evidence that students have the opportunity to use and develop the SEPs in this unit because the students are engaged in grade-appropriate elements of the SEPs in service of making sense of the phenomena presented.

Evidence of the Grade-Appropriate Elements of the SEPs in the unit includes, but is not limited to:

Asking Questions and Defining Problems

Ask questions based on observations to find more information about the natural world

- Students view the harvest corn and the class completes a Notice and Wonder chart with questions about the corn (Lesson 1, page 4). Students record their individual questions on the student activity sheet called “Harvest Corn: Notice and Wonder.” The teacher and students create a class Notice and Wonder chart that is posted in the classroom.
- In Lesson 2, students develop their ability to ask testable questions by using their initial questions to decide what and how to investigate. In Lesson 3 (page 6), students ask questions about the changes and how they might predict what could cause the corn to change or what changes they might see in the future.

Ask and/or identify questions that can be answered by an investigation.

- Students discuss what type of environment is best for growing corn and generate questions to investigate (Lesson 8a, page 6).

Planning and Carrying Out Investigations

With guidance, plan and conduct an investigation in collaboration with peers.

- In Lesson 2, students discuss what they should do to determine if the “harvest corn” is real, helping them plan and begin investigations that compare observations of the wet corn.
- Students discuss what could be investigated and design an experiment to determine where the white things are coming from in Lesson 4a. The class creates an Investigation Plan Outline.
- In Lesson 8a, the class collaboratively designs and conducts an investigation to determine how changes in the environment affect plant growth. Students are introduced to the idea of variables and how more than one independent variable will affect their results. **However, this discussion of variables is at the Grade 3–5 level, and the rationale behind this advanced support is not listed.**

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

- The class plans an investigation in Lesson 6 (pages 8–9). They determine that there needs to be a control (one cob in the dark and one cob in the light), what data to collect and how to measure growth. **However, this discussion of controls is at the Grade 3–5 level, and the rationale behind this advanced support is not listed.**
- In Lesson 8b page 7, the class discusses why it is important to only change one variable at a time. “With four different containers, it was kind of hard to see patterns, draw conclusions, and make

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claims, because we were changing lots of things at once...It is much easier to see patterns, draw conclusions, and make claims when we can compare results from where we changed only one thing at a time in the containers.” However, this discussion of variables is at the Grade 3–5 level, and the rationale behind this advanced support is not listed.

- Student groups plan their own investigation to answer a question in Lesson 9a, page 6. They complete a Student Activity Sheet where they document their investigation plans.

Evaluate different ways of observing and/or measuring a phenomenon to determine which way can answer a question.

- Student groups select what needs to be measured and how they will measure as part of the investigation plan in Lesson 9 (page 7).

Make observations and/or measurements to collect data that can be used to make comparisons

- Students make observations, record measurements and collect data to use as evidence for how the wet harvest corn has grown and how the water level has changed since their last observations in Lesson 5.

Analyzing and Interpreting Data

Record information (observations, thoughts, and ideas).

- In Lesson 1, students draw pictures of the corn (or use teacher provided pictures), record their observations and questions, and share the ideas about the harvest corn.
- Students rotate through four stations with plants and record their observations and measurements of the plants in Lesson 8b (pages 5–6).

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.

- Students record observations of changes or similarities in the corn in Lesson 2.
- In Lesson 3, students use observations of change and the patterns in the changes as evidence towards the argument of whether the corn is real or fake.
- In Lesson 8b, students record and compare observations regarding changes in size/length of structure in the plants and the leaves.

Using Mathematics and Computational Thinking

Describe, measure, and/or compare quantitative attributes of different objects ~~and display the data using simple graphs~~

- Students make observations, record measurements and collect data in Lesson 5 to use as evidence for how the wet harvest corn has grown and how the water level has changed since their last observations. This element was not listed as an SEP in this lesson.
- In Lesson 6, students describe the amount of growth in the plant structures, using several measurement opportunities. There is an optional extension to display in simple graphs. If this activity is included, the last part of the element (*display the data using simple graphs*) can be utilized.
- Students describe the amount of change/growth in the plants’ leaves and roots in Lesson 8b.

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Engaging in Argument from Evidence

Construct an argument with evidence to support a claim.

- In Lesson 4b, students co-construct oral and written arguments with evidence from their observations that a plant is growing from the kernel and not the cob.
- Students use evidence to respond to “Does the seed have something inside that helps the plant grow?” in Lesson 4c.
- Using Student Activity Sheet 7, students use evidence to construct a CER around two questions: “Is the harvest corn alive?” and “Is it one plant or many?” Students provide several pieces of evidence and reasoning based on their observations and investigations so far. This is completed individually, using strategies learned when a similar activity that was done as a class, to help students develop their ability to use evidence to support a claim.
- Based on their observations, students use evidence to argue that plants need water but not necessarily soil to grow (Lesson 8b).

Obtain, Evaluate, and Communicate Information

Communicate information with others in oral and/or written forms using models, drawings, writing or numbers that provide detail about scientific ideas

- Students communicate how they designed their experiment to investigate where the little white things are coming from using models, drawings, and writing (Lesson 8b).
- In Lesson 6a, students communicate orally and through models, drawings, and writing about how they designed their experiment to investigate if plants need light to grow.

Disciplinary Core Ideas (DCIs): Extensive

The reviewers found extensive evidence that students have the opportunity to use or develop the DCIs in this unit because students are engaged in developing elements from DCIs associated with the grade level as well as applying DCIs that have been previously developed.

Seven lessons in the unit are based around DCIs that have been previously developed in Kindergarten or First Grade, leaving the last two lesson sequences to focus on the grade level DCI. While the sequence of learning supports student sense making in the unit, more than the majority of the unit focuses on previously developed DCIs.

Evidence of the Grade-Appropriate Elements of the DCIs in the unit includes:

LS2.A Interdependent Relationships in Ecosystems

Plants depend on water and light to grow.

- In the investigations in Lessons 4a, 4b, and 4c with seeds, kernels and cobs in water, students come to the understanding of what plants need to grow and thrive.

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- While students are investigating how much their wet harvest corn has grown in Lesson 5, they notice how the water level has changed since the last observations and figure out what might have happened to that water.
- In Lesson 7, the class conducts an investigation where they put corn in the light and in the dark.
- In Lessons 8a and 8b, students investigate to determine in what kind of environment plants will thrive and how water is related to changes in the plants.
- In the concluding lesson (Lesson 9), students investigate to answer questions about how plants grow.

Evidence of DCIs from other grade levels used in the unit includes, but is not limited to:

LS1.A Structure and Function

All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.

(This element is a Grade 1 DCI.)

- In Lesson 1, the students come up with questions and observations about the corn. As the class discusses these, the teacher helps to put science terms to the student observations. The students use these terms for the parts of the corn when making their own drawings (Lesson 1, page 4).
- Students dissect the corn to further explore the parts of the corn and try to determine the function of each part in Lesson 2.
- A student-designed investigation (Lesson 4a) to determine where the little white things are coming from provides more information about the plant parts and their functions.
- Students investigate bean seeds to figure out what seeds have inside to produce a new plant in Lesson 4c.

LS1.B Growth and Development of Organisms

Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behavior that help the offspring to survive. (This element is a Grade 1 DCI.)

The materials also use the following DCIs from [A Framework for K–12 Science Education](#), (page 146) describing what students should understand by the end of Grade 2:

Plants grow and change.

