How Do Living Things Heal?

DEVELOPER: OpenSciEd

GRADE: 6-8 **| DATE OF REVIEW:** January 2022

Educators Evaluating Quality Instructional Products

NextGen Science WestEd

How Do Living Things Heal?

EQuIP RUBRIC FOR SCIENCE EVALUATION

OVERALL RATING: E
TOTAL SCORE: 8

CATEGORY I: NGSS 3D Design Score	CATEGORY II: NGSS Instructional Supports Score	CATEGORY III: Monitoring NGSS Student Progress Score
2	3	3

Click here to see the scoring guidelines.

This review was conducted by the Science Peer Review Panel using the EQuIP 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	Extensive	**A.**	Monitoring 3D Student Performances	Extensive
B.	Three Dimensions	Adequate	**B.**	Student Ideas	Extensive	**B.**	Formative	Extensive
C.	Integrating the Three Dimensions	Extensive	**C.**	Building Progressions	Extensive	**C.**	Scoring Guidance	Adequate
D.	Unit Coherence	Extensive	**D.**	Scientific Accuracy	Extensive	**D.**	Unbiased Tasks/Items	Extensive
E.	Multiple Science Domains	Extensive	**E.**	Differentiated Instruction	Extensive	**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	Adequate			

Summary Comments

Thank you for your commitment to students and their science education. NextGenScience is glad to partner with you in this continuous improvement process. It is obvious that this unit was thoughtfully crafted, and it has many strengths including:

- **Phenomena and Three-Dimensional Learning:** Throughout the unit, lessons are focused on students engaging with all three dimensions while making sense of phenomena. The phenomena used are interesting for students and motivate sense-making and learning. All lessons are focused around making sense of phenomena and link back to the anchoring phenomenon of the healing foot.
- **Three-Dimensional Assessments:** Assessment opportunity boxes throughout the unit provide teachers with a three-dimensional learning target, what to look for in student performances in all three dimensions, and what to do if students are not meeting the learning targets. These supports are very well written and very supportive for teachers in assessing student learning.
- **Unit Coherence:** The unit has a strong emphasis on coherence and linking ideas, learning, and phenomena from different lessons. The teacher supports for unit coherence are very useful (e.g., Progress Tracker, DQB, Our Body as a System Poster, etc.) and allow students to see their learning progress throughout the unit and help them make sense of the anchoring phenomenon.
- **Equity:** There is a very clear and deliberate attention to equity and inclusion throughout the unit. The Teacher Guide introduction material, the call-out boxes on "Equity and Inclusion", and many of the teacher notes emphasize the need to ensure all student voices are heard and all students have access to learning. The final project furthers this focus on inclusion by helping students see changes in perspective over time concerning disabilities and having students design projects to improve accessibility.

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

- There's currently somewhat of a mismatch between student activities in the lessons and the claimed elements in the "Elements of the SEPs and CCCs" document. Consider ensuring the claimed elements for each lesson match the learning students are engaged in, especially for some elements of the SEPs and CCCs mentioned in Criterion I.B.
- Some focal SEPs are not as well developed as others and students only use or develop these elements once or twice during the unit. Consider providing a clear progression of student learning throughout the unit for all focal SEPs in order to support teachers and students in seeing how their learning and use of the SEPs develops over time.
- More opportunities for multiple modalities in assessment prompts and options for student responses would improve the unit, as well as opportunities for student choice in modalities for assessments.
- More formal support and guidance for providing actionable, specific, individual feedback for students and revision of explanations/models based on that feedback would be very valuable. Also, additional opportunities and guidance for students to self-assess and, reflect on their learning throughout the unit would be helpful.

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 doesn't support a claim that the criterion was met. The purple text in these review reports is written directly related to criteria and is meant to point out details that could be possible areas where there is room for improvement. Not all purple text lowers a score; much of it is too minor to affect the score. For example, even criteria rated as Extensive could

have purple text that is meant to be helpful for continuous improvement processes. In these cases, the criterion WAS met. The purple text is simply not part of the argument for that Extensive rating.

All page numbers referenced in this report refer to the Teacher Edition document unless noted otherwise.

CATEGORY I

NGSS 3D DESIGN

I.A. EXPLAINING PHENOMENA/DESIGNING SOLUTIONS

I.B. THREE DIMENSIONS

I.C. INTEGRATING THE THREE DIMENSIONS

I.D. UNIT COHERENCE

I.E. MULTIPLE SCIENCE DOMAINS

I.F. MATH AND ELA

I.A. EXPLAINING PHENOMENA/DESIGNING SOLUTIONS

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

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

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

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

Rating for Criterion I.A. Explaining Phenomena/Designing Solutions	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that learning is driven by students making sense of phenomena and/or designing solutions to a problem because each lesson in the unit is focused on students figuring out the anchoring phenomenon of how an injured foot heals. Student questions and experiences about healing motivate sense-making and learning throughout the unit.

The focus of the unit is to support students in making sense of how an injured foot can heal and the lessons regularly revisit the phenomenon to add layers of explanation based on learning. For example:

- Lesson 1: Students construct an initial model to explain "What happens during the healing process so the student was able to use his foot again to walk, run, jump, and dance?" (page 40).
- Lesson 2: Students examine a related phenomenon and connect their learning to the unit phenomenon: "Conduct a brief discussion comparing what we're seeing on the chicken wing to the human body, relating and pointing to different structures of your arm that correspond to the chicken wing" (page 68).
- Lesson 7: "Revisit How Does a Foot Heal? poster to help us connect our work in the unit back to the anchoring phenomenon. Display slide A. Say, Last time we used a microscope to investigate skin, bone, and muscle tissue and so far we have figured out a lot about the parts that make up a foot and how they interact and work together. But we still have more to figure out about how the foot healed from the injury. Let's begin by taking stock of what we have figured out about the healed foot" (page 155).
- Lesson 12: "Reflect on our recent work. Display slide A. Ask, Okay, let's go back to the case from Lesson 1 and see what we can now explain. Before we do, let's take stock of the key science ideas we've figured out about cells that can help us explain how living things heal?... Say, We have figured out so much. Let's start today by revisiting our timeline that is part of the 'How Does the Foot Heal' poster of the foot injury to see which events in the healing process we can explain now. Revisit the Healing Timeline from Lesson 1 to decide which events we can now explain. Direct the class' attention to the Healing Timeline. Point to each event on the timeline and ask the class to show you a thumb up for yes or a thumb down for no while you ask, Do you think we can explain how healing happened around this event?" (page 251).

- Lesson 12: "Connect to our related phenomena. Once everyone has finished How do the systems in the body interact during the healing process?, propose using what we've figured out about healing to explain some of our related phenomena…Now that we were able to explain how healing happens, let's see if we can go back to our list of related phenomena and see if we think we can explain the healing that happens in other body parts or other living things" (page 258).

Student questions and prior experiences related to the phenomenon of a healing foot motivate sense-making and student learning.

- Lesson 1: Students develop a Driving Question Board (DQB) as a class and organize the students' questions about the healing foot into categories. These questions are revisited regularly throughout the lessons to answer figure out the healing foot process. A few of the examples are shown below:
    - Lesson 1: "I had lots of questions as well. Let's take a look at some of the notes his doctor took along the way. We are going to notice and wonder about several time points, including when the patient was injured and during the student's recovery. Once we have all had a chance to record our noticings and wonderings, we will share our ideas as a class" (page 33).
    - Lesson 4: "revisit the DQB and identify questions the class can now answer about blood. (Lesson 5 includes more specific directions about how the class could document their answers.) However, it is more likely that students have additional questions to add to the DQB from their reading today or considerations about how blood and healing are related. Take time to add these questions now" (page 133).
    - Lesson 5: "Point to the DQB and How Does the Foot Heal Over Time? poster displayed in the classroom. Ask students to review any ideas developed, or questions generated related to feeling, or lack of feeling in the foot from the DQB and How Does the Foot Heal Over Time? poster. Use the prompts and responses below to return to the DQB and How Does the Foot Heal Over Time? poster to begin thinking about how nerves might be involved in the injury and healing" (page 139).
    - Lesson 7: "Distribute to each student a copy of DQB Questions or Parts of Questions We Have Answered and a digital copy of the questions from the Driving Question Board using the record you made at the end of Lesson 1. Using the instructions on DQB Questions or Parts of Questions We Have Answered, tell students to read through the questions and identify which ones can be answered now and which ones we still need to make progress on" (page 182).
    - Lesson 13: "Briefly take stock of the DQB to see what category(ies) we still need to make progress on. Display slide I. Have the students do a quick standing Scientists Circle around the DQB so that they can see the categories of questions…We have made a lot of progress over the course of our unit figuring out a lot about our Driving Question, How does our body heal?. But there are still groups of questions we have yet to figure out. What are some of these that you see?" (page 271).
- Lesson 1: Students create an "Ideas for Investigations" chart that records student ideas for what they need to figure out to fully understand the healing foot phenomenon. This chart is not mentioned again in other lessons in the Teacher Edition. Although the materials may implicitly have the intention that this chart is revisited along with the DQB in other lessons, this is not made clear in the instructions. "Now that the class has created a DQB, tell students that it is time to really dig into the hard work of figuring out what is going on! Ask students, What kind of information or data will we need to be able to figure out what is going on inside our

body when: it is performing a specific function, when it is injured, and as it heals? Give students about 5 minutes to individually record in their notebooks some ideas for future investigations or data we need. As students are doing this, create a new poster titled 'Ideas for Investigations and Data We Need.' Put this right next to the DQB. Tell students that you are going to record their ideas and that you want everyone's ideas to be represented. Have students turn and talk about their ideas before sharing out with the whole group" (page 58).

- Lesson 5: "As students share how they might investigate nerves, encourage them to also share questions they have about nerves. After a student shares their question, prompt them to record the question on a sticky note and add it to the DQB. Guide students to place their new questions together and ask a student volunteer to label this cluster of new questions with the term 'Nerves'. Use those questions to help students think about additional ways they might investigate their questions" (page 141).
- Lesson 8: "Share new questions we now have about healing. Display slide I. Say, Are there any new questions that you have about the healing process in humans or other living things? Have a set of sticky notes and markers situated next to or near the DQB. Ask for volunteers to share their questions. After a student shares a question, ask them to write it on a sticky note with a marker and add it to the DQB" (page 195).

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. i. Provides opportunities to *develop and use* specific elements of the SEP(s). ii. Provides opportunities to *develop and use* specific elements of the DCI(s). iii. Provides opportunities to *develop and use* specific elements of the CCC(s).	
Rating for Criterion I.B. Three Dimensions	Adequate *(None, Inadequate, Adequate, Extensive)*

The reviewers found adequate evidence that the materials give students opportunities to build understanding of grade-appropriate elements of the three dimensions because students engage with middle school elements of the three dimensions in each lesson of the unit while making sense of the healing foot phenomenon. While students are regularly engaging with these elements throughout the unit, there is some mismatch between elements of the three dimensions claimed and the student activities in a few of the lessons.

Science and Engineering Practices (SEPs) | **Rating: Adequate**

The reviewers found adequate evidence that students have the opportunity to use or develop the SEPs in this unit because students regularly develop and use grade appropriate SEP elements to make sense of phenomena throughout the lessons. There is a reasonable match between SEPs claimed in the

"Elements of SEPs and CCCs" document and the activities students engage with. However, some elements claimed for lessons did not align with student activities.

Asking Questions and Defining Problems

- *Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.*
    - Lesson 1: Students ask questions about the foot healing phenomenon from the case study after observing a doctor's report to clarify and seek additional information on how the body heals itself. "Then pass out 3-4 sticky notes and a marker to each student. Ask students to write at least three questions, one per sticky note, about healing and at least one about other related phenomena. They should write their questions big and bold--we want to be able to see the questions clearly" (page 56).
    - Lesson 1: As a class, the students develop a DQB concerning how the foot was able to heal. This DQB is referred back to in later lessons. "Instruct students to share their questions, one by one, with the whole group. Explain to students how you will create the DQB: The first student reads their question aloud to the class then posts it on the DQB. Students who are listening should raise their hand if one of their questions relates to the question that was just read aloud. The first student selects the next student whose hand is raised. The second student reads their question, says why or how it relates, and posts it near the question it most relates to on the DQB. That student selects the next student, who may have a related question or a new question. We will continue until everyone has at least one question on the DQB" (page 57).
    - Lesson 2: "Brainstorm how we could try the dissection again to see how an injured chicken wing functions. Display slide I. Ask students, Okay, so now we have some data from the investigation we did in our last class about how muscles and bones work together for a limb or extremity (like the chicken wing or human foot) to move. In Lesson 1, the parts of the person's foot were injured and needed to heal before he could walk again. How could we revise the chicken wing dissection to figure out more about how the injury affected the different parts of the foot and prevented him from being able to walk?" (page 76).
    - Lesson 4: "Revisit the Driving Question Board. Display slide DD. If time allows, revisit the DQB and identify questions the class can now answer about blood. (Lesson 5 includes more specific directions about how the class could document their answers.) However, it is more likely that students have additional questions to add to the DQB from their reading today or considerations about how blood and healing are related. Take time to add these questions now. ALTERNATE ACTIVITY If your class has a lot of questions about blood that are answered in this lesson, consider recording all the Driving Question Board questions and sending them home with students. Have students highlight questions they think they have made progress on and pick one or two to answer as home learning" (page 133).

- *Define a design problem that can be solved through the development of an object, tool, process, or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.*
    - Lesson 14: Students define a design problem to make their school more accessible for someone. Criteria and constraints are not discussed or scientific knowledge that may limit solutions. "Display slide Q. Say, You will work with your small group on this challenge. One person in your small group should record your group's ideas so that you

will have them ready to share. As you work with your small group, think about: What areas of our school would need to be redesigned so she could have access? What are some initial brainstorm ideas for how you could redesign this area? How would the ideas you brainstormed lead to more accessibility for Sinéad?... Display slide Q. Say, You will work with your small group on this challenge. One person in your small group should record your group's ideas so that you will have them ready to share. As you work with your small group, think about: What areas of our school would need to be redesigned so she could have access? What are some initial brainstorm ideas for how you could redesign this area? How would the ideas you brainstormed lead to more accessibility for Sinéad?... Were there any redesigns or adaptations that your group brainstormed that you think would help all four of these people have better access to areas around our school?" (pages 294–295).

Developing and Using Models

- *Develop and/or use a model to predict and/or describe phenomena.*
    - Lesson 1: "Develop an initial model to explain, 'What happens during the healing process so the student was able to use his foot again to walk, run, jump, and dance?' You can use words, pictures, symbols, and/or close-ups to represent the relevant parts and interactions that occur in the injured foot and healed foot. Be sure to capture what you think is happening within the body that helps the foot heal over time. a. Begin to develop your model by adding the parts of the foot impacted by the injury to each foot. Show how these parts would be different in the injured and healed foot. b. Now go back and add to your model to explain what you think happened in the body between the time the foot was injured and when it healed (as represented with the arrow)" (6.6 Lesson 1 Handout – Healing Initial Model).
    - Lesson 7: "Building towards: 7.B Develop a model at a zoomed in scale to describe what happens to the structure and function of skin cells at the time of injury…Now we need to begin to shift and make sense of what happens at the cell level for the body to heal from an injury. At this point in the unit, this assessment is formative in the sense that students should include cells in their models, specifically the type of cell that corresponds to the body part they chose to model in their notebook. They should also include how the injured part results in a change in function of the foot. Students may represent the injured part at the cellular level in many different ways such as: Cells damaged or missing; Cells pushed apart but not broken" (page 182).
    - Lesson 8: "Say, Let's see if we can capture these ideas of what is happening with the cells as the skin heals in a model. In your notebook you are going to be given about 5 minutes to develop a model that represents what you think is happening at the site of injury in the time-lapse so that the gap in the skin where the scrape occurred was filled, or healed over time. As you develop your model, use what we have figured out about the different parts, or structures of our body, what these different structures do and how the different structures interact with other systems in our body, to show what parts are involved in this process of closing the gap from the scrape. Include these structures as part of your model" (page 190).
    - Lesson 12: Students use the models they have developed throughout the unit to apply their understanding of how an injury heals to other organisms: "At this point in the unit students have figured out a lot about how the body heals from an injury all the way down to the cellular level. Now they are being asked to think about whether these processes could be the same for a lizard or sea star who is injured and loses an

appendage…Look for students to begin applying the conceptual model they have developed in this unit to the last question on the handout by explaining they would want to know if the lizard and sea star also have cells and have similar systems we have that can bring nutrients to the cells so that the injury can heal" (page 259).

Obtaining, Evaluating, and Communicating Information

- *Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s).*
    - Lesson 1: Students look at handouts with doctor's notes about the case study to obtain technical information and describe patterns about the foot healing. However, the text students read is not considered scientific text adapted for classroom use, but rather an informational text where students can gather information from reputable sources. These types of texts align better with the Grade 3–5 element "*Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.*"
    - Lesson 3: This element is claimed for lesson 3. Students observe different types of medical images of different parts of the body and look for patterns, similarities, and differences. However, students do not read scientific texts adapted for classroom use in this lesson.
    - Lesson 4: Students read text about blood in order to obtain information about how blood tissue functions in the body. However, this is informational text rather than a scientific text adapted for classroom use. "Remember as you read this article to keep our questions in mind: What are all those parts of the mixture doing for the body? Why is blood so important that it goes everywhere? Underline or highlight key ideas in the text that help you answer these questions about the components of the blood and their functions. Also jot down any questions that come up during your reading. If we don't get them answered today, we can add them to our Driving Question Board." (page 127).
    - Lesson 5: In this lesson students read an informational text about the nervous system order to obtain scientific information about the natural world. However, this is informational text rather than a scientific text adapted for classroom use. "Read about the structure and function of nerves. Distribute Reading: The Body's Nervous System (printed for students so they can mark up the text), or alternately direct students to The Body's Nerves in their student edition book. Ask, What are we trying to figure out from the information we get from this reading? Look for students to say that we are trying to figure out what nerves do and why they are in different parts of the body. Students might also say that we are trying to figure out more about the structure of nerve cells and how this is connected to what nerves do in our body, or what their function is. Remind students to follow the strategies outlined in Obtaining Information from Scientific Text, since they will be asked to share where they found the information used to support their thinking. Also, remind them that they can refer to the observations documented on their handout as they read" (page 147).
- *Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.*

- This element is claimed for Lesson 5. Students read an article about the nervous system and view microscope images of nerve tissue but do not assess the credibility, accuracy, and bias of the publication.

Planning and Carrying Out Investigations

- *Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.*
  - Lesson 2: In this lesson students watch (or participate in) a dissection of a chicken wing to make observations on how the human foot might work inside and what parts of the foot would need to heal to gain functionality. "If we were to use a chicken wing to try to figure out how these parts work together, how might this help us eventually figure out how our foot works? …Conduct a brief discussion comparing what we're seeing on the chicken wing to the human body, relating and pointing to different structures of your arm that correspond to the chicken wing…. Tell students to record the timestamp of the video in case they want to watch it again, and then give students more time as needed to record their thoughts. Additionally, there is some guidance in the video, but you may need to note with your students that the researcher is alternately pulling on the bicep muscle and then pulling on the tricep muscle" (page 68–69).
- *Collect data to produce data to serve as the basis for evidence to answer scientific questions or test design solutions under a range of conditions.*
  - Lesson 4: "Okay, so when we are using the microscopes to observe human blood samples and when we are using images to observe animal blood, we want to collect data about what we see. We are trying to answer our question about what is in the blood. What kinds of information should we take note of so we can use this data--our observations--to figure out what's in the blood? How should we record this data? … Summarize by saying something like, Okay, so we want to draw what we can see because that will help us communicate about the sizes and shapes of what we're seeing. In addition, we may need to use some words and numbers to describe what we are seeing in our sketches" (page 121).
  - Lesson 7: Students plan an investigation to collect evidence to support what things are made of cells. "Explain the rest of Part 1 of the assessment. Say, Now that you have some things listed that you think might be made of cells, record how you would collect the data that could be used as evidence for whether all things are made of cells. Begin by making a claim about whether you think other things are made of cells. Then choose one of the things you brainstormed and recorded as having cells and use the prompts in the next question to help you record a plan about how you would investigate whether the thing you listed is made of cells. Give everyone about five minutes to record how they would design this investigation" (page 178).
- *Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.*
  - Lesson 10: "Display slide E. Have students turn and talk with a partner about these questions. So, if bacteria are alive, how could we get evidence to convince us that these single-celled bacteria need nutrients to grow and make more cells? After a minute or two of partner talk, ask students to share their ideas…Consider how we could test E. coli. Say something like, Some of you suggested investigating whether bacteria made more cells with more food. So, we need a way to give the bacteria food,

but in a way where we can control the amount they get and that it's all the same kind of food, or nutrients, so it's a fair test, right?... Consider the controls needed in this investigation. Use prompts such as the following to help students consider the independent, dependent, and controlled variables for our investigation of bacteria on agar plates with different amounts of nutrient agar. So if we want to test what happens to the bacteria growth on different amounts of agar, what would be our independent variable? What would we be changing? What would be our dependent variable? What would we be observing or measuring? What control variables would we need to keep the same to make sure that our investigation is fair? Why is it important to do that, to control the other variables?" (pages 217–219).

Analyzing and Interpreting Data

- *Analyze and interpret data to provide evidence for phenomena.*
    - Lesson 2: "Make sense of how the chicken wing relates to the human foot by mapping the different parts. Say, We figured out a lot about how the parts of the chicken wing work together for the wing to move, but a chicken wing isn't a human foot. How can we use what we observed to figure out more about how the human foot works? Using a mapping tool, let's think through how this could help us. Hand out a copy of Mapping the Chicken Wing to the Human Foot to each student. Display slide H. Facilitate a discussion to decide how to map the different parts of the chicken wing to the human foot" (page 70). Students use a data table and their observations of a chicken wing dissection to determine what parts (e.g., skin, bone, muscle, nerve, etc.) would be injured in the healing human foot.
    - Lesson 6: "Okay, so you see that the data table on your handout has space to record the magnification that you can find the best view - that means you're at a high enough magnification to closely see the structures that make up this tissue and you're able to focus clearly on them. We'll be comparing our data later. Why will it be important for you to record the magnification at which you made your drawings?... Bring the class together to share their data with a partner. Display slide G. Assign each student a partner to talk with who was not in their microscope group. Give students 2-3 minutes to discuss these questions, using their data to support their responses. 1. What similarities did you see (between the same body parts and across different ones)? 2. What differences did you see? 3. How do you think the structure of the various parts of the body you saw help it do its function? What makes you think that?" (pages 163 – 164). Students make a data table to record their observations of different cells in the microscope. Students then discuss similarities and differences in their observations that might help explain the functions of the structures they are looking at that are found in the healing foot.
    - Lesson 9: "Display the How Do Cells Fill the Gap poster from the previous lesson. Display slide A. Say, Last time, after watching the time lapse of skin healing, we had some questions: How did the scab form? and What made the new skin? We then came up with some initial claims for how the skin makes more skin to fill in the gap. Here's the poster where we recorded some of those ideas" (page 203). In this lesson students record observation data and then look for evidence in their observations to support claims about cells and healing.
    - Lesson 10: "Have students discuss 'What it Means' (WIM) for each of their WIS statements. These ideas are students' initial explanations of what they think is happening to cause the change in bacterial growth (effect) as observed in the data.

Give groups 3–4 minutes to interpret their observations before asking several groups to share. To help ensure that students see the relevant patterns in the data, probe their interpretations involving how the % [sic] nutrients are related to the observed bacteria growth. Record some of the WIM comments on a white board, chart paper, or in an shared electronic document. As students develop evidence for causal relationships between nutrient levels and bacteria growth across the dataset, support students in turning their statements into cause and effect statements" (page 222). Students analyze the data from their bacteria/agar investigation to determine if there is evidence that the bacteria are using the food to make more cells.

- *Analyze and interpret data to determine similarities and differences in findings.*
    - This element is claimed for lesson 14 in the "Elements of SEPs and CCCs" document but students do not analyze and interpret data in lesson 14.

Engaging in Argument from Evidence

- *Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.*
    - Lesson 7: "Distribute Part 2: Are Other Things Made of Cells? to each student. Say, Record your claim from Part 1 of the assessment at the top of Part 2. Then take some time analyzing the microscopic images. Think about what we have figured out about what a cell looks like and how we have identified cells on our Word Wall and on Our Body as a System poster. As you analyze the images, feel free to annotate and mark up the images as you look for evidence of the different materials being made up of cells or not. Using this evidence, write an argument supporting or refuting your claim" (page 179).
    - Lesson 10: "In the following questions you are going to construct an argument supported by evidence. In our efforts to figure out how cells in the human body can fill the gap to heal a wound, we found out that like mammal cells, bacteria cells can grow and split to reproduce and make more of themselves. 1. Based on the data you analyzed and the information you obtained in this lesson, what do bacteria and other single-celled organisms need to reproduce and make more of themselves?" (Lesson 10 Assessment — What do bacteria need to make more of themselves?). Students use evidence from their agar investigation to construct an explanation for what bacteria need (and therefore other cells need) to reproduce and make more cells. This activity students engage in is more aligned to the element *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events,* because students are not constructing an argument, but rather an explanation.