- Students record observations about the changes in the corn from the last observations in Lesson 2.
- Student observations of the wet corn continue in Lesson 4a. They identify changes in the corn and plan investigations to help them answer the questions that arise from their observations.
- Using measuring tools, students investigate how much their wet harvest corn has grown since the last observations (Lesson 5).

Plants have predictable characteristics at different stages of development.

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- Students examine the inside of seeds (Lesson 4c) and observe and record the growth of corn kernels throughout the unit. They draw and label pictures to document the different stages of growth.

LS1.D Information Processing

Plants also respond to some external inputs (This element is a Grade 1 DCI.)

- In Lesson 6 (pages 7–8), students view a time-lapse video showing how the green parts of the plant grow upward toward the light and the roots grow downward.
- Students design an investigation to determine if plants need light to grow in Lessons 6a and 6b.

Crosscutting Concepts (CCCs): Extensive

The reviewers found extensive evidence that students have the opportunity to use and develop the CCCs in this unit because grade-appropriate elements are used in service of students making sense of the phenomena presented in the unit.

Evidence related to this criterion includes:

Patterns

Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

- After making observations of harvest corn left in water, students begin to discuss the patterns of change that may occur in the future (Lesson 1).
- The teacher introduces the word “pattern” after the students take the corn cobs apart in Lesson 2 (page 8). In this discussion, students talk about the parts that are common to all the corn and notice the pattern of kernels on the cob.
- In Lesson 3 (page 6), students notice the patterns of change in the corn. “As students mention changes in the corn, name these as patterns.”

Cause and Effect

Simple tests can be designed to gather evidence to support or refute student ideas about causes.

- In Lesson 6, students design an investigation to determine if plants need light to grow.
- Students design and conduct an investigation to determine how changing the environment that the roots are in will affect how it grows (Lessons 8a and 8b).
- In Lesson 9, students design and conduct an investigation to answer any other questions about what else plants need to grow.

Structure and Function

The shape and stability of structures of natural and designed objects are related to their function(s).

- Students start to observe the parts (structures) of the corn and ask questions related to the function of those parts in Lesson 1.

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- In a discussion of the wet harvest corn in Lesson 3 (pages 6–7), students are introduced to the word “structure” as they discuss the parts of the corn kernel. Later, in Lesson 4b (page 6), students come up with ideas about the function of those parts, based on their observations.
- In Lesson 4b, students learn from observation that the kernel is where the little white things sprout from. They connect this understanding to their knowledge of seeds.
- The students take apart seeds in Lesson 4c to see what seeds have inside to make a new plant.
- in Lesson 7, students predict what structures in the plant allow it to get water.

Stability and Change

Some things stay the same while other things change.

- Students begin to observe changes and similarities in the corn from previous observations in Lesson 2.
- In Lesson 3, observations are used to determine what has stayed the same and what has changed with the wet corn
- In Lesson 4a (pages 5–6), students complete a Student Activity Sheet where they notice ways that their corn has changed.
- Students use measurement to determine how much their wet harvest corn has grown and how the water level has changed since the last observations (Lesson 5).
- In Lesson 6a, students observe changes in the wet harvest corn that is growing in light and dark conditions.

Suggestions for Improvement

SEPs

In several places, the SEPs are currently being used at the 3–5 level. Consider marking these as enrichment opportunities for students who have already mastered the K–2 skills.

DCIs

The materials incorporate several DCI elements from the Kindergarten and Grade 1 standards. If there is a purpose to including these elements, consider providing an explanation to teachers as to why they are used. If the unit was designed to support learning gaps, especially with the transition to NGSS, it would be helpful to provide statements of this intent.

CCCs

None

I.C. Integrating the Three Dimensions: Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.

Rating for Criterion I.C. Integrating the Three Dimensions: Extensive

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The reviewers found extensive evidence that student performances integrate elements of the three dimensions in service of figuring out phenomena. There are numerous events where all students are expected to figure out an interesting phenomenon in a way that requires grade-appropriate elements of all three dimensions of the standards. The three dimensions are intentionally used together to help students adequately explain a phenomenon.

Evidence of integration of the three dimensions in the unit includes, but is not limited to:

- Lesson 1: Students **ask questions** about the corn and record observations of their data (**Analyzing Data**), notice and wonder about the **structure and function** of the parts of the corn (**LS1.A**), and notice and wonder what might happen to the wet corn in the future.
- Lesson 2: Students use **observations (Analyzing Data)** to notice change in the corn (**LS1.B**), and compare similarities and differences in the corn (**Stability and Change**).
- Lesson 3: Students use **observations (Analyzing Data)** to determine what has stayed the same and what has changed (**Stability and Change**) in the wet corn (**LS1.B**) and **ask questions** about the **patterns of change** they could see in the future.
- Lesson 5: Students **investigate** how much the wet harvest corn has grown and how the water level has **changed** since their last observations (**LS1.B; LS1.C**).
- Lesson 6a and 6b: Students **plan and carry out investigations** to determine **change** in their wet corn, why certain **structures** in the wet corn grow in different directions, and if plants need light to grow (**LS1.D, LS1.C, LS1.B**).
- Lesson 6b: Students **argue from evidence** by co-constructing an oral and written argument supported by evidence that plants depend on light (**cause**) in order to grow (**effect**) (**LS1.C; LS2.A**).
- Lesson 7: Students **construct an argument** (CER) from evidence related to **changes** in the structures of the harvest corn and the amount of water in the containers over time (**LS1.A, LS1.B**).
- Lesson 8: Students **design and conduct an investigation** to determine the best environment for plant growth, determining how **changes** in the environment affect growth (**Cause and Effect**) (**LS2.A**).
- Lesson 9: Students consider **questions** they still have about plants, **plan and conduct investigations** in small groups to answer these questions (**CCC - simple tests to gather evidence; DCI** will be dependent on the question being investigated).

Suggestions for Improvement

None

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I.D. Unit Coherence: Lessons fit together to target a set of performance expectations.

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

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

Rating for Criterion I.D. Unit Coherence: **Extensive**

The reviewers found extensive evidence that lessons fit together coherently to target a set of performance expectations. Each lesson builds on prior lessons by addressing questions from previous lessons and by cultivating new questions based on what was figured out or from prior student experiences. The lessons help students develop proficiency towards a specific performance expectation. In addition, student questions often drive the learning experiences and help to develop an understanding of core ideas and concepts. Students revisit the anchor phenomenon several times, linking their new learning to support sensemaking around the phenomena.

Evidence of unit coherence in the unit includes, but is not limited to the following:

- The unit works toward the following Performance Expectation: 2-LS2-1. *Plant and conduct an investigation to determine if plants need sunlight and water to grow.* Students plan and perform several investigations (plants grown in light and dark, plants watered and not watered) leading to a determination of what environmental conditions produce plant growth.
- In the Teacher Handbook (pages 13–14), the Navigation Routine is described. This a series of activities that occurs at transition points in the lessons to help link learning across lessons.
- Each lesson provides a clear explanation of what students did in the previous lesson, what they are doing in the current lesson, and where the learning will go in the following lesson. For example:
 - Lesson 2 uses student wonderings from Lesson 1 to develop a plan to investigate the parts and structures of the corn in order to determine if the corn is real or fake; these investigations continue over a period of time, allowing students to observe change and new structures forming in the corn to argue that the corn is not fake
 - Lesson 3 uses learning from previous lessons along with the observations in this lesson to argue that the corn is not fake, it is real and from a plant.
 - At the end of Lesson 4c (page 9), students gather for a discussion that summarizes the parts of the seeds they have observed. Students then brainstorm what should happen next. At the beginning of the next lesson (Lesson 5 page 5) students articulate what they figured out in the previous lesson and ask questions about what should happen next.
 - At the beginning of Lesson 7 (pages 6–7), students look back at the Notice and Wonder charts. They circle questions that have been answered and put a checkmark next to questions they have started to answer with their investigations. Finally, they determine

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which questions they still need to answer.