Constructing Explanations and Designing Solutions

- *Apply scientific ideas, principles, and/or evidence to construct, revise, and/or use an explanation for real-world phenomena, examples, or events.*
    - Lesson 11: Students construct an explanation from evidence for what is happening when stuff gets into and out of cells. Students share what they observed and documented from their investigation of changes that occurred as salt water and plain water were added to red onion cells. These observations are used as evidence to support explanations for how things get in and out of cells (page 241).

- Lesson 12: "Directions: Look back at the data and science ideas you've recorded in your science notebook, Progress Tracker, and the posters we've made as a class. In the chart below, construct an explanation of how healing happened for these events on our Healing Timeline. Include evidence to support each of your explanations so that you can defend them when you share" (Lesson 12 Handout — How Healing Happened Chart).
- Lesson 12: "Using the ideas and evidence in How Healing Happened Chart that you put in your notebook, explain how the different systems in the body interact as the healing process occurs so that the person can resume physical activities. Think about how the student in Lesson 1 couldn't walk, move, jump or dance when the injury occurred but after 4 months the body had healed to a level that the student could once again do these things" (Lesson 12 Assessment — How do the systems in the body interact during the healing process).
- Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Assessment — Growth Summative Assessment).

Disciplinary Core Ideas (DCIs) | **Rating: Extensive**

The reviewers found extensive evidence that students have the opportunity to use or develop the DCIs in this unit because students regularly develop and use grade-appropriate elements to make sense of the healing foot phenomenon and students are supported in developing competence in the DCI elements by applying them in more than one context. There is a clear match between DCI elements claimed in the Teacher Edition and the student activities found in the lessons.

LS1.A: Structure and Function

- *All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).*
  - Lesson 4: "When we observed blood at the microscopic scale, we noticed that blood is made up of different components. What did you figure out from the reading about these components? What did you find out about what these different parts do? Thinking about the shape or the structure of the different blood cells, how do you think these shapes help them function?" (page 129).
  - Lesson 5: Students observe microscopic images of nerve cells: "Record students' ideas in drawings (possibly with words) on a piece of 8.5x11 inch paper and attach it to the Our Body as a System poster as a 'zoom in' on nerves under the zoomed in blood cell drawing. See the sample drawing shown here, based on human nerves at medium magnification. Rather than focus on what a single nerve cell looks like, the drawing should show several cells together to reinforce the idea that the system is made up of many cells working together" (page 145).
  - Lesson 7: "Display slide B and say, Read the question on the slide silently to yourself. This is what you will think about today and you will use what we have figured out so far to help you look for evidence of whether other things are made of cells. Distribute Part

1: Are Other Things Made of Cells?. Orient students to what they are going to record here. Say, Think about other things you predict would also be made up of cells. List these at the top of Part 1: Are Other Things Made of Cells? in the first part titled 'Brainstorm'. Give students about two minutes to record their ideas" (page 178).

  - Lesson 10: "Use prompts such as the following to lead a brief discussion about multiple-celled and single-celled organisms. What do you notice about bacteria cells compared to human cells? What is similar and/or different? What do you notice about bacteria cells compared to human cells? What is similar and/or different?" (page 217).
  - Lesson 10: Students read about single-celled organisms and discuss the characteristics of each: "Purpose of this discussion: Students will use what they figure out from the articles that they read and discussed in small groups that there are organisms that are made of only one cell. They will also establish that cells are the smallest living things, whether in a multicellular or unicellular organism, and that cells need food to make more of themselves" (page 225). A class discussion addresses the following questions: "We're calling them organisms - do we have enough evidence that bacteria and other single-celled creatures are living things? What makes you think so? How do bacteria and other single-celled organisms compare to human cells?...Can someone put those pieces together for me about how bacteria and humans can both be living?" (page 226).

- *Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.*
  - This element is claimed for Lesson 4. Students do look at the general structure and function of blood cells and vessels in the body but do not look at any special structures within the cells or discuss the cell membrane.
  - Lesson 5: "Use the following questions to help guide their observations and small group discussions: What similarities and differences do you notice between nerves from different organisms? How does what you see change as you move from low to high magnification? What structures do you see? How does the structure of nerves compare to the structure of red blood cells? White blood cells? Platelets? How might the structure that you see support what we think the nerves do for our body? (Note - This prompt is meant to push students to make predictions about the nerves' functions. Students will read more about nerve function on Day 2.)" (page 143).
  - Lesson 6: "We also have seen that the different types of cells all look different from each other if they come from different locations, but what would you say is similar between the different types of cells?... , Let's add this to our definition of the cell by making an image of a cell on a paper and labeling what you all said is similar between the cells. This might help us later as we continue to figure out more about what things are made of cells. Draw an image of a cell on a separate piece of paper. Then say, The edge, or boundary that you all noticed in your samples is called a cell membrane by scientists, so let's label the edge as the cell membrane. And the stuff inside is called the cytoplasm" (pages 167–168).
  - Lesson 9: "Students will likely talk about how the cell seems to have something red at the center, and that this center area splits when the cell splits. Introduce and add the labels nucleus and chromosomes to these structures in the model. Students will also have likely noticed that all the cells seem separated by a boundary, which we've identified previously in Lesson 6. The inside of each cell appears dark, but is then surrounded by a lighter boundary. For now, knowing the function of the nucleus and the chromosomes will not help them understand how healing works in the context of

this unit. However, knowing that these structures represent the nucleus and the chromosomes inside a cell, and knowing that a cell has a cell membrane as the boundary identifying one cell from another, will support students in looking for these structures to be present when new cells are made. These ideas will help students discuss and understand that they should be looking for these parts as evidence that healing involves the formation of new cells" (page 206).

  - Lesson 11: "Continue the discussion to synthesize students' ideas about the functions of the cell membrane and cell wall. … The red onion cells had another boundary outside of the cell membrane though. We also noticed this thick structure in other plant cells. What do you think that outer boundary's function is in plant cells?... Add to the cell drawing from Lesson 9. Collaboratively add new structures and their functions and update previously identified structures with what we've figured out today. It may be useful to create a second drawing of a plant cell next to the initial cell drawing. See an example update at right. Say, We investigated the structures inside red onion cells to help us figure out how cells get what they need" (pages 243–244).

- *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
  - Lesson 1: There is evidence for developing this element starting with larger structures and building to substructures in future lessons within the unit: "The purpose for listing the parts of the foot that were impacted along with the timeline is to help students think about the large parts of the foot that were impacted. You do not need to press them to think beyond the large parts (bone, skin, and muscle) of the foot that were impacted. In subsequent lessons they will continue to investigate more about these parts, including how they interact to allow a body part to function (Lesson 2), common structures that are found in the bone, muscle, and skin (blood vessels and nerves in Lesson 3), components found in blood (Lesson 4), components of nerves (Lesson 5) and components (or parts) that make up the skin, muscle and nerves (Lesson 6). At this point, students only need to understand that several structures inside the foot are impacted" (page 39).
  - Lesson 2: "To start out, say, We have figured some things out about the structures of skin, muscles, and bones in a chicken wing and how they relate to structures in the human body. We also made connections to how these three parts in our body might be interacting when we move our arm or foot. Let's begin by recording what the different parts, or structures are that we investigated today" (page 73).
  - Lesson 6: "Say, Let's make note, cells look very similar when they are from the same part of the body and they look different when taken from different parts of the body. Many cells from a particular part of the body are referred to as a tissue. A tissue is a group of cells that work together to perform a function. Add 'tissue' to the Word Wall. Say, Do you think if you had only one muscle cell by itself, it could still do it's function to move the bones and skin of the body? Sample students [sic] responses: No, the cell is so small compared to the bone or the skin. There were so many cells on the slides we looked at and that was just a very thin little piece of that part of the body, so I think it takes millions of muscle cells to move the bones around. Say, Right, it takes many cells working together for a part of the body to be able to perform its function" (page 168).
  - Lesson 10: During a Building Understanding Discussion: "Purpose of this discussion: Students share the differences they observed in the bone, skin, and muscle cross sections. They name those structures cells (like the blood and nerves), but these are

packed together (called tissue). Listen for these ideas: There are patterns of small structures in each of these samples that we can only see with a microscope. These microscopic structures are called cells. Repeating patterns of cells working together form tissues in the body. Bone, muscle, and skin tissue are structured differently for them to perform a function" (page 235).
    - Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Assessment — Growth Summative Assessment).

LS1.D Information Processing

- *~~Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as~~ signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors ~~or memories~~.*
    - Lesson 5: "What to look for: As students use the prompts and strategies outlined on Obtaining Information from Scientific Text while reading: The Body's Nervous System, they should highlight and document information in the reading that supports the following ideas: There are nerves in skin, bones, muscles, and other parts of the body. Nerve cells have a very unique structure - they have long, skinny 'branches' or 'tentacles' protruding from a central portion. The structure of nerve cells is perfectly suited for their function. Nerve cells branch out and connect to other nerve cells throughout the body, forming a network of nerves that carry signals between all parts of the body and the brain" (page 148).
    - Lesson 12: During a Consensus Discussion: "Purpose of this discussion: Notice patterns in our explanations of healing in the foot to come to consensus about what happens inside the body as it heals. Listen for these ideas: Nerves send pain signals from the injured area to the brain so the body reacts to what happened. Nerves also send signals back to the muscles to move them" (page 256).

Crosscutting Concepts (CCCs) | **Rating: Extensive**

The reviewers found extensive evidence that students have the opportunity to use or develop the CCCs in this unit because students regularly engage in grade-appropriate elements throughout the lessons in service of making sense of phenomena and students are supported to develop competence in specific CCC elements. There is a reasonable match between claimed elements in the "Elements of SEPs and CCCs" document and the student activities found in the Student and Teacher Editions. However, a few elements claimed for lessons did not align with student activities.

Cause and Effect

- *Cause and effect relationships may be used to predict phenomena in natural or designed systems.*
    - Lesson 1: "If students need support choosing what to put in their models, refer them back to the Healing Timeline and Parts of the Foot posters we developed as a class. Ask them what they think might be happening with each part of the foot from when the injury happened until the student could walk again. Ask students what was different in

the parts of the foot right after the injury and after it was healed. It may be that students will include parts of the foot without representing how the parts interact or work together. If you notice this, remind students that we can also think about what's going on inside the foot, and underneath the skin because X-rays allow us to see some internal structures. Prompt students to include how the parts (of the foot/system) were interacting during the events we recorded in the healing timeline, and what we might see if we could look inside the foot at these interactions" (page 41). Students are developing initial models of what causes the foot to heal and what causes the changes in appearance they observed with the healing foot phenomenon they were observing. The relationship is not used to make predictions at this point in the unit.

- Lesson 2: "Discuss your predictions with a partner. Display slide K and direct students to turn and talk with a partner about their predictions of how the function of the wing would be affected if one of the parts of the wing was injured. Ask students to share any pictures they drew in their science notebook with each other. Have one or two students briefly share out predictions with the whole class, making sure not to indicate whether any of the stated predictions will describe what's going to happen" (page 76). Students make predictions of how changing the dissection experiment could change how the chicken wing operates to help them understand how the functionality of the injured foot might have been affected.
- Lesson 10: "In the following questions you are going to construct an argument supported by evidence. In our efforts to figure out how cells in the human body can fill the gap to heal a wound, we found out that like mammal cells, bacteria cells can grow and split to reproduce and make more of themselves. 1. Based on the data you analyzed and the information you obtained in this lesson, what do bacteria and other single-celled organisms need to reproduce and make more of themselves? Use words or pictures (or a combination) to show your ideas. 2. Think back to when we saw the mammal cells making more of themselves in the last lesson. Construct an argument: What do you think our cells need to reproduce and make more of themselves to heal the wound? The following question is nongraded. Share your current thinking. You may explain your thinking in words and pictures. 3. Make a prediction: How do bacteria, single-celled organisms, and the cells that make up other multicellular organisms get the food they need?" (Assessment: What do bacteria need to make more of themselves, page 1). Although a cause and effect relationship is embedded in these concepts and this element is claimed in the CCC Elements document, it is not clear from the assessment prompts that students are aware that they are using the CCC of **Cause and Effect** to predict phenomena.

Systems and System Models

- *Systems may interact with other systems; they may have sub-systems, and be a part of larger complex systems.*
  - Lesson 1: Students make their initial visual models of the foot healing and thinking about how different parts of the foot heal and work together for the foot to be fully healed. "Begin to develop your model by adding the parts of the foot impacted by the injury to each foot. Show how these parts would be different in the injured and healed foot. b. Now go back and add to your model to explain what you think happened in the body between the time the foot was injured and when it healed (as represented with the arrow)" (6.6 Lesson 1 Handout — Healing Initial Model)

  - Lesson 2: "Use the prompt response suggestions below to press students to continue to consider how systems could be a useful lens for examining this new phenomenon of injury and healing…" (page 81).
  - Lesson 12: "Using the ideas and evidence in How Healing Happened Chart that you put in your notebook, explain how the different systems in the body interact as the healing process occurs so that the person can resume physical activities. Think about how the student in Lesson 1 couldn't walk, move, jump or dance when the injury occurred but after 4 months the body had healed to a level that the student could once again do these things" (Lesson 12 Assessment — How do the systems in the body interact during the healing process?).
  - Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Assessment — Growth Summative Assessment).
- *Models can be used to represent systems and their interactions — such as inputs, processes, and outputs — and energy, matter, and information flows within systems.*
  - Lesson 1: "Begin to develop your model by adding the parts of the foot impacted by the injury to each foot. Show how these parts would be different in the injured and healed foot. b. Now go back and add to your model to explain what you think happened in the body between the time the foot was injured and when it healed (as represented with the arrow)" (6.6 Lesson 1 Handout — Healing Initial Model). Here students are looking at different parts of the foot and how they may heal differently however they are not thinking about inputs, outputs, or energy, matter, and information flows within the system this early in the unit.
  - Lesson 8: "In your notebook you are going to be given about 5 minutes to develop a model that represents what you think is happening at the site of injury in the time-lapse so that the gap in the skin where the scrape occurred was filled, or healed over time. As you develop your model, use what we have figured out about the different parts, or structures of our body, what these different structures do and how the different structures interact with other systems in our body, to show what parts are involved in this process of closing the gap from the scrape. Include these structures as part of your model" (page 190). Student models do not include energy, matter, and information flow, however.
  - This element is claimed in lesson 12 in the "Elements of SEPs and CCCs" document. While students do engage with systems when constructing explanations in this lesson, they do not use models to represent the systems and do not represent inputs, outputs, energy, matter, and information flows in this lesson.

Patterns

- *Graphs, charts, and images can be used to identify patterns in data.*
  - Lesson 3: "Students annotate the body part images that have been adapted for classroom use to indicate what they notice and wonder. This work gives students practice in interpreting scientific and technical images to find patterns (similarities and differences) in different views of common parts of the body. For example, students may

notice that x-rays mainly show bones, whereas the MRIs show bones and other structures" (page 94). "Have students observe close-up diagrams of skin, muscles, and bone, and discuss their observations with a partner. Encourage students to look for similarities, differences, and patterns among the close-up images" (page 100).

  - Lesson 4: Students use microscope images or slides to identify patterns in the blood tissue. "Say, Remember we are using the microscope and microscopic images to see if we can find out what is in blood, or what blood is made up of. A good clue that you're seeing something significant is if you're noticing repeats. For example, if you're seeing patterns that occur at different magnifications, that's likely a significant observation. If you and your partner(s) are seeing similar patterns, that's likely something to take note of. It will also be interesting to notice if you see similar patterns (or not) between the human blood and animal blood" (page 123). "Share observation patterns with the whole class. Display slide W. Use prompts such as those shown below to invite students to share the patterns they noticed with the whole class. Add a row to keep track of students' ideas about blood. Create a column on the far-right side of the Our Body as a System poster and label it "What this part looks like close up" (page 125).
  - Lesson 7: Students use microscope images to look for patterns to answer the question of which things are made of cells are which are not. "Below is some data from pictures of slides under a microscope for six different materials…What patterns do you notice across all the data?" (6.6 Lesson 7 Assessment Part 2: Are Other Things Made of Cells?).
- *Patterns can be used to identify cause and effect relationships.*
  - Lesson 10: Students look for patterns in their data from the agar investigation to determine if having more available food caused more bacteria cells to grow. "Have students discuss 'What it Means' (WIM) for each of their WIS statements. These ideas are students' initial explanations of what they think is happening to cause the change in bacterial growth (effect) as observed in the data. Give groups 3–4 minutes to interpret their observations before asking several groups to share. To help ensure that students see the relevant patterns in the data, probe their interpretations involving how the % [sic] nutrients are related to the observed bacteria growth. Record some of the WIM comments on a white board, chart paper, or in an [sic] shared electronic document. As students develop evidence for causal relationships between nutrient levels and bacteria growth across the dataset, support students in turning their statements into cause and effect statements" (page 222).

Scale, Proportion, and Quantity

- *Phenomena that can be observed at one scale may not be observable at another scale.*
  - Lesson 3: "These diagrams help support students' transition to considering body parts at a microscopic scale. Students will develop their understanding of 'zooming in' at different scales over the next three lessons, as they use microscopes and microscopic images to investigate blood, nerves, skin, bone, and muscle. Zooming in at different scales will help students gain a rich understanding of the structure-function relationship within each of these parts" (page 100).
  - Lesson 4: "Gather the class in a Scientists Circle with their science notebooks to discuss what they figured out. Display slide L. Lead a Building Understandings Discussion about the scale at which we can see with the microscope. Record these ideas on chart paper for future reference (see the sample poster below the discussion prompts)… How did changing the objectives change what you could see? Why?... The amount of space you

can see at one time is called your 'field of view.' How does the field of view change at different magnifications?" (page 118).

- Lesson 4: "Individually consider how what we can see changes at different scales. Display slide S. After students have had time to observe and record data about both of their group's blood samples, have them complete this reflection to prepare to make sense of their observations. Direct students to write their response to this question in their notebooks: What structures were evident that were not visible without the use of a microscope? Compare what you could (or couldn't) see with the microscope to what you could (or couldn't) see without it" (page 123).
- Lesson 6: "Do we have evidence to support our claims about this connection to the function - that the structure of the cell from a part of the body is arranged the way it is so that it can perform its function in that part of the body? To consider this, we're going to be thinking about the microscopic scale - what we just saw in these cross sections, and we also need to zoom back out and think about these parts at the scale we can see - our body parts" (page 168).
- Lesson 6: "This question requires students to think about the body parts at different spatial scales - they've zoomed in with the microscopes and now they have to think about what's happening in the larger body parts to consider how each structural unit contributes to the tissue structure and function within the body part" (page 164).
- Lesson 9: "In lesson 8, we watched a zoomed-out view of skin healing. Using what we figured out from this first video, what could be happening in the gap where the skin was injured?... In the second video we zoomed-in even further and observed cells when fluorescent dye had been added to help us see different parts of the cell. How was this second video similar to the first video?" (page 204).

Structure and Function

- *Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.*
  - Lesson 2: Students use their observations from the chicken wing dissection to try to determine the structure and function of the different parts of the human foot. "As we continue to figure out more about the different parts, or structures, in our body over the course of the unit, let's continue to think about how the different parts are structured, or put together, to help us figure out how they might be working together as part of the healing that is occurring…Let's think about what we saw each of these parts doing in the chicken wing dissection and record what we think the function of the part is. Add another column to the right titled 'What this part does in the body' (function)" (pages 74–75).
  - Lesson 4: "Thinking about the shape or the structure of the different blood cells, how do you think these shapes help them function? So how does the structure of the blood itself relate to its function?" (page 129).
  - Lesson 5: "Use the following questions to help guide their observations and small group discussions: What similarities and differences do you notice between nerves from different organisms? How does what you see change as you move from low to high magnification? What structures do you see? How does the structure of nerves compare to the structure of red blood cells? White blood cells? Platelets? How might the structure that you see support what we think the nerves do for our body? (Note — This

prompt is meant to push students to make predictions about the nerves' functions. Students will read more about nerve function on Day 2.)" (page 143).

- Lesson 5: "What did we observe about the structure of nerves when we examined images of them taken using a microscope? And in general, what do we know about the relationship between the structure of something and its function, or job? Take a minute or two to talk to a partner, and be prepared to share with the class. When students come back to the whole group, call on some to share what they discussed with their partners." (page 146)
- Lesson 6: "Bring the class together to share their data with a partner. Display slide G. Assign each student a partner to talk with who was not in their microscope group. Give students 2-3 minutes to discuss these questions, using their data to support their responses. 1. What similarities did you see (between the same body parts and across different ones)? 2. What differences did you see? 3. How do you think the structure of the various parts of the body you saw help it do its function? What makes you think that?" (page 164).
- Lesson 7: This element is claimed for lesson 7 in the "5.0 Healing Elements of SEPs and CCCs" document. However, student prompts in this lesson do not discuss structure or function of cells or multicellular organisms in a way that students interact with this CCC.
- Lesson 11: "Continue the discussion to synthesize students' ideas about the functions of the cell membrane and cell wall. Suggested prompts: So we have evidence that things like water can move in and out of a red onion cell through its boundaries. Do you think the same could be true for other cells? Why? We heard the term 'cell membrane' when we were watching videos of cells growing and splitting. It's that outer, flexible boundary around animal cells, and now we've seen it inside plant cells, too. What can we add to our understanding about the key functions of the cell membrane? The red onion cells had another boundary outside of the cell membrane though. We also noticed this thick structure in other plant cells. What do you think that outer boundary's function is in plant cells?" (page 243).
- Lesson 13: "In our unit we have figured out some things about bones through our investigations of looking at them at different scales using x-rays and microscope slide images to be able to analyze their structure and figure out more about their function. Think about a baby compared to an adult, how do the bones of an adult compare to the bones of a child? Many of you were saying that children are growing and so their bones must be growing too. If you think about how this happens, what are some initial ideas you have about how bones might grow? Make noticings about x-rays of bones from people of various ages. Display slide C. Say, Let's take a look at some bones in the hands of people of different ages. What are some things you notice? As you share, I will record your noticings on this poster" (pages 265–266).
- This element is claimed for lesson 14 in the "Elements of the SEPs and CCCs" document but students do not engage in this element during lesson 14.

Stability and Change

- *Small changes in one part of a system might cause large changes in another part.*
  - This element is claimed for lesson 14 in the "Elements of the SEPs and CCCs" document but students do not engage in this element during lesson 14.

Suggestions for Improvement

Science and Engineering Practices

- Consider ensuring there's alignment between the elements claimed in the "Elements of SEPs and CCCs" and student activities in some of lessons mentioned above, especially for the following SEPs: **Obtaining, Evaluating, and Communicating Information** and **Analyze and Interpret Data**.
- Consider providing additional opportunities for students to use the SEP **Engaging in Argument from Evidence** in which students use evidence to support or refute claims. It is claimed as a focal SEP, but students do not engage with this SEP as often as many of the other practices in the unit.

Disciplinary Core Ideas

- Consider adding the DCI elements to the "Elements of the SEPs and CCCs" document to make clear to teachers which lessons address each DCI element.

Crosscutting Concepts

- Consider ensuring there's alignment between the elements claimed in the "Elements of SEPs and CCCs" and student activities in some of lessons mentioned above.

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 *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that student performances integrate elements of the three dimensions in service of figuring out phenomena and/or designing solutions to problems because students are regularly engaged in activities and performances that integrate middle school elements of all three dimensions to make sense of phenomena.

A few examples of student three-dimensional performances include:

- Lesson 2: "Ask students, Okay, so now we have some data from the investigation we did in our last class about how muscles and bones work together for a limb or extremity (like the chicken wing or human foot) to move. In Lesson 1, the parts of the person's foot were injured and needed to heal before he could walk again. How could we revise the chicken wing dissection to figure out more about how the injury affected the different parts of the foot and prevented him from being able to walk?... Have students record their ideas in their notebooks. Students will use their answers to navigate to the next investigation and prepare them to watch for changes to the how the chicken wing functions, or moves" (page 76). In this activity students integrate the following dimensions as they revise the chicken wing dissection activity in order to better understand the healing injured foot phenomenon:

  - SEP: *Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.*
  - DCI: **LS1.A Structure and Function**
  - CCC*: Cause and effect relationships may be used to predict phenomena in natural or designed systems,* and *Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function*.
- Lesson 4: "Individually consider how what we can see changes at different scales. Display slide S. After students have had time to observe and record data about both of their group's blood samples, have them complete this reflection to prepare to make sense of their observations. Direct students to write their response to this question in their notebooks: What structures were evident that were not visible without the use of a microscope? Compare what you could (or couldn't) see with the microscope to what you could (or couldn't) see without it" (page 123). In this activity, students integrate the following three dimensions:
  - SEP: *Analyze and interpret data to provide evidence for phenomena*.
  - DCI: *All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).*
  - CCC: *Phenomena that can be observed at one scale may not be observable at another scale.*
- Lesson 9: Students use a data table to record claims they make about how cells fill in a gap of an injury and what they observed in cells at the beginning, middle, and end of a video. Students then explain how different magnifications and time scales allowed them to support their claims (Lesson 9 Handout — Observations to Evaluate). In this activity students integrate the following three dimensions:
  - SEP: *Analyze and interpret data to provide evidence for phenomena*.
  - DCI: **LS1.A Structure and Function** *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions*.
  - CCC: *Phenomena that can be observed at one scale may not be observable at another scale.*
- Lesson 12: "Using the ideas and evidence in How Healing Happened Chart that you put in your notebook, explain how the different systems in the body interact as the healing process occurs so that the person can resume physical activities. Think about how the student in Lesson 1 couldn't walk, move, jump or dance when the injury occurred but after 4 months the body had healed to a level that the student could once again do these things…Choose one of these ideas that you think is most helpful in explaining how body systems interact during the healing process (SCALE or STRUCTURE/FUNCTION) Why is this idea helpful in explaining how body systems interact during the healing process" (Lesson 12 Assessment — How do the systems in the body interact during the healing process?). In this assessment activity, students integrate the following three dimensions:
  - SEP: *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events.*
  - DCI**: LS1.A Structure and Function** *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
  - CCC:

- **Scale, Proportion, and Quantity**: *Phenomena that can be observed at one scale may not be observable at another scale.*
- **Structure and Function**: *Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.*

- Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Assessment — Growth Summative Assessment). In this assessment, students integrate the following three dimensions:
  - SEP: *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events.*
  - DCI: *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
  - CCC: *Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems*.