- Many discussions are prompted by teacher questions designed to move student thinking forward. It is not always evident that authentic student questions drive the learning.
- The Unit Storyline provides a roadmap that illustrates how each lesson supports prior learning and builds to the next lesson. For example:
 - Lesson 1 introduces the anchor phenomenon that serves as a basis for learning throughout the unit.
 - Lesson 5 returns to the anchor phenomenon and compares changes in the corn and water levels from their previous observations.
 - Lessons 6a and 6b establish that there is growth of some structures in different directions in their wet corn, leading students to design investigations to determine how light affects plant growth.
 - Lesson 7 pulls the learning together from the previous lessons to support students in constructing an argument using their evidence from the past lessons.
 - Lesson 8 explores how changing the environment that plants are rooted in will affect how the plant grows—the impact of water and soil, or lack thereof, on the plants. This lesson leads into future learning surrounding changes in ecosystems and what plants need for growth. This is noted in the “Getting Ready - Background knowledge” section which explains the role of soil and mentions that the information is for teachers, as it's not a target concept in Grade 2.
 - Lesson 9 allows students to bring all their learning together to support independent design and carrying out of investigations (in small groups) around questions the class still has about plants.
- Teacher guidance is provided to help the navigation from one lesson to another. For example:
 - “Invite students to generate ideas for the path of today’s lesson. If students aren’t sure what to do, relate the activity to something more familiar” (Lesson 2, page 6).
 - “To kick off this discussion, try asking a volunteer to read aloud from the Notice and Wonder charts from Lessons 2 and 3. This will provide a clear reminder. Then, ask students to restate what we decided we would need to do” (Lesson 4a, page 5).
 - “Before dismissing students, ask students to restate what our next steps should be in our investigations” (Lesson 6a, page 11).

Suggestions for Improvement

- In the discussions at the end of the lessons, consider having students bring up their own questions before the teacher starts asking questions. The teacher could accept all questions and then focus on the questions that provide a bridge to the next lesson. Other questions could be posted in the classroom and, if there is time, the teacher could allow students to investigate or research answers to their questions.

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- Lesson 8 leads into future learning surrounding changes in ecosystems and what plants need for growth. This would be a great opportunity to show the future progression of these ideas through Grade 5 more explicitly.

I.E. Multiple Science Domains: When appropriate, links are made across the science domains of life science, physical science and Earth and space science.

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

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

Rating for Criterion I.E. Multiple Science Domains: **Adequate**

The reviewers found adequate evidence that links are made across the science domains when appropriate because the unit focuses on the life sciences domain and the phenomena driving the unit is fully addressed within this domain.

Suggestions for Improvement

Since the DCI associated with the Grade 2 PE 2-LS1-1 is **LS2.A - Interdependent Relationships in Ecosystems**, making connections to **ESS3 DCI - Earth and Human Activity**, specifically to **ESS3.A Natural Resources** and **ESS3.C Human Impacts on Systems** could be helpful. This would broaden the perspective of student learning around the investigation of what plants need and how humans may impact those needs, thus changing their environments. Bringing in multiple Grade 2 PEs would provide more justification for the length of this unit.

I.F. Math and ELA: 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.

Rating for Criterion I.F. Math and ELA: **Extensive**

The reviewers found extensive evidence that the materials provide grade-appropriate connections to mathematics, English language arts (ELA), history, social studies, or technical standards because grade-appropriate mathematics and ELA-Literacy concepts are purposefully incorporated into lessons with teacher support to help students make these connections. Writing assignments are varied in structure and purpose and are rigorous. Students have opportunities for verbal classroom discourse. Students use grade level writing skills to explain and communicate their understanding of the science ideas. In addition, explicit connections to CCSS are noted at the end of each lesson. *However, although there are some suggestions for books to read aloud, there are no student reading selections.*

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CCSS connections made in the unit include:

Mathematics

CCSS.Math.Content.2.MD.A.1 – *Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tape.*

- In Lesson 5 (page 6) students decide to keep track of growth by measuring the root and the shoot with a ruler. They record their data using metric measurements.
- Students measure the growth of roots and leaves in Lesson 8b, comparing the differences they notice in plants grown in various environments. *An optional opportunity to show measurements on a line plot is listed in the standards alignment section, however reference to this activity was not found within the lesson’s teacher guide.*

CCSS.MATH.CONTENT.2.MD.A.4 – *Measure to determine how much longer one object is than another, expressing the difference in terms of a standard-length unit.*

- In Lesson 7 (page 8), students calculate the amount of growth by subtracting current measurements from previous measurements.

English Language Arts

CCSS.ELA-LITERACY.SL.2.1 – *Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.*

- Teachers are given guidance about supporting student discussions in the Teacher Handbook, pages 26–32. This includes information about different kinds of discussions, ideas to promote equity during discussions, questioning strategies, and teacher support for planning for and reflecting on student discussions.
- Students work in pairs to discuss responses on Student Activity Sheet 7 (Lesson 7, page 9).
- Students participate in a whole class discussion to articulate the purpose of their third investigation (Lesson 8b, page 5). They come to consensus on what they were trying to figure out in that investigation.

CCSS.ELA-LITERACY.W.2.5 – *With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.*

- The G2 Unit Specific Front Matter, Section G, pages 7–20 provides teacher support and guidance for writing across the unit. This discusses the different forms of student writing and the places in the unit where that writing occurs. As an example, students are introduced to various forms of writing, including writing scientific argument. Early in the lessons this is done as a class. Later in Lesson 9c (page 6) students write scientific arguments on their own. In 9d (page 4), students share their findings with classmates and answer questions about their presentation.
- Several writing extension lessons are included (Lesson 4a,b we; 6a,b we, 8a,b we). In these extensions, students write on a focused topic, they revise their writing and they participate in shared writing projects.
- In Lesson 9, students participate in a shared research and writing project.

Suggestions for Improvement

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- In addition to the suggested read aloud, consider adding a non-fiction reading selection. This would help teachers integrate this science unit into their reading instruction. Short, grade appropriate informational text selections can be found at websites that provide informational text for instructional purposes. An example is the selection called “What Do Plants Need?” at Readworks.org (log in required).
- It could be helpful to move the student informational text to a later place in the lessons after students have mastered some vocabulary words and have enough background knowledge for the text to make sense.

Overall Category I Score (0, 1, 2, 3): 3

Unit Scoring Guide – Category I
Criteria A–F 3: At least adequate evidence for all of the unit criteria in the category; extensive evidence for criteria A–C 2: At least some evidence for all unit criteria in Category I (A–F); adequate evidence for criteria A–C 1: Adequate evidence for some criteria in Category I, but inadequate/no evidence for at least one criterion A–C 0: Inadequate (or no) evidence to meet any criteria in Category I (A–F)

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Category II. NGSS Instructional Supports

Score: 2

Criteria A-G:

3: At least adequate evidence for all criteria in the category; extensive evidence for at least two criteria

2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A

1: Adequate evidence for at least three criteria in the category

0: Adequate evidence for no more than two criteria in the category

II.A. Relevance and Authenticity: Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world.

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

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

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.