Suggestions for Improvement

None.

I.D. UNIT COHERENCE	
Lessons fit together to target a set of performance expectations. i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences. ii. The lessons help students develop toward proficiency in a targeted set of performance expectations.	
Rating for Criterion I.D. Unit Coherence	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that lessons fit together coherently to target a set of performance expectations because students have opportunities to address questions about the healing foot phenomenon and other phenomena throughout the unit and figure out some of the answers to those questions in subsequent lessons, as well as develop new questions.

Students have regular opportunities to engage in asking questions based upon what they have learned so far and revisit these questions in later lessons. Lessons in the unit build directly on prior lessons and make links between lessons explicit to students. For example:

- Lesson 3: "As students come into class, have them reflect on the last lesson by looking at their Progress Tracker in their science notebooks. Refer students back to the Our Body as a System poster that we revised in the last lesson, using the body systems images (muscular and skeletal) as needed. Begin by saying, Last lesson, we used a chicken wing to investigate how the muscles, bones, and skin interact and work together. Facilitate a short discussion to elicit student ideas about what they have figured out" (page 93).
- Lesson 5: "Point to the DQB and How Does the Foot Heal Over Time? poster displayed in the classroom. Ask students to review any ideas developed, or questions generated related to feeling, or lack of feeling in the foot from the DQB and How Does the Foot Heal Over Time? poster. Use the prompts and responses below to return to the DQB and How Does the Foot Heal Over Time? poster to begin thinking about how nerves might be involved in the injury and healing" (page 139).
- Lesson 5: "During this discussion, ask the class if any questions related to nerves on the DQB can be answered. If there is general agreement regarding the question and answer, place a check or sticky note on the answered question. Be sure to also permit students to add additional questions to the DQB regarding nerves" (page 143).
- Lesson 7: Students return to the anchoring phenomenon of how does the foot heal over time. Students end Lesson 7 by considering what the injury looks like. "Using what you now know about what these different parts look like close up at the cellular level, choose one of the parts to develop a model of what you think they would look like right at the point of injury when the gap appears in the foot - or in other words right after the weight landed on the foot. If we could look close up at the gap, or injury site right when it happened, how do you think it would look similar or different from what it looked like prior to the injury? How would these changes be connected to the change in function of the foot after the injury?" (page 181). In Lesson 8, students consider how skin heals which leads to Lessons 9 and 10 where they figure out how the cells fill the gap of the injury.
- Lesson 8: "Share out questions and students' responses to the DQB questions. As students share their responses, have the class decide whether a question was fully answered, partially answered, or still requires more work. If the question was fully answered, move the sticky note to a new poster near the DQB labeled 'Questions we have answered.' If the question was partially answered, put a check mark on the question to keep track of questions we are making progress toward but are not fully answered yet, however, leave it on the DQB. When time allows, either this day or another day, have students work in groups to document answers to these questions on 5x8 index cards or 6x8 sticky notes, similar to what they did in Lesson 5. Students will realize that we have answered a lot of questions about the foot, what it is made of, and how it functions. However, we are missing ideas about the healing process and other living things" (page 187).
- Lesson 8: "Revise Driving Question and summarize topics of unanswered questions. Say, Currently our question for our DQB is focused on how the foot from Lesson 1 healed. Do you think answering our questions would help us understand how other types of injuries that happen to our bodies heal? Do you think some of these same questions could be about other types of injuries that happen to our bodies? How could we revise the Driving Question we have for our DQB to capture this idea that we are figuring out more than just how a foot heals?" (page 188).

- Lesson 9: "Display the How Do Cells Fill the Gap poster from the previous lesson. Display slide A. Say, Last time, after watching the time lapse of skin healing, we had some questions: How did the scab form? and What made the new skin? We then came up with some initial claims for how the skin makes more skin to fill in the gap. Here's the poster where we recorded some of those ideas" (page 201).
- The Progress Tracker (introduced in Lesson 2) allows students to keep record of what they have learned and figured out throughout the unit. This Tracker is used in most of the lessons. Some examples include:
    - Lesson 2: "Introduce the Progress Tracker. Present slide Q. Have students draw a three-column chart in landscape orientation directly in their science notebooks in the section set aside for Progress Trackers. Explain that as we investigate healing and how it happens, we are going to keep track of how our model changes and develops over time in our Progress Tracker" (page 87).
    - Lesson 5: "If time allows, revisit the DQB and identify questions the class can now answer about blood. (Lesson 5 includes more specific directions about how the class could document their answers.) However, it is more likely that students have additional questions to add to the DQB from their reading today or considerations about how blood and healing are related. Take time to add these questions now" (page 133).

The lessons work together to provide sufficient opportunities for students to build proficiency in the following targeted learning for all three dimensions. The materials indicate that the PEs marked with an asterisk are partially developed in the unit (page 13).

- **MS-LS1-1**. Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
- **MS-LS1-2***: Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- **MS-LS1-3***: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
- **MS-LS1-8***. Gather ~~and synthesize~~ information that sensory receptors respond to stimuli by sending messages to the brain for immediate behavior ~~or storage as memories~~.

Suggestions for Improvement

Consider providing additional opportunities for students to co-develop the questions to investigate in the next lesson.

I.E. MULTIPLE SCIENCE DOMAINS

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

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

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

Rating for Criterion I.E. Multiple Science Domains	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that links are made across the science domains when appropriate because the anchoring phenomenon of the healing foot and related lesson-level phenomena can be fully addressed within the life science domain. Additionally, the usefulness of CCCs across science domains is highlighted through references to previous domains in previous units.

Related evidence includes:

- Lesson 1: "Remind students that models allow us to view a system from different perspectives and scales. Ask students to recall moments from previous units where it was useful to look at something from a different perspective or scale… Does anyone remember how looking at something from a different perspective helped us figure more things out in an earlier unit? Yeah! Like in the Everest Unit, when we moved from the top-down view to the side-view of Earth's crust, we could see that earthquakes occurred at different depths. I think in the Tsunami Unit, we looked at different wave models because each one had certain strengths and limitations, but when examined together we could figure out more. Sometimes we can understand more by looking at different perspectives at the same time" (page 40).
- Lesson 2: In this lesson the teacher highlights how the students have used a similar protocol in an Earth Science unit to compare two phenomenon and find patterns. "Remind students they used a similar mapping tool in Storms Unit to consider how magnetic marbles representing water particles could help us figure out what is happening as water vapor heats up and cools down" (page 70).
- Lesson 2: "Use the prompt response suggestions below to press students to continue to consider how systems could be a useful lens for examining this new phenomenon of injury and healing. In the Cup Design Unit, when we were trying to figure out how to keep our drink cold longer, we analyzed different cup systems. What were some of the parts of the cup system? What did we figure out were parts of a system in Storms Unit? How could thinking about the body as a system help us in figuring out what happens in our body when it heals?" (pages 80–81). Here the teacher prompts students to think about how they have used the CCC of **Systems and System models** to analyze engineered systems and Earth science systems and think about how it could also be used to analyze living systems.
- Lesson 3: The teacher reminds the students about how they use cross-section model to understand more about parts of a system. "Remember in earlier units when we looked at side views of air masses in OpenSciEd Unit 6.3: Why does a lot of hail, rain, or snow fall at some times and not others? (Storms Unit) or when we were figuring out what was happening below Earth's surface that led to mountain change in OpenSciEd Unit 6.4: What causes Earth's surface to change? (Everest Unit)? Those were examples of cross-sectional views of different systems. Why did we look at those images that cut across the Earth like that?" (page 96).

Suggestions for Improvement

None.

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 *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials provide grade-appropriate connections to the Common Core State Standards (CCSS) in mathematics, English language arts (ELA), history, social studies, or technical standards because ELA and mathematics standards are clearly identified throughout the unit and students use various reading, writing, and speaking standards while engaging in sense-making.

Connections to CCSS in mathematics or ELA and Literacy are called out in individual lesson instructions in the Teacher Edition in the "SUPPORTING STUDENTS IN MAKING CONNECTIONS IN ELA" and "SUPPORTING STUDENTS IN MAKING CONNECTIONS IN MATH" boxes.

Connections to CCSS mathematics standards are made in Lesson 4.

- Lesson 4: "You may choose to take time to explore the mathematics of ratios of blood cells, given the percentages of each type in the reading. If those percentages are true for the samples we have on our slides, and we can see X white blood cells in the field of view, how many red blood cells might we estimate are in that same field of view? If the total volume of a blood sample is 10 mL, how much of that sample would we expect to be blood plasma? This math extension would support CCSS.MATH.CONTENT.6.RP.A.1: Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities and/or CCSS.MATH.CONTENT.6.RP.A.3.C: Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent" (page 130).

Connections to CCSS ELA standards are made when appropriate. For example:

- Lesson 1: "CCSS.ELA-Literacy.SL.6.1.c: Pose and respond to specific questions with elaboration and detail by making comments that contribute to the topic, text, or issue under discussion. When the class is building the Driving Question Board, if a student forgets to explain why or how their question is linked to someone else's question, press that student to try to talk through their own thinking. This is a key way to emphasize the importance of listening to and building off of one another's ideas and to help scaffold student thinking. If students can't figure out which question to connect to theirs, encourage them to ask the class for help. After an idea is shared, ask the original presenter if there is agreement and why, and then post the question. Today's activities rely on students communicating and articulating their thinking. One tool that may support classroom discussion is the Communicating in Scientific Ways sentence starters" (page 60).
- Lesson 3: "CCSS.ELA-LITERACY.RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts. In this lesson, students viewed several images and diagrams to make sense of some of the structures inside a human body--where they're located and how they're arranged. In order to support their claims that blood vessels and nerves are found in the bone, skin, and muscles, students must compare various scientific diagrams with MRIs and cite evidence about how the structures that they can identify support their claims" (page 103).

- Lesson 4: "CCSS.ELA-LITERACY.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases, as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics. The informational text students read about blood in this lesson is the first time they're introduced to cells. Determining the similarities and differences among red blood cells, white blood cells, and platelets will set a foundation for students to continue refining their definition of cells and the variety of structures they can have, all related to specific functions they carry out" (page 134).
- Lesson 5: "CCSS.ELA-Literacy.SL.6.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text, or issue under study. The focal practice for this lesson is SEP 8 Obtaining, Evaluating, and Communicating Information. Students obtain information from a reading and use that information to figure out how the structure of nerve cells supports their function in the body. Obtaining Information from Scientific Text is provided to support students in obtaining information from scientific text. The tool includes strategies, such as skimming the title, subtitles, and captions to get the gist of the reading, marking up the text in a number of ways, and documenting the ideas that support our purpose for engaging in text. Additional suggestions are provided in the lesson, such as paired reading of the text, to further support students in obtaining the information they need" (page 156).
- Lesson 5: "CCSS.ELA-Literacy.SL.6.1: *Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly*. There are a number of opportunities in this lesson for students to engage in discussions in pairs, small groups, and as a class. Some discussions are teacher-led, but not all. Students should be encouraged to share their prior understandings, observations, and current thinking while working collaboratively with their peers to figure out the role of nerves and nerve cells in the body and how their function is served by the unique structure of nerve cells and the network they create throughout the body to receive and send signals between the body and brain. As much as possible, questions and prompts are used by the teacher to allow students to lead discussions, giving students multiple opportunities to share their current thinking and build on the thinking of others. Additional strategies that can be used include: Strategically pair and group students, keeping individual student needs in mind. Provide numerous opportunities for students to respond to questions and share their thinking (in pairs before class discussion, for example). Allow students to use drawings, symbols, writing, and gestures to express their ideas." (page 156).