Rating for Criterion II.A. Relevance and Authenticity: **Adequate**

The reviewers found adequate evidence that the materials engage students in authentic and meaningful scenarios that reflect the real world. The materials provide support to teachers to help all students make connections to their own lives. These connections provide motivation for students to engage in the learning. Students experience the phenomenon firsthand, and this firsthand experience serves as an on-ramp to understanding. The lesson provides opportunities for students to connect their own questions and prior experiences to the targeted learning. While the students are engaged in multiple first-hand experiences with the phenomena in the unit, **the connections to student lives, their homes, broader communities and cultures are not the focus and often are not given intentional connection in the unit.**

Evidence in the unit includes, but is not limited to:

- The introduction of the phenomenon is productively puzzling for students, with many of them not understanding that the harvest corn is “alive.” Students have many opportunities to handle the corn and the kernels.
- In the Unit Front Matter (pages 21–22), the materials discuss how teachers can connect the unit to student experiences. They also tell why they do not recommend alternate phenomena, such as a pumpkin, as a basis for this unit. In addition, they describe a way to extend student learning after the unit is over. **Specific information about using these ideas does not appear in the teacher instructions for the lessons.**
 - G2 Unit Specific Front Matter Section I.1 – “How can I connect the unit context to student experiences and their community?” Suggestions for connecting the lesson to students’

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lives include analyzing foods that we eat and sorting them according to the part of the plant we eat, and connecting this learning to farming.

- G2 Unit Specific Front Matter Section I.2 – “What alternate phenomenon can I use?” This section offers rationale for using the harvest corn and how it is a compelling phenomenon.
- G2 Unit Specific Front Matter Section I3 – “How can I extend student learning after the unit is over?” Suggestions for teachers include literary stations where students read books about plants and ideas for read aloud books.
- Lesson 1 provides opportunities for students to connect their experiences with corn to the harvest corn.
- Students and the teacher construct a K-W-L chart (Lesson 2, page 10). In constructing this chart, students bring their own experiences into the discussions: “Students can use words, pictures with labels.” Teachers are advised “The KWL can be revisited and added to/revised throughout the unit.”
- Lesson 3 provides opportunities for students to discuss where they may have seen seeds or roots in previous experiences and compare them to those they know.
- Lesson 4a asks students to connect to experiences when they have done something “twice” or repeatedly to be sure. This leads to discussion of a rationale for planting multiple ears of corn and kernels for their experiment.
- In Lesson 4b, students are prompted to think about questions including “What are some other kinds of seeds you have seen?” and “Have you ever seen plants growing from other kinds of seeds?”

Suggestions for Improvement

- Consider providing more intentional opportunities for students to make connections to their lives, cultures, and homes. There are a few intentional call outs in the unit, but it is not a regular occurrence.
- Consider inserting the ideas about how teachers can connect the unit to student experiences from the section in the Front Matter (pages 21–22) into appropriate places in individual lessons.

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

Rating for Criterion II.B. Student Ideas: Adequate

The reviewers found adequate evidence that the materials provide students with opportunities to both share their ideas and thinking and respond to feedback on their ideas. Teachers are supported to act as an expert facilitator, drawing out student ideas while coordinating development toward targeted learning.

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Students use their ideas and cite shared ideas of others to build upon prior understanding. The classroom discourse is usually facilitated by the teacher, *so students are not often engaged in discourse facilitated by students*. Student artifacts include elaborations (which may be written, oral, pictorial, and kinesthetic, modeling) of reasoning behind their answers, and show how students' reflective thinking has changed over time. The unit provides support to teachers for eliciting student ideas. Students are given opportunities to use feedback to construct new learning. Students are given the opportunity to transfer their learning to new situations. Opportunities for feedback from teacher and student are present, *however peer feedback was not often present beyond small group discussions and there is little opportunity for teacher feedback of individual student work*.

Evidence in the unit includes, but is not limited to:

- G2 Unit Specific Front Matter Section G.7 provides examples of written feedback teachers could give to students regarding their ideas shared in writing.
- Lesson 1 (page 4) provides a formative assessment guidance section for teachers. This section has examples of how to support students in communicating their thinking through writing or speaking. Some of these ideas are to post sentence starters, use individualized word lists to help share thinking, share ideas with partners and have partners share, and use pictures of corn for students to label.
- On page 4 of Lesson 2, teachers are given ideas about what to look for in student observations and several specific ways that teachers can support students in communicating their ideas through writing and with their thinking. These ideas include using sentence starters, posing questions to elicit student thinking, and providing options for students to capture observations through photos and labeling.
- Lesson 3 gives students the opportunity to use their observations as evidence to argue whether the corn is real or fake; suggestions for supporting student discussions are provided in the teacher guide.
- Lesson 4a provides strategies for building understanding during discussions using Talk Moves (page 6).
- Lesson 4b offers students the opportunity to co-construct an argument from evidence regarding where the little white things are growing out of. Students discuss collaboratively and work to develop a claim from their observations through a Consensus Building Discussion.
- In Lesson 4c, students engage in a consensus building discussion to communicate what they figured out in the previous experiment. They share initial ideas in a discussion about the lima beans and investigating seeds and then build consensus during a discussion at the end of dissection.
- Lesson 5 begins with consensus building discussion then moves into a sharing initial ideas discussion around the wet harvest corn. The class makes a new Notice/Wonder chart and then students work together to measure and track their observations. The lesson concludes with a consensus building discussion around what they figured out.

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- Lesson 6 begins with consensus building discussion to reflect on previous decisions surrounding their harvest corn and then engages students in their observations of the harvest corn. Students then share ideas with the Notice/Wonder chart. Strategies to support this discussion are offered on page 6 box C.
- Lesson 7 supports learners in thinking about all they have figured out so far. They use a consensus building discussion to begin thinking about this and working through what they have figured out and what they are still wondering about.
- In Lesson 8, students share ideas about what is happening with the water in the wet corn bins leading students to wonder if dirty water is the best kind of water for plants and if plants need dirt or not. A discussion about investigating this is facilitated and students collaboratively design and outline their investigation plan. Students share thinking and respond in an exit ticket.
- Lesson 9 supports students in exploring ways to investigate their own questions, establish fair tests, use control groups, and put into practice the experiences from the unit. Students work collaboratively in small groups to determine the question they want to investigate, plan the investigation and its materials, conduct the investigation, construct arguments from evidence, and share/present their arguments to the class.

Suggestions for Improvement

- Consider setting up situations where student pairs engage in discussions of their ideas. Students could serve as both the one asking questions as well as the one responding to the questions. A simplified version of the table tent version of sharing and building on each other's ideas from Stem Teaching Tools could be used: [Stem Teaching Tool 48](#).
- Consider developing a protocol to teach students to engage in peer feedback. With supports and scaffolding, students could provide peer feedback on group-designed investigation plans and evidence-based arguments.

II.C. Building Progressions: 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.

Rating for Criterion II.C. Building Progressions: **Inadequate**

The reviewers found inadequate evidence that the materials identify and build on students' prior learning in all three dimensions because a description of the expected level of proficiency that students should have is not present for all three dimensions. Progression of learning and background knowledge is offered in each lesson related to the DCIs. There is no guidance for the progression of learning with SEPs or CCCs beyond what is measured in the summative discovery report in Lesson 9. Common student misconceptions and guidance with misconceptions are offered in each lesson and "look fors" within the

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formative assessments are provided, however, they are not specific to the expected levels of proficiency within each dimension.

Evidence related to this criterion includes:

- At the beginning of each unit, a section called “Background Information” tells what students should understand about the targeted DCIs (Lesson 2 page 3). *Similar information about prior levels of proficiency about the SEPs and CCCs is not provided in this section.*
- Each lesson’s teacher guide provides “background information” in the “Getting Ready: Teacher Preparation” section that supports the teacher in understanding the DCI involved. For example:
 - The Lesson 1 background knowledge section explains the prior DCI learning students would have been introduced to in Grade 1 and what ideas they may not have adequately developed around leaves and roots of plants.
 - Lesson 2 provides an excerpt from the Framework for LS1.A and what students were introduced to in Grade 1.
 - Lesson 3 builds on the ideas shared from the Framework for LS1.A, shares how they are using learning from the previous lesson and provides guidance for boundaries in this lesson.
 - Lesson 6 offers background information from Grade 1 DCI concepts that are important to this lesson.
 - Lesson 7 provides background information from the Framework and NGSS Kindergarten PEs that support the understanding related to living things needing water, air, and resources from the land. This section gives a definition of a living thing. Connections to previous learnings are built into the lesson guide on page 8.
 - Lesson 8a provides background information from the Framework, shares what DCI students were introduced to in Grade 1, and provides information on soil. The information about soil is there to support teacher understanding around the topic, even though they are not target concepts in Grade 2. This builds to future learning in the NGSS.
 - Lesson 8a offers a note in the Formative Assessment Guidance section that “predictions that the plant will not grow at all without water connects to a prior grade band DCI - LS1.C.”
- At the conclusion of each lesson, a section called “Alignment with Standards” lists the SEP and CCC elements that have been addressed in the lesson. *However, this section does not describe how the lesson provides a logical progression from prior learning to new targeted learning.*

Suggestions for Improvement

Consider including a section of information about a learning progression for the SEPs and CCCs. A discussion could be included of what students should already know and be able to do with one or two of the elements of the SEPs and CCCs highlighted in the unit and how the teacher could know the level of competency of students. It would be helpful to clearly describe a logical progression from the expected prior learning about SEP and CCC elements through the learning targeted in the materials.

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

Rating for Criterion II.D. Scientific Accuracy: Extensive

The reviewers found extensive evidence that the materials use scientifically accurate and grade appropriate scientific information. All science ideas included in the materials are accurate and there is strong support for teachers to clarify potential alternate conceptions that they (or their students) may have.

Evidence in the unit includes, but is not limited to:

- At the beginning of each lesson, a section called “Alternative Student Conceptions” alerts teachers to ideas that their students may have. Methods to clarify these ideas are provided to teachers.
- Each lesson’s teacher guide provides a section in “Getting Ready: teacher preparation” to link student understanding to scientific terminology. These terms are not shared as a means for front-loading or vocabulary instruction prior to the experience but are organically used within each lesson to support student learning. For example:
 - Lesson 3 explains why it is important to not “name” the little white things or teach the terminology around these yet. It also offers guidance as to what to do if students incorrectly refer to the little white things.
 - Lesson 8a gives an explanation regarding how soil provides for plants as information for teachers in supporting the learning around these ideas, even though they are not target concepts for Grade 2.
- Lesson 4a supports accuracy in data analysis through planting one kernel per container (page 7 Box F).
- Lesson 5 supports accuracy in tracking measurements and scientific observations.
- Lesson 8b supports ideas around seeing patterns, drawing conclusions, and making claims with multiple changes in an experiment. This leads to the idea of looking at one variable change at a time (pages 6–7).
- Lesson 9a introduces the ideas of having a control group in investigations and designing investigations to answer a testable question. **However, these ideas primarily support Grade 3–5-level SEP elements.**

Suggestions for Improvement

None

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II.E. Differentiated Instruction: Provides guidance for teachers to support differentiated instruction by including:

Appropriate reading, writing, listening, and/or speaking alternatives (e.g., translations, picture support, graphic organizers, etc.) for students who are English language learners, have special needs, or read well below the grade level.

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

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.

Rating for Criterion II.E. Differentiated Instruction: Adequate

The reviewers found adequate evidence that the materials provide guidance for teachers to support differentiated instruction. The unit provides a variety of differentiation strategies with examples and guidance for use that support reading, writing, listening, or speaking that are integral to the sense-making. The lessons address the needs of many learners. Extra support (related phenomena, multiple modalities) is provided for students who are struggling to meet performance expectations. [Supports for English Language Learners and those with special needs were not addressed in the materials.](#)

Evidence includes, but not limited to:

- General ideas for how teachers can support differentiated instruction are provided in the Teacher Handbook (pages 33–34).
- In the Unit Front Matter pages 21–22, differentiation options for teachers are addressed.
- The Formative Assessment Guidance section in the Teacher Guide for each lesson provides a section on how to adjust instruction. For example:
 - Lesson 4c page 3 has ideas for students who are not ready to use rulers so can instead use non-standard tools like centimeter cubes.
 - Lesson 5 page 4 provides clarification around modification and accommodations, then offers an example accommodation for learners with the exit ticket responses. It also provides guidance for differentiated exit tickets for students to choose the best way to explain their thinking.
- Differentiation for Struggling Learners:
 - Lesson 1 page 6 box C: “Differentiation” provides an idea for alternatives to drawing the corn using photos to allow students to write descriptions of what they notice.
 - Lesson 2 page 8 box C: “Differentiation” provides an explanation of how to support students who are struggling with understanding patterns, parts, or structures.
 - Lesson 3 page 7 box E offers some differentiation strategies and alternate activities, such as share thinking with partner or small group prior to class discussion, using accountable talk structures to help all students participate, and providing access to the corn parts as a hands-on model.

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- Lesson 4a page 7 box E offers support for the discussion if students don't have the background experience of multiple trials. Page 6 box C offers the option to take pictures of the corn for students to use, rather than have students do their own drawing.
- Lesson 4b page 8 box F provides sentence starters to help activate student thinking and writing.
- Lesson 4c page 7 box D provides guidance to support identification of structures and similarities in structures of the kernel and lima bean.
- Lesson 7 page 9 box C gives guidance for pairing students during the activity to support participation of all learners.
- Enrichment Support:
 - Lesson 2 page 8 box C : "Differentiation" provides ideas for enrichment with learners who may be able to extend the learning to predictions based on their observations.
 - In Lesson 2 (page 9), enrichment ideas are given for students who already know about plant parts and their functions.
 - In Lesson 3 page 8 and Lesson 4a page 6, there is a suggestion that if students mention measuring and recording the lengths of the little white things, it would be appropriate to allow them to start this (even though it is the focus of an upcoming lesson). Recording the data would lead to representing and graphing the data at a later point.
 - Lesson 4b page 9 Box F provides support for individual students writing scientific explanations.
 - Lesson 4c page 8 box G provides an alternate activity suggestion for group posters that display their discoveries.
 - Lesson 7 page 9 box C tells of an extension opportunity to connect back to results from Lessons 3c and 4b and enrichment questions that support "reasoning" in the CER.
- Alternative activities:
 - Lesson 6a offers two examples of alternative activities for learners, changing the structure around the notice/wonder chart discussion and also ideas about following student suggestions to develop additional investigations.
 - In Lesson 6b (page 6), an idea about adding centers and having students work in smaller groups is provided.
 - Lesson 9a offers guidance for the organization of the testable questions and small investigation groups (page 6).

Suggestions for Improvement

Many of the differentiation ideas could also be used with English Language Learners and special needs students. Consider extending the discussion of differentiation ideas to explicitly include these students.

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

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.).