Suggestions for Improvement

- Consider including further connections to ELA CCSS in Lessons 6–14 and make explicit to students how the ELA skills are critical in the sciences. The Additional Teacher Guidance for connections to ELA CCSS is only provided for the first five lessons.
- Consider providing additional opportunities for mathematics CCSS connections (where appropriate) in addition to the optional activity in Lesson 4. For example, Lesson 10 includes support for the SEP **Using Mathematics and Computational Thinking**; however, there is no mention of a mathematics CCSS connected to this activity.

How Do Living Things Heal?

EQuIP RUBRIC FOR SCIENCE EVALUATION

OVERALL CATEGORY I SCORE: **2** (0, 1, 2, 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)

CATEGORY II

NGSS INSTRUCTIONAL SUPPORTS

II.A. RELEVANCE AND AUTHENTICITY

II.B. STUDENT IDEAS

II.C. BUILDING PROGRESSIONS

II.D. SCIENTIFIC ACCURACY

II.E. DIFFERENTIATED INSTRUCTION

II.F. TEACHER SUPPORT FOR UNIT COHERENCE

II.G. SCAFFOLDED DIFFERENTIATION OVER TIME

II.A. RELEVANCE AND AUTHENTICITY

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

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

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

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

Rating for Criterion II.A. Relevance and Authenticity	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials engage students in authentic and meaningful scenarios that reflect the real world because the phenomena they are explaining and learning about in the unit are engaging and relevant to people's lives. The unit connects the phenomena to students' past experiences as well as their community.

Students experience the phenomenon of the healing foot as directly as possible through images, videos, and documents. For example:

- Lesson 1: "Introduce the phenomenon. Display slide C. Say, I am going to tell you the story of a middle school student. Today, this middle school student can walk, run, and jump! However, a while ago, this middle school student had an injury that prevented him from being able to do these things. He dropped a heavy weight on his foot during PE/gym class. After this happened, he was not able to stand, walk, or run and had lots of pain" (page 32).
- Lesson 1: Students are given an "Emergency Room Report" of the injury they are studying as well as a "Post Operation Report". These reports contain x-rays, photos, and detailed doctors' descriptions of the injury.
- Lesson 8: Students watch a time lapse video of a skin wound healing in order to observe what happens as an injury heals.

Students connect their learning to their home and community through home interviews and the final project of redesigning the school to make it more accessible for people with disabilities.

- Lesson 1: "The purpose is to have students think of experiences that they have had related to healing that was similar to what happened in the healed foot. Distribute Related Healing Phenomena Stories to each student. Say, You are going to ask trusted members of your community about their stories of healing or stories they have heard from others. Use the question prompts on Related Healing Phenomena Stories to help you ask questions as they tell their stories" (page 50).
- Lesson 13: "Invite students to gather ideas about healing from their communities. Display slide J. Distribute Home Learning: How do we support healing?. Say, When you go home today, talk with your friends and family about our class. First, share with them what we have been figuring

out about healing. Describe an example of an investigation we did to answer one of our questions. Then share with them the different supports for healing that we have seen used in our unit and ask them these questions: 1. Ask whether they have ever experienced using any of the supports we have talked about to help their body heal from an injury. 2. Ask how these supports helped their body heal and allow them to participate in everyday life? 3. Ask about additional supports the people in your community have used to help their body heal from an injury that we haven't looked at in class?" (page 272).

- Lesson 14: "At the very end of the transcript, Sinéad shares a challenge she has for us. Let me read it to us aloud. 'So today, I want your perceptions challenged. Who are we not designing for? How can we amplify their voices and their experiences? What is the next step? Design is an enormous privilege, but it is a bigger responsibility. I want you to open your eyes'. We are going to spend a few minutes taking her up on this challenge and think about our classroom and school. Display slide Q. Say, You will work with your small group on this challenge. One person in your small group should record your group's ideas so that you will have them ready to share. As you work with your small group, think about: What areas of our school would need to be redesigned so she could have access? What are some initial brainstorm ideas for how you could redesign this area? How would the ideas you brainstormed lead to more accessibility for Sinéad?" (page 294).

The unit provides opportunities for students to connect the phenomenon to questions from their own experiences. For example:

- Lesson 1: "Share out as a class about a time when you were unable to do an activity. Display slide B. Use the prompts below and slide B to elicit student experiences when something happened that caused them not to be able to use part of their body. As students share, ask follow-up questions to push them to think deeper about what was happening inside their bodies during the time they describe, and whether other parts of their bodies were impacted, even if not directly affected by the injury... When your body was able to do the activity again, were you able to engage in the activity in the same way you could before the injury? Or was there anything different about how you could engage in this physical activity again? Talk with an elbow partner about this briefly. Let a few students share their experiences" (pages 31–32).
- Lesson 1: "Use the prompts below to elicit experiences and ideas about what happened from student volunteers. Accept all responses. Have you ever experienced something like this where you dropped something on your foot or another part of your body? Why do you think he was not able to do these activities with his body after the injury? What happened in the body to allow him to get back to these activities? What are you wondering about with his injury and journey to recovery?" (pages 32–33).
- Lesson 4: "Last time we were together, we looked at MRIs and diagrams and found there were blood vessels in the muscles, skin, and bones. Where else do you think blood is in the body? In your finger, in your nose, in your hair? What experiences have you had that make you think blood is in those locations?" (page 111).
- Lesson 10: "Stop and jot our initial ideas about bacteria. Display slide B. Say, I think most of us have heard of bacteria before, but I'm wondering what we already know about them. Let's stop and jot down some of our initial ideas about bacteria. Feel free to include where you might have heard about them, or how you think it relates to our healing story" (page 216).

Teacher guidance is provided for anticipating emotional responses and issues that may arise when students share their personal experiences. Related evidence includes:

- The front matter contains a Supporting Disability Inclusion, and Social Emotional Learning section that outlines how teachers can support students as they learn about healing and the related topic of disability (page 20).
- Lesson 1: "Additional Guidance: Be mindful that sharing or hearing stories of past injuries can bring up past or recurring trauma for students. You may or may not be privy to information about students' past experiences with injury, so it may be helpful to send home communication to parents letting them know the topic of conversation in advance so that they can let you know of any topics that may be sensitive for students. We also recommend seeking the support of a school psychologist, social worker, mental health specialist, or counselor to support discussions that may be challenging for some students" (page 31).
- Lesson 1: "Connections to Me and My Community: Inclusion As students are sharing their experiences, be mindful of ability-diversity. Disabled students may experience injury and healing in different ways than their non-disabled peers, so it is important to welcome and honor all experiences. Listen for students who use language that may construe disability in a negative light, reminding students that individuals that become disabled after an injury learn to adapt to their body's new way of functioning and are able to complete the daily tasks of life, if a little differently. It is important that students understand that individuals with disabilities often take a great deal of pride in their disability and consider it a key part of their identity" (page 32).
- Lesson 11: "As you plan this investigation, be considerate of your students who may experience food insecurity. Remind the class to be respectful of the materials they're going to use and to not be wasteful. Depending on your number of students/classes you might not need to use an entire onion, so only cut what you need for each class and store the remainder for a future use, such as a meal at your home. After the investigation, collect used onion pieces and dispose of them in the trash after students have left the room. Note that the remainder of the onion used in the making of the video was also used for nourishment" (page 237).

Suggestions for Improvement
None

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	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials provide students with opportunities to both share their ideas and thinking and respond to feedback on their ideas. Students have regular opportunities to share their models and ideas with peers throughout the unit. Additionally, students have multiple opportunities to show their progress in thinking over the course of the unit by updating the Progress Tracker. However, opportunity for teacher feedback is limited and only one formal opportunity to give and receive peer feedback is provided.

Students have opportunities to express, clarify, and justify their ideas through classroom discourse, written responses, and drawn models. For example:

- Lesson 1: "It is important to organize activities in ways that create opportunities to support student engagement in meaningful, accountable talk by emphasizing socially safe activity structures (e.g., small group or partner work before a whole class discussion). This is especially beneficial to emergent multilingual students. For this reason, partner talk or small group talk should precede whole group sharing to give students an opportunity to share their ideas with one or two peers before going public with the whole class" (page 42).
- Lesson 3: "Turn and talk with a partner to discuss image observations. Display slide E. Have students work with a partner to discuss and summarize their ideas from annotating Reference: A Medical Professional's View Inside the Body and share out what the x-ray and MRI helped us see inside each part of the body. As students are working, walk around and listen to their discussions for ideas to bring out in the whole-class share-out" (page 95).
- Lesson 5: "Review previous observations of nerves and motivate our next steps. Show Slide L and say, What did we observe about the structure of nerves when we examined images of them taken using a microscope? And in general, what do we know about the relationship between the structure of something and its function, or job? Take a minute or two to talk to a partner, and be prepared to share with the class. When students come back to the whole group, call on some to share what they discussed with their partners. Regarding the structure of nerves, listen for students to share that the structure of nerves is very different from other structures they've seen thus far. Nerves appear to have thin tentacle-like arms that branch out from the larger center portion. Regarding the relationship between structure and function, listen for students to say that an object's structure may help it carry out its function. They may give examples from the previous lesson, such as the shape of blood cells enabling them to move easily" (page 146).
- Lesson 5: "Direct students to the Progress Tracker section of their notebooks. Have them turn their notebooks to landscape orientation and draw a 3-column progress tracker like the one on the slide. Remind students that the Progress Tracker is a space for them to process and record their thoughts while we're working to figure out how an injury can heal. Give students time to add to their Progress Trackers. See the sample student responses shown on the next page… Columns: 'Question', 'What we figured out in words/pictures', 'This makes me think or wonder about healing'" (page 153).
- Lesson 6: "Reflect on how the use of scale has helped us figure out more about structure and function. Say, So now we have looked at different parts of our body at different scales, both macroscopic and microscopic. Open to the next blank page in your notebook, title it 'Using different scales' and answer this question, 'How has looking at these different body parts using different scales helped you figure out more about the structure and function of these parts?'" (page 170).
- Lesson 7: "1. What patterns do you notice across all the data? 2. How does the data support or refute your original claim in question 1? 3. Using the data as evidence, write an argument that answers our question, 'Do all things have cells?' 4. How does looking at these things at a microscopic scale help you develop your argument?" (Lesson 7 Assessment — Are Other Things Made of Cells?).
- Lesson 9: "Refer to the New Cells Being Made poster then say, We have figured out today that old cells make new cells by growing and splitting to fill in the gaps, but how is this happening? Take a few minutes to jot down some of your thoughts in your science notebook then turn and talk with a partner to share your ideas and questions you still have about this. Allow students the remaining time to discuss the questions on the slide and record ideas from the conversation

they have with their partner in their science notebook. Remind students that they should be prepared to share these ideas and questions with the rest of the class next lesson" (page 210).

- Lesson 10: "1. Based on the data you analyzed and the information you obtained in this lesson, what do bacteria and other single-celled organisms need to reproduce and make more of themselves? Use words or pictures (or a combination) to show your ideas. 2. Think back to when we saw the mammal cells making more of themselves in the last lesson. Construct an argument: What do you think our (human) cells need in order to reproduce and make more of themselves? Use words or pictures (or a combination) in your argument" (Lesson 10 Assessment — What do bacteria need to make more of themselves).
- Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Lesson 13 Assessment — Growth Summative Assessment).

The materials provide some supports for providing feedback to students from both the teacher and peers. For example:

- Lesson 5: "As students work, walk around the room and listen and observe. Make note of the things that you hear and see them documenting on their handout. Use the following questions to help guide their observations and small group discussions: What similarities and differences do you notice between nerves from different organisms? How does what you see change as you move from low to high magnification? What structures do you see? How does the structure of nerves compare to the structure of red blood cells? White blood cells? Platelets? How might the structure that you see support what we think the nerves do for our body? (Note - this prompt is meant to push students to make predictions about the nerves' functions. Students will read more about nerve function on Day 2.)" (page 143).
- Lesson 8: Students share their model with their group and get peer feedback about their models and decide what they would revise about their models. "Students share their initial model with their group. Display slide F. Tell students to use the directions on the slide to do a modified talking stick protocol with their group. Small Group Talking Stick Round 1: Take your model with you and meet with the small group you are assigned to. When given the start signal, pass around a pencil as a talking stick and take turns, each person using their model to explain how the skin cells form new skin on the foot [1 minute per person]. As each person shares, think about how their idea compares with other models you've seen (including your own). Small Group Talking Stick Round 2: Pass the talking stick around again to have each person share at least one similarity, difference, or question you noted between the models that were shared [1 minute per person]. Students may also choose to share what they would revise about their initial model based on what they heard from their peers about their models" (page 191).
- Lesson 9: "Keep in mind that the Progress Tracker should not be used as a summative assessment, but rather as a formative assessment to understand what students are thinking at this point. We recommend that you provide feedback to students in the form of questions to probe student thinking and push for more sensemaking" (page 209). While the Teacher's Edition recommends the teacher provides feedback to students through questioning, there is not enough guidance for the teacher to provide effective constructive feedback to individual students.