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

Rating for Criterion II.F. Teacher Support for Unit Coherence: Extensive

The reviewers found extensive evidence that the materials support teachers in facilitating coherent student learning experiences over time because student sensemaking and student questions drive the learning over the course of this unit. Students have the opportunity to ask questions about the phenomena, and these questions drive the learning through the unit and into the individual lessons. Students are engaged in meaningful and relevant phenomena with access for learners. Students apply the three dimensions to investigate and explain the phenomena. There is guidance to help students connect phenomena and questions across the lessons.

Evidence includes, but is not limited to:

- G2 Unit Specific Front Matter Section G.9 provides examples of how the experiments, individual writing, and class models build on each other and over the course of the unit.
- Guidance in supporting the tracking of the daily activities is given in the teacher guide for each lesson (example Lesson 3 page 8, box F). “It is recommended that students start keeping track of these activity sheets in a notebook.”
- Discussions at the end of each lesson allow students to ask questions and help determine what needs to be done next. At the end of Lesson 2 (page 8), the teacher is guided to lead a discussion of “What did we find out after we dissected the corn?” and “Do we have any more questions about the corn?”
- The Lesson Level Performance Expectation shows specific elements of the SEP, DCI, and CCC that will be addressed in the lesson. Support is given to the teacher through the lesson to help students progress on the capabilities in the elements of the DCI. Some guidance about students’ progress in the SEPs and CCCs is also given.
- Lesson 4 is divided into three lessons (4a, 4b, 4c). The teacher guide offers insight into how these lessons follow up on the experiments started in the previous lesson. With the results of experiments taking multiple days, the guide offers recommendations for moving onto Lesson 5 during the “experiment” phase (page 2).
- Students return to the phenomenon throughout the unit as they figure out various elements that help to explain the phenomenon. Lesson 5 returns to the anchor phenomenon and engages students in returning to previous observations and comparing them with new evidence (measurements and observations). This guides the teacher on the importance of circling back to the anchor phenomenon throughout the unit.

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- Lesson 6a begins a nine-day investigation of whether plants need light to grow. During this time, teachers are encouraged to move to Lesson 7 and come back to 6b for follow up from the investigation.
- Lesson 7 allows students to consolidate their thinking, reflect on what they have already figured out and what they still need to figure out, and use this evidence to construct an argument.
- Lessons 8a and 8b explore how the environment and changes to the environment can affect plant growth (specifically ideas about water and dirt).
- Lessons 9a, 9b, 9c, and 9d bring all of the student learning experiences together, allowing students to demonstrate their understanding through a culminating investigation process.

Suggestions for Improvement

None

II.G. Scaffolded differentiation over time: 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.

Rating for Criterion II.G. Scaffolded Differentiation Over Time: **Extensive**

The reviewers found extensive evidence that the materials support teachers in helping students engage in the practices as needed and gradually adjust supports over time. Instructional materials create learning experiences targeting students with diverse needs and abilities so they can connect to and make progress over time toward common learning goals of engaging in the practices and making sense of a phenomenon. Supports are provided for all students to engage in the SEPs in ways that not only integrate the other two dimensions, but also explicitly build student understanding and proficiency in the SEPs over the course of the unit.

Evidence includes, but is not limited to:

- G2 Unit Specific Front Matter Section G.7 provides examples of strategies for supporting students and gradually releasing responsibility in writing.
- Lesson 4a page 8 Box G offers support for introducing the investigation plan outline, which will later be used as a writing extension.
- The Investigation Plan Outline scaffolds over the unit. Lesson 4a introduces the planning outline and it is crafted together as a class on an anchor chart. Lesson 6a offers the options to complete as a class or differentiated independently, with a bit more formal informational writing lesson in 6a we. Lesson 8a returns to the outline, offering the option of a shared writing time or independently completing and then extends the outline to writing a more formal informational writing in lesson 8a we. The Investigation Plan Outline gives a scaffold to learners to support them in the development of more formal writings.

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- The Evidence-based Argument outline provides a scaffold to support a writing extension, culminating in the writing of a structured paragraph. This outline is used in Lesson 4b, 6b, and 8b. Notes in the “Formative Assessment Guidance” section of the lessons discuss how to use this scaffold. In Lesson 8b (page 4) this section shares how to support students in moving from the outline to the writing.
- Lessons 9a, 9b, 9c, and 9d demonstrate how students move from class construction of ideas, planning, and arguments to individual or small group construction of ideas, investigations, arguments. The outlines used in previous lessons provide the foundation for students to design, plan, and develop their investigations and communicate their results.

Suggestions for Improvement

None

Overall Category II Score (0, 1, 2, 3): 2

Unit Scoring Guide – Category II

Criteria A-G:

3: At least adequate evidence for all criteria in the category; extensive evidence for at least two criteria

2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A

1: Adequate evidence for at least three criteria in the category

0: Adequate evidence for no more than two criteria in the category

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Category III. Monitoring NGSS Student Progress

Score: 2

Criteria A–F:

3: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion

2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A

1: Adequate evidence for at least three criteria in the category

0: Adequate evidence for no more than two criteria in the category

III.A. Monitoring 3D student performances: 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.

Rating for Criterion III.A. Monitoring 3D Student Performances: Adequate

The reviewers found adequate evidence that the materials elicit direct, observable evidence of students using practices with core ideas and crosscutting concepts to make sense of phenomena or design solutions because students are required to use the core of grade-appropriate SEPs and CCs and some grade-appropriate DCIs in service of sensemaking. Tasks are driven by well-crafted phenomena in order to elicit rich student performances. There are multiple opportunities for students to demonstrate their understanding and ability to use grade-appropriate elements of the SEPs and CCCs. *However, a majority of the tasks involve DCI elements that are below grade level.*

Evidence includes, but is not limited to:

- An overview of the assessment resources (Assessment Opportunities for the 2nd Grade Storyline) provides teachers with information about which dimensions are being assessed and suggestions for additional support if needed.
- Tasks require the use of at least two dimensions, *although the DCI used is often below the Grade 2 level:*
 - In Lesson 2 students collaboratively plan investigations to make sense of if the corn is real or fake and compare previous observations to new observations to determine any changes in the corn.
 - Students complete an Exit Slip at the conclusion of Lesson 4b (page 11). The task asks students to make predictions about the functions of different parts of the kernel. Students are in the process of figuring out that the kernels of corn are actually separate seeds that will eventually make new plants.
 - Students investigate changes in the wet harvest corn through measurements and observation data in Lesson 5. They compare these measurements to previous observations of the corn.
 - In Lesson 6a students begin to ask questions about why different structures in the wet corn are growing in different directions, which leads them to development of a new investigation to see if plants need light to grow.

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- The student activity sheet for Lesson 7 provides an opportunity for students to synthesize what they have figured out and use it as evidence to construct an argument. It allows students to reflect on what they have learned as well as the wonderings they have not yet figured out.
- Lesson 8 brings in the opportunity for students to investigate the environment in which plants grow and how changes in that environment affect plant growth (Grade 2 DCI). Students draw diagrams of the investigation plan and make predictions about what will happen in each of the containers.
- Lesson 9a, 9b, 9c, and 9d bring all the experiences of the unit together and give the students the opportunity to demonstrate their performance in all three dimensions through the design and carrying out of investigations, using evidence to construct a claim and argument around their question, and then presenting these investigations and arguments to the class. This offers a culminating perspective on all the practices from the unit, as well as using the CCCs to think about their DCI questions (Grade 2 DCI).

Suggestions for Improvement

Consider expanding the use of Grade 2 DCIs in the unit to provide students with more opportunities to produce grade-appropriate three-dimensional artifacts.

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

Rating for Criterion III.B. Formative: Extensive

The reviewers found extensive evidence that the materials embed formative assessment processes throughout that evaluate student learning and inform instruction. Materials include many regular opportunities for formative assessment that are called out explicitly. These opportunities occur multiple times within each lesson, and each is accompanied by clear guidance for how to interpret a range of student responses and change instruction based on varied student responses. Formative assessments take varied forms and are frequently built directly into instructional sequences. Formative assessments are tied to all three dimensions, and clearly build from student engagement with the dimensions. This includes a wide variety of assessment types to elicit and respond to student thinking. **However, there are limited opportunities to use formative assessment with Grade 2-level DCIs.**

Evidence includes, but is not limited to:

- An overview of the formative assessment resources is found at the beginning of each lesson. The information is also repeated on pages 1–18 in the document called Assessment Opportunities. This document identifies the places in the lessons where formative assessment occurs, the three dimensions used in the assessment, ideas to support the teacher analysis of assessment

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responses, and suggestions if students need more support. An example is the formative assessment described on pages 11–12. Students use their understanding of the parts of plants (Grade 1 DCI) to carry out an investigation in which they observe and measure sprouting seeds (SEP) and compare their data to previously collected data to determine what changes have occurred (CCC). Information to teachers includes guidance for students struggling with measurement and accommodations for the exit ticket including using pictures, acting out with gestures, and giving an oral answer.

- Formative Assessment Opportunities boxes are present throughout each lesson’s teacher guide. For example:
 - In Lesson 1, the section called “What to look for” shares examples of what students should notice and wonder about such as parts of the corn, functions of those parts, and characteristics of the parts.
 - Guidance for feedback and assessing exit slips is provided in Lesson 3 page 8. “When assessing exit slips, look for: new learning that has occurred or how their learning has changed. Provide feedback through questioning (verbal/written) to elicit more information or to clarify certain responses.”
 - Lesson 4b includes an exit slip. “What could the function of the kernels be and why? What could the function of the cob be and why?”
 - Guidance for understanding students’ thinking about seeds from the exit slip formative assessment is provided in Lesson 4c page 9. Teachers are supported to provide an alternate instructional sequence based on student responses. “Use this slip to understand what students are thinking about seeds...If details from students’ exit slips are limited, the teacher may want to implement a lesson or review (before the next lesson) the structure of a seed.”
 - A formative assessment in Lesson 5 page 8 is designed to determine students’ measurement skills. If the teacher determines that students are lacking these skills, guidance is given to use small group instruction. “Teacher may need to pull small groups to model and reteach measuring to the nearest cm.”
 - Lesson 6a, page 11 gives questions to pose to understand if students are making adequate progress in figuring out if plants need light to grow.
 - In Lesson 7, page 11 students are asked to complete this statement, “I used to think...but now I know...” Students reflect on how their thinking has changed since Lesson 1.
 - The exit slip for Lesson 8a, page 9 asks students to draw or show their thinking “In order to grow well, I think plants need...” They are challenged to use labels to describe the function of the plant parts shown.
 - Lesson 8b uses “agree & disagree statements” as the exit slip.
 - Students participate in Agreement Circles in Lesson 9b page 6. “Students move to true or false half of a circle as they listen to each ‘conceptually challenging’ statement the teacher reads. Students may change their mind but must offer a reason.”

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Suggestions for Improvement

Consider expanding the use of Grade 2 DCIs in the unit to provide teachers with more opportunities to formatively assess students on grade-appropriate DCIs.

III.C. Scoring guidance: 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.

Rating for Criterion III.C. Scoring Guidance: **Inadequate**

The reviewers found inadequate evidence that aligned rubrics and scoring guidelines help the teacher interpret student performance for all three dimensions. For the summative task, a rubric is provided for teachers to interpret student progress. The rubric identifies what evidence to look for in the student use of the SEP and CCC elements. However, the rubric identifies the categories of “Met” and “Not Yet Met” without interpretive support. Examples of student responses are not included in the rubric for the Discovery Report to give teachers ideas about what responses in each of these categories would look like. Although the SEPs and CCCs are addressed in the scoring guidance, there is no scoring guidance for the DCIs. Scoring guidance is not provided for exit slips and other major formative assessment opportunities.

Evidence includes, but is not limited to:

- In Lesson 9, students complete a Discovery Report. The rubrics (one for Teachers and one for the Students) provide a picture of what students should be able to do during these culminating lessons with respect to the SEPs and CCCs. The teacher form of this rubric has teachers determine whether the student has met or not yet met certain elements of the SEPs and CCCs. The DCIs are not addressed in the rubric. There are no student examples to help teachers determine what “met” and “not yet met” look like in the work of Grade 2 students.
- Although there are no scoring guides for important formative assessments, there is information given to teachers about using the results of formative assessment to plan future lessons and to provide feedback to students.

Suggestions for Improvement

- Consider providing examples of student work so that teachers are more informed about evaluating student work.
- Consider including assessment of the DCIs in the final scoring rubric.

III.D. Unbiased tasks/items: Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.

Rating for Criterion III.D. Unbiased Task/Items: **Adequate**

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The reviewers found adequate evidence that the materials assess student proficiency using accessible and unbiased methods, vocabulary, representations, and examples because the materials are developmentally appropriate and offer a variety of access points for students to demonstrate thinking and share ideas. Representations or scenarios are culturally neutral and provide potential scaffolds to make sure that students have the background they need to be successful with the task.

Evidence includes, but is not limited to:

- Text and vocabulary are grade level appropriate. For example:
 - The Agree-Disagree Statements activity associated with Lesson 8b uses vocabulary that has been emphasized in the unit and the text is grade level appropriate. “Plants need water to grow.”
 - The unit does not include a grade level informational text selection that can be used to integrate these science lessons with Grade 2 ELA activities.
- Activities in the unit allow students to express their thinking in a variety of ways. For example:
 - Lessons 1 and 2 offer methods for students to represent the corn in a variety of ways, including drawing, photos, pictures, and writing and recording observations.
 - In Lesson 4a, students communicate how they designed their experiment to investigate where the little white things are coming from using models, drawings, and writing.
- At places in the unit, students’ background knowledge is tapped and supports are provided for students who lack that background. For example:
 - In Lesson 4c, students view a video of the growth of a seed and then discuss what they have seen. “Some students may not understand what a **structure** is so be sure to give examples using pictures as well as an explanation. This will help students make connections to their learning...Ask students about what they know about seeds and help them generate more questions about seeds.”
 - In Lesson 7, students and the teacher construct an anchor chart to capture ideas about how they could use representations learned in mathematics class to represent their measurement data.
 - Lessons 9 provides a realistic way for students to employ the practices of scientists. Access to the activity is available to all students with scaffolds in place as needed. Students have some choice in performing this summative task.

Suggestions for Improvement

- Consider adding a grade level reading selection that integrates into the Grade 2 ELA curriculum.
- Consider including clear pathways in the teacher guide for each lesson for students to make connections to their lives beyond the classroom.

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III.E. Coherent Assessment system: Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.

Rating for Criterion III.E. Coherent Assessment System: Extensive

The reviewers found extensive evidence that the materials include pre-, formative, summative, and self-assessment measures that assess three-dimensional learning. Materials include assessments that are consistently designed to connect to learning goals and require students to apply appropriate elements of the three dimensions to make sense of the phenomenon. Most or all tasks and items are multi-dimensional and contain significant tasks, and the measurement of the three dimensions proportionally matches up with the learning goals. Materials use a variety of measures and provide multiple assessment opportunities so that students can demonstrate their understanding of the same learning goals in a variety of ways. All four of the assessment types mentioned in the criterion are present.