- Lesson 10: This activity supports students in self-assessing their work and providing peer feedback. However, this activity is listed as an alternate activity. "If you decide to do self-assessment and peer feedback... Explain that students will have a chance to self-assess their argument first and then they'll engage in peer feedback. After all this feedback, they'll have an opportunity to revise their argument. Distribute a copy of Self Assessment [sic] and Peer Feedback to each student. Review as a class the three key elements of the argument and the individual self-assessment task. Share instructions for how to self assess [sic] using a pen or pencil. Underline places where you state a claim. Circle evidence that you used. Highlight places where you use cause and effect language. Explain that during the self-assessment, students should add notes directly to their argument about what they want to revise. Tell students they'll have a chance to record a new argument at the end of class, so these notes do not need to be perfect. While students self-assess their argument, circulate among the students and probe them for places where they could include additional science ideas, evidence, and cause and effect language. Distribute 1 copy of Peer Feedback Guidelines to each student. Review elements of quality peer feedback. Give examples of productive and unproductive feedback. While students provide peer feedback, circulate the class and probe students for places where they think their peers could include additional science ideas, evidence, and cause and effect language" (page 230).
- Lesson 10: "What to do: The purpose of this assessment is to see if students can use evidence for what they have figured out about bacterial cells and apply it back to the healing phenomenon. If students struggle to support the claim with evidence, encourage them to look back at what they figured out in Lesson 9 about how cells make new cells. Then, students should think about what they figured out about what happened with the bacteria in this lesson when they were given food and nutrients. Using these pieces of data, ask them what they think: do human cells need similar things to the bacteria to grow and split to make more of themselves? What do we know about human cells and bacteria or other single-celled organisms [sic] cells? Additionally, if students struggle to use cause and effect language to state a claim, consider using the self assessment [sic] and peer feedback as described in the alternative callout" (page 230).
- Scoring Guides and teacher keys for some assessments provide guidance for the teacher to provide written feedback that could be provided to students. For example, in Lesson 12: "Collect How do the systems in the body interact during the healing process? and use the science ideas in Key: How do the systems in the body interact during the healing process? to assess student explanations and check for understanding they are bringing from their experience with the unit thus far. Provide students feedback on their explanations using the single point rubric found in the Key: How do the systems in the body interact during the healing process?" (page 299), and in Lesson 13: "you may mark examples of evidence you see and jot notes about where specifically a student has room for improvement or has shown above-and-beyond understanding. Th is [sic] feedback can then be shared with students (in writing or in a conversation) to support their learning" (page 355).

Student artifacts show changes in reasoning and thinking over the course of the unit. For example:

- The "Body as a System" Poster is revised and added to throughout the unit as students add in information from each lesson that applies to the body healing as a system. A matrix is provided on pages 319–324 explaining how student thinking changes over the course of the unit and how this should be reflected in what they add to the poster.
- The Progress Tracker is used by students to show their changes in their learning over the course of the learning sequence. For example:

  - Lesson 2: "We will use this tool to help us keep track of ideas we figure out from each lesson. In the 'What we figured out in words/pictures' you can draw pictures or write in words, bullet points, or whatever way is most meaningful for you. The 'This makes me think or wonder about healing….' column helps us think about the big picture of how healing happens as we figure out new things or what questions we might have that we want to learn more about. Initially, we may have more questions in this section or partial ideas, but that is okay because questions help us figure out what we still need to know. Individually take 3 minutes to think about what you figured out from our last classes. You can draw from anything we've done so far" (page 87).
  - Lesson 9: "Ask them to add rows for what we've figured out about what happens at the site of injury to fill the gap. Remind students that this tracker is their space to process and record their thoughts while we're working to figure out how an injury can heal. Suggest that students try to draw what they think is happening in the gap. To help students struggling to construct this drawing, consider drawing a gap in skin cells on the board such as the one shown here. Additionally, if students mentioned after Video #1 that groups of cells may connect together, then ask them to show how that would work using this starting picture. You could ask students to draw the image in their notebooks and then draw what happens in the gap. Give students 5-8 minutes to add to their Progress Trackers" (page 208).
- Lesson 7: "…Now we need to begin to shift and make sense of what happens at the cell level for the body to heal from an injury. At this point in the unit, this assessment is formative in the sense that students should include cells in their models, specifically the type of cell that corresponds to the body part they chose to model in their notebook. They should also include how the injured part results in a change in function of the foot. Students may represent the injured part at the cellular level in many different ways such as: Cells damaged or missing; Cells pushed apart but not broken" (page 182).

Suggestions for Improvement

- While oral feedback may be provided by the teacher and peers during partner share time and "scientist circles", there are not as many opportunities for written feedback from the teacher and peers. Adding more of these opportunities would be beneficial to student learning.
- More opportunities to provide students individual feedback from the teacher or peers and time and support for students to revise their thinking, models, and explanations based on that feedback would strengthen this category.

II.C. BUILDING PROGRESSIONS

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

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

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

Rating for Criterion II.C. Building Progressions	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials identify and build on students' prior learning in all three dimensions because the unit materials indicate the prior learning proficiencies students should have and the progression of the learning throughout the unit.

Related evidence includes:

- Expected student prior learning for all three dimensions is described, as well as how the unit builds off of this prior learning, in the "What additional ideas will my students have or know from earlier grades or OpenSciEd units?" section of the Teacher Edition (page 18). Note that the reviewers found the labeling confusing as it lists the elements as "Previous unit or grade-level DCIs," while CCCs and SEP elements are also included in this table.
- In the "Teacher Background Knowledge" section of the Teacher Edition, a table showing expected learning for the focal DCIs, SEPs, and CCCs during the unit is provided. This table explains which lessons students are interacting with each element of the three dimensions and briefly describes what activities help to develop their learning.
- Side call-out boxes in the Teacher Edition often highlight expected prior learning and how to build off of it. Most of these call-outs focus on CCC elements and are not found in every lesson. A few examples are included here:
    - Lesson 1: "SUPPORTING STUDENTS IN DEVELOPING AND USING SCALE, PROPORTION, AND QUANTITY Creating a timeline in this first lesson helps to map out the different points in the healing process of the foot. Over the course of the unit students will realize that different parts of the body take differing amounts of time to heal. In addition, they will figure out what is happening at a microscopic scale during the healing process for each of these parts of the body. Students will begin to connect the crosscutting concept of Scale, Proportion, and Quantity in regard to time and scale. Students will continue to develop this crosscutting concept throughout the unit through additional investigations, models they develop, and explanations they construct" (page 36).
    - Lesson 2: "Over the course of the unit, students will incrementally build a system model of the body and how the different parts interact to help our body heal. In this lesson, we are just beginning to explore as a class how we can use the system thinking we have already figured out in earlier units in 6th grade, such as the Cup Design Unit, to make sense of how different parts in a system interact for the system to function. By titling this poster something similar to Our Body as a System, we are supporting students in applying the system thinking from earlier units to a new phenomenon" (page 81).
    - Lesson 3: "SUPPORTING STUDENTS IN DEVELOPING AND USING SCALE, PROPORTION, AND QUANTITY These diagrams help support students' transition to considering body parts at a microscopic scale. Students will develop their understanding of 'zooming in' at different scales over the next three lessons, as they use microscopes and microscopic images to investigate blood, nerves, skin, bone, and muscle. Zooming in at different scales will help students gain a rich understanding of the structure-function relationship within each of these parts. As such, do not yet call attention to the idea of microscopic scale here; simply continue to use the idea of getting closer and seeing inside. In Lesson 6, after students have seen these structures magnified 40, 100, or

even 1,000 times, you can revisit these diagrams to notice that the artist may not have represented in these diagrams exactly what we actually see at the various scales. The artist's purpose here was instead to show what we cannot see from outside the body and provide clarity using color to differentiate structures" (page 100).

- In some lessons, the "Where We Are Going" information found at the beginning of the lesson describes how prior learning will be built upon. A few examples are included here:
    - Lesson 4: "Students have investigated phenomena that involve different scales. For example, in OpenSciEd Unit 6.4: What causes Earth's surface to change? (Everest Unit), students identified patterns in regional and global earthquake data at different spatial (zooming in/out) and temporal (short and longer time periods) scales. In this lesson, students investigate phenomena using a microscope and quantitative scale (magnification). Previously, in sixth grade, students used 'zoom-ins' to consider what they cannot see, such as considering differences in particle movement at different temperatures. In this lesson, rather than only modeling non-visible parts and processes, students will use a tool (a microscope) to actually see things at the microscopic scale. If your students already have experience using microscopes, make sure you discuss or revisit the idea of microscopic scale when considering how microscopes can help us investigate blood in step 5. This lesson references students' prior knowledge from OpenSciEd Unit 6.1: Why do we sometimes see different things when looking at the same object? (One-way Mirror Unit): lenses refract light and change what we can see. If your class did not read How do eyeglasses help people see better? as home learning in Lesson 6 of that unit, you might want them to read it as home learning between days 1 and 2 of this lesson" (page 110).
    - Lesson 5: "In OpenSciEd Unit 6.1: Why do we sometimes see different things when looking at the same object? (One-way Mirror Unit), students explored the role of the brain in processing inputs or signals from the body. They investigated the structures that make up the human eye, how those structures receive light inputs and change those inputs into electrical signals, then send those signals along the optic nerve to the brain, where they are processed into what we see. In this lesson, students further explore the relationship between the structure and function of nerves to understand the role of nerves in the body. They use microscopic images to observe nerves, discovering that nerve cells have a unique structure. As students model what they observe, they wonder about the structure of nerve cells. Using a scaffolding tool for SEP 8 Obtaining, Evaluating, and Communicating Information, students read scientific text to obtain additional information about nerve cells, which helps them figure out that the nerve cells' distinctive structure makes them perfectly suited for their functions (Lexile reading estimate: 1100L-1300L). Students learn that nerve cells branch out and connect with all parts of the body and with one another, allowing signals to flow to and from the brain" (page 138).
    - Lesson 10: "In previous lessons, students figure out that the human body contains different types of cells and that the structure of a cell is related to its function. They also see that these cells can grow and split to make more cells. In this lesson, students will not yet be delving into the middle school level understanding of growth of our body. They are comparing growth of cells before they split to the growth of a child as they age. In this lesson, students share initial ideas about bacteria and analyze data from an investigation to confirm that cells need nutrients to grow and split to make more cells. Although they do not conduct the investigation themselves, this secondary data allows students to notice that more bacteria grows as the nutrient level of the gel

is increased. Later, in Lesson 13, students will use their model of healing to argue that the larger scale of growth in the body is a similar process to healing. In addition, as students apply their healing model to the process of growth, they will connect this to how this results in their body also growing as new cells are made" (page 214).

Suggestions for Improvement

Consider adding call-outs for anticipated student alternate conceptions/misconceptions that students may have while building toward the learning targets and highlighting support for teachers to address these.

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 *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials use scientifically accurate and grade-appropriate scientific information because all scientific ideas and representations included in the materials are accurate and valid scientific sources are used for all readings and scientific content used in the unit.

Related evidence includes:

- The Teacher Background Knowledge section provides teachers with potential preconceptions students may bring to the unit (page 13).
- Lesson 4: Students read a scientifically accurate article about blood cells that is adapted from several reputable online sources (hemotology.org, kidshealth.org, National Health Institute, American Red Cross) (6.6 Lesson 4 Handout Reading What is Blood).
- Lesson 5: Students read about The Body's Nervous System. The reading is adapted from an article from the National Institutes of Health and livescience.com
- Lesson 6: Students jigsaw a collection of readings about microorganisms. These readings all contain scientifically accurate information.

Suggestions for Improvement

None.

II.E. DIFFERENTIATED INSTRUCTION

Provides guidance for teachers to support differentiated instruction by including:

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

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

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

Rating for Criterion II.E. Differentiated Instruction	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials provide guidance for teachers to support differentiated instruction because supports are provided for teachers to meet the needs of a wide variety of student learners throughout the Teacher Edition and Teacher Handbook.

Materials provide clear support for students who struggle to meet learning goals.