Evidence includes, but is not limited to:

- The Teacher Handbook (pages 7–8) outlines the assessment opportunities used in the unit.
- Assessment Opportunities in G2 Plant Growth Unit document provides a quick look at the assessment resources in the unit and what to look for in their assessments and conversations.
- The materials offer two types of pre-assessments. One is to use the activities in the first lessons to assess students' level of understanding. A second idea is to use the pre-post assessment, with the warning that using this may take some of the wonder out of the first few lessons and may drive student questions in a certain direction (Assessment Opportunities, page 2).
- Formative assessments such as exit tickets are used in multiple lessons: 2, 3, 4b, 4c, 5, and 7. Most are two- or three-dimensional and reflect the development of important aspects of more than one dimension, *although the DCI is often used below the Grade 2 level*. These assessments allow students to express their understanding in a variety of ways (see also the evidence for III B). For example:
 - The formative assessment in Lesson 5 on Measurement and Prediction allows teachers to gain an understanding of students' individual skills with measuring and a sense of whether the student understands what structures in the plant should show evidence of growth over time.
 - Lesson 8b gives students the opportunity to share their thinking through agree/disagree statements and explain their thinking.
- A summative assessment with scoring guidance is provided. The summative assessment is the sequence of activities in Lessons 9a, 9b, 9c, and 9d. A guide for teachers is provided, showing where to look for evidence of student use of elements of the SEPs and CCCs. This assessment also has a student self-assessment rubric.
- A Student Self-Check is included in the Assessment folder and can be used anywhere in the unit to have students reflect on their learning.

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Suggestions for Improvement

Consider expanding the use of Grade 2 DCIs in the unit to provide students with more grade-appropriate three-dimensional assessment opportunities.

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

Rating for Criterion III.F. Opportunity to learn: **Adequate**

The reviewers found adequate evidence that the materials provide multiple opportunities for students to demonstrate performance of practices connected with their understanding of core ideas and crosscutting concepts. There are multiple student performances that provide students opportunities to demonstrate understanding, and teachers are engaged in feedback to support new student learning. **However, the feedback loop most generally focused on the teacher-student feedback and not peer-peer feedback.**

Evidence includes, but is not limited to:

- One major learning goal is to answer the question of whether the corn is real or fake. Students have several opportunities through the lesson to develop and revise an answer to this question.
 - In Lesson 1 students record observations through notice/wonder structure. They share their ideas about the harvest corn and whether it is real or fake. They make predictions about what might happen to the wet corn. The teacher provides feedback to student ideas during class discussions.
 - In Lesson 2 students collaboratively plan investigations to develop evidence to determine if the corn is real or fake. Students “complete an exit slip that asks ‘Do you think the corn is from a real plant or not? Explain your thinking with at least 2 reasons.’ Teachers are guided to “Keep a clipboard handy while assessing exit slips or dialogue during Scientist Meeting as an effective way to document and comment on student growth.”
 - Students complete an exit slip at the end of Lesson 3 to document their ideas about what they think caused the corn to change. Feedback ideas are provided to the teachers. “When assessing exit slips, look for: new learning that has occurred or how their learning has changed. Provide feedback through questioning (verbal/written) to elicit more information or to clarify certain responses.”
 - In the three parts of Lesson 4 students use prior observations and evidence to support the need for further investigation of where the little white things are coming from. Guidance for teacher feedback is provided in Lesson 4b page 11 and Lesson 4c page 9.
- Another major learning goal is to determine what plants need to grow.
 - In Lesson 6a students begin to ask questions about why different structures in the wet corn are growing in different directions, which leads them to development of a new

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investigation to see if plants need light to grow. Feedback guidance is given on pages 6 and 11.

- Lesson 7 provides an opportunity for students to synthesize what they have figured out and use it as evidence to construct an argument. It allows students to reflect on what they have learned as well as the wonderings they still have not figured out yet.
- Lessons 8a and 8b bring in the opportunity for students to investigate the environment in which plants grow and how changes in that environment affect plant growth. Teacher feedback helps students begin to design their investigation plan (Lesson 8a, page 9). In Lesson 8b page 7, students present ideas and teacher-student discussions as well as student-student discussion help to build an understanding.
- Lessons 9a, b, c, and d bring all the experiences of the unit together and give the students the opportunity to demonstrate their performance in all three dimensions through the design and carrying out of investigations, using evidence to construct a claim and argument around their question, and then presenting these investigations and arguments to the class. This offers a culminating perspective on all the practices from the unit, as well as using the CCCs to think about their DCI questions.
- Teacher feedback is provided and students can use this feedback to construct or revise their understanding. For example:
 - Teacher support for providing feedback is outlined in the Formative Assessment Guidance document at the beginning of each lesson.
 - The Student Activity Sheet associated with Lesson 7 asks students to answer, “I used to think _____, but now I know _____, because: _____.” Teacher feedback is guided by this suggestion: “Student responses on this will allow you to determine any students who don’t think the harvest corn was alive or that the harvest corn. Bring students into the whole class conversation on day 2, to have them work with the claims that the class agrees on - that the harvest corn is living, and that it is producing many plants. Watch for shifts in student thinking, have them restate those claims and the evidence that their peers shared for these claims. Then look again for a shift in their thinking in their responses to the exit ticket. You may want to recollect Lesson 7 Student Activity sheets at the end of day 2 to make this comparison.”
 - In Lesson 8a, students gather at the beginning of the lesson to discuss their investigation. Teachers are given advice on providing feedback and adjusting instruction. “It may be challenging for students to recall the link between the dry and wet bean seeds and the fact that plants need water to grow. You may need to walk students through the process of the bean seed investigation to help recreate that logic” (page 5).

Suggestions for Improvement

The focus of feedback in the unit is currently on the feedback from the teacher to the student. Consider including opportunities for the students to develop and use the skills needed to conduct peer review. Simple protocols for peer feedback can be learned and conducted by Grade 2 students.

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Overall Category III Score (0, 1, 2, 3): 2

Unit Scoring Guide – Category III
Criteria A–F: 3: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion 2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A 1: Adequate evidence for at least three criteria in the category 0: Adequate evidence for no more than two criteria in the category

Overall Score

Category I: NGSS 3D Design Score (0, 1, 2, 3): 3

Category II: NGSS Instructional Supports Score (0, 1, 2, 3): 2

Category III: Monitoring NGSS Student Progress Score (0, 1, 2, 3): 2

Total Score: 7

Overall Score (E, E/I, R, N): E/I

Scoring Guides for Each Category
Unit Scoring Guide Category I (Criteria A–F): 3: At least adequate evidence for all of the unit criteria in the category; extensive evidence for criteria A–C 2: At least some evidence for all unit criteria in Category I (A–F); adequate evidence for criteria A–C 1: Adequate evidence for some criteria in Category I, but inadequate/no evidence for at least one criterion A–C 0: Inadequate (or no) evidence to meet any criteria in Category I (A–F) Category II (Criteria A–G): 3: At least adequate evidence for all criteria in the category; extensive evidence for at least two criteria 2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A 1: Adequate evidence for at least three criteria in the category 0: Adequate evidence for no more than two criteria in the category Category III (Criteria A–F): 3: At least adequate evidence for all criteria in the category; extensive evidence for at least one criterion 2: Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A 1: Adequate evidence for at least three criteria in the category 0: Adequate evidence for no more than two criteria in the category

Overall Scoring Guide
<p>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)</p> <p>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)</p> <p>R: Revision needed—Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5)</p> <p>N: Not ready to review—Not designed for the NGSS; does not meet criteria (total 0–2)</p>