- Each three-dimensional performance assessment has "What to look for/listen for" guidance as well as "What to do" guidance to support teachers in identifying students who are not meeting the learning goals and how to address their needs. For example:
  - Lesson 4: "What to do: If students struggle to answer this question on the handout, first make sure they know the terms 'structure' and 'function.' You may want to rephrase the question to ask, 'What is one way the shape of a blood cell helps it do its job?' You may also want to offer a sentence frame using a specific structure of the blood, such as 'The function or job of the platelets is to _____. Their structure or shape helps them do this because _____' Refer students to the images in the reading as well. They may be more comfortable making inferences about the structure/function relationship of the blood parts based on images rather than what they read in the text" (page 127).
  - Lesson 5: "What to do: If students have incomplete or missing ideas in their Progress Trackers, remind them to review the reading: The Body's Nervous System and the Obtaining Information from Scientific Text handout to look for and document the information they found in the reading. They can also revisit the How Does the Foot Heal Over Time? poster and the Our Body as a System poster for additional support. Student explanations approaching, but not yet reaching proficiency, might not include what they figured out about the structure of the nerve cells, the function of the nerve cells or how the structure supports this function. In these cases, prompt students to think back to the activities they did with a partner using the paper clips and ask them what they experienced. In addition you could ask them to think back to the activity they did with the class squeezing hands and what this helped us figure out about how the structure of nerves helps them perform their function" (page 153).
  - Lesson 9: "What to do: If students struggle with evaluating the different claims, remind students that we are trying to figure out what is happening at the injury site to fill the

gap. Ask students to describe what they observed the cells doing in the videos. If necessary, have students replay each video and help students connect how their observations involve old cells splitting and filling the gap with new cells. Then have students return to the images and claims on the How Do Cells Fill the Gap poster to assess which claims best describe what we observed and which ones don't. Then have students explain their reasoning" (page 203).

Strategies are provided to address the needs of multilingual learners, learners with disabilities, and those who read below grade level:

- The Teacher Edition provides guidance for developing a word wall (page 23). Support for the word wall can be found throughout many of the lessons in the unit.
- "Attending to Equity" call-out boxes throughout the unit provide support for teachers in meeting the needs of emerging multilingual students, students who read below grade level, and students with disabilities. A few examples are provided here:
    - Resources are provided in the Supporting Disability, Inclusion, and Social Emotional Learning section within Teacher Background Knowledge (page 20).
    - "Students should be encouraged to record their ideas using linguistic (e.g., written words) and nonlinguistic modes (e.g., photographs, drawings, tables, graphs, mathematical equations, measurements). This is especially important for emerging multilingual students because making connections between written words and nonlinguistic representations helps students generate richer explanations of scientific phenomena" (page 30).
    - "Supporting Emergent Multilingual Students: For students who are learning English or who need support following a whole-group discussion, it can be helpful to use gestures in addition to talking. For example, as students describe their injuries, have them point to the body part and move their body to describe what they were unable to do. Keep in mind, you may have students with current injuries. Ask them to explain what they can't do currently with their body. As appropriate, revoice what is shared while demonstrating with your own body the actions described" (page 31).
    - "While color coding is a useful way to quickly reference the parts of the model, letter or number coding helps ensure accessibility for any student who may be color blind. If color coding is used, consider a color palette that uses orange, blue, black, or dark brown" (page 44).
    - "Supporting Emergent Multilingual Students: When developing new vocabulary, strategies that may benefit emergent multilingual learners are to use student-friendly definitions, make connections to cognate words when possible, and include a visual representation of the word. Use these strategies throughout the unit. In addition, as the class works together to develop these two ways of using the word 'structure', it may help emergent multilingual students to include a definition in their native language on the Word Wall for each use of this word" (page 73).
    - "To support all students' perception [sic] of microscopic images in this lesson and throughout the rest of the unit, you might adapt the tools your class is using in a few ways. Students with low vision may be able to see microscopic images on a screen instead of through the eyepiece, so having a USB-connected digital light microscope available might be helpful. Students who are blind should be provided with models or raised-line images so they can participate in the exploration of graph paper and the investigation of blood" (page 111).

  - "Some students, particularly students with learning differences, below grade-level reading, or students who are emergent multilingual learners may require more support to successfully gather information from the reading (Lexile reading estimate: 1100L-1300L). Obtaining Information from Scientific Text is a tool that provides the kind of support these students may need. In addition, you could read the titles, subtitles, and image captions together and allow students to ask clarifying questions. You might also consider providing extra time for students to read or allow students to read with a partner" (page 147).
  - "At this point in the lesson, some of your students may need further support. Some options that will help ensure equity and access for students can include one or more of the following: Allow students to read through the procedures with a partner or read the procedures aloud as a class. Use consumable copies of Procedure to Investigate Structures in Red Onion Cells and remind students to use strategies for obtaining information from text, including highlighting important ideas or directions; examining images; taking notes in the margins; and documenting any questions they might have" (page 238).
- Additional guidance for meeting the needs of all learners is provided in the "OpenSciEd Teacher Handbook" (pages 28–33). Many strategies are discussed here for ensuring instruction engages and supports learners of all types and abilities.

Materials provide support and extensions for students who have already met performance expectations.

- "In this unit, Developing and Using Models is a focal SEP. Therefore, numerous scaffolds exist to support students in this practice in the context of cells and healing. If you believe your students are ready to proceed with less support, we recommend first removing scaffolding related to practices that are not focal in this unit. For example, though analyzing and interpreting data is used in a number of activities, it is likely a familiar practice, as students have engaged with it in previous units. Therefore, consider asking students to use their own methods to note similarities and differences when comparing images, or to organize and present evidence for a phenomenon, without offering them supplemental data tables, graphic organizers, or handouts (often provided throughout this unit). However, take caution when removing scaffolding, as it is designed to ensure greater access and to help remove barriers to understanding complex phenomena" (page 41).
- "You may choose to take time to explore the mathematics of ratios of blood cells, given the percentages of each type in the reading. If those percentages are true for the samples we have on our slides, and we can see X white blood cells in the field of view, how many red blood cells might we estimate are in that same field of view? If the total volume of a blood sample is 10 mL, how much of that sample would we expect to be blood plasma?" (page 130).
- "Option A - If you prefer to use microscopes, or are looking to challenge your students, and you have the time and slides available, have students follow similar procedures and safety protocols as Lesson 4 to view nerve cells under a microscope. Option B - If you have a classroom microscope whose view can be projected (rather than a class set of microscopes for students to use themselves), you may carry out this lab as a whole-class demonstration. You can invite different students to focus the microscope while everyone records what they see in their data tables. It is important for students to record their own observations so they can compare across magnifications" (page 142).
- "Universal Design for Learning: Providing students the opportunity to choose the level of perceived challenge can support engagement and help develop self determination, pride in accomplishment, and increase the degree to which they feel connected to their learning.

Readings by order of increasing difficulty: Yeast: Why are there holes in my bread? - Lexile reading estimate: 810-1000L; just below grade level Algae: What's making my fish tank look so green? - Lexile reading estimate: 1010L-1200L; on grade level What are Bacteria? - Lexile reading estimate: 1010-1200L; on grade level Archaea: Extreme Living - Lexile reading estimate: 1410-1600L; above grade level" (page 224).

Suggestions for Improvement

Consider providing more, and varied, learning opportunities that extend students who have already met expectations.

II.F. TEACHER SUPPORT FOR UNIT COHERENCE	
Supports teachers in facilitating coherent student learning experiences over time by: i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.). ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions.	
Rating for Criterion II.F. Teacher Support for Unit Coherence	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials support teachers in facilitating coherent student learning experiences over time because several clear tools are provided in the Teacher Edition that support unit coherence and linking student engagement across lessons.

Teacher guidance is provided to support the teacher in linking lessons across the unit using tools such as the DQB, the Progress Tracker, and the Our Body as a System Poster. For example:

- Examples of the DQB being used to link student engagement across lessons:
    - Lesson 5: "Revisit the Driving Question Board. If your students added questions about nerves to the DQB that they are now able to answer, take a few minutes to revisit the DQB. Read through the questions we added, as well as those in other categories that we have worked through in previous lessons, and mark those that we can answer with a checkmark. When time allows, either this day or another day, have students work in groups to document answers to these questions on 5x8 index cards or 6x8 sticky notes. It is also likely that students have additional questions to add to the DQB from their reading today or about the role of nerves in the process of healing. Take time to let students add these questions now" (pages 153–154).
    - Lesson 7: "Explain Home Learning. Display slide F. Distribute to each student a copy of DQB Questions or Parts of Questions We Have Answered and a digital copy of the questions from the Driving Question Board using the record you made at the end of Lesson 1. Using the instructions on DQB Questions or Parts of Questions We Have

Answered, tell students to read through the questions and identify which ones can be answered now and which ones we still need to make progress on" (page 182).
  - Lesson 8: "Take stock of questions we've answered from the Driving Question Board. Display slide A. Gather students into a Scientists Circle around the Driving Question Board (DQB) and poster of How Does a Foot Heal Over Time. Make sure students bring DQB Questions or Parts of Questions We Have Answered and their science notebooks. Say, Let's take stock of what we have figured out and what we still want to know about how living things heal… How could we revise the Driving Question we have for our DQB to capture this idea that we are figuring out more than just how a foot heals? (page 162).
  - Lesson 13: "Briefly take stock of the DQB to see what category(ies) we still need to make progress on. Display slide I. Have the students do a quick standing Scientists Circle around the DQB so that they can see the categories of questions. We have made a lot of progress over the course of our unit figuring out a lot about our Driving Question, How does our body heal?. But there are still groups of questions we have yet to figure out. What are some of these that you see?" (page 271).
- Examples of the Progress Tracker being used to link student engagement across lessons:
  - Lesson 4: "Direct students to the Progress Tracker section of their notebooks (landscape orientation) and have them add rows for what we've figured out about blood. Remind students that this tracker is their space to process and record their thoughts while we're working to figure out how an injury can heal…Revisit the Driving Question Board. Display slide DD. If time allows, revisit the DQB and identify questions the class can now answer about blood. (Lesson 5 includes more specific directions about how the class could document their answers.) However, it is more likely that students have additional questions to add to the DQB from their reading today or considerations about how blood and healing are related. Take time to add these questions now" (page 133).
  - Lesson 5: "Direct students to the Progress Tracker section of their notebooks. Have them turn their notebooks to landscape orientation and draw a 3-column progress tracker like the one on the slide. Remind students that the Progress Tracker is a space for them to process and record their thoughts while we're working to figure out how an injury can heal. Give students time to add to their Progress Trackers. See the sample student responses shown on the next page" (page 153).
  - Lesson 9: "Update Progress Trackers in science notebooks. Display slide G. Direct students to the Progress Tracker section of their notebooks and if they need to start a new page, remind them that in this unit we are making our Progress Tracker in landscape orientation. Ask them to add rows for what we've figured out about what happens at the site of injury to fill the gap. Remind students that this tracker is their space to process and record their thoughts while we're working to figure out how an injury can heal. Suggest that students try to draw what they think is happening in the gap" (page 208).
- Examples of Our Body as a System Poster being used to link student engagement across lessons:
  - In the Teacher Reference 3 Development of the Our Body as a System Poster section of the Teacher Edition, guidance is provided for using the poster to support students in using the **Systems and System Models** CCC as a lens to understanding the central phenomenon. "Over the course of this unit, the class will be revising the poster titled Our Body as a System. This poster will be started in Lesson 2. The purpose of this

poster is to have a space for the class to keep track of what they figure out throughout the unit about the body" (page 319). Guidance is provided showing how this CCC is used in the lessons.

- Lesson 3: "Refer back to Our Body as a System poster and remind students that we have agreed that thinking about our body in terms of systems is helpful. Say, In our last lesson we began to develop this poster around the different structures in the body and their functions. We titled it Our Body as a System. What did we decide about why we might want to think about our body as a system?" (page 96).
- Lesson 4: "Discuss the colors we observed. Tell students that you're going to record the patterns they noticed in their observations to add to a 'zoom in' on Our Body as a System poster, and you're considering what colors (marker or digital pen) we should use to draw the structures we observed" (page 124).
- Lesson 5: "Record students' ideas in drawings (possibly with words) on a piece of 8.5x11 inch paper and attach it to the Our Body as a System poster as a 'zoom in' on nerves under the zoomed in blood cell drawing. See the sample drawing shown here, based on human nerves at medium magnification. Rather than focus on what a single nerve cell looks like, the drawing should show several cells together to reinforce the idea that the system is made up of many cells working together" (page 145).
- Lesson 6: "Refer back to Our Body as a System poster. Say, If we look back at Our Body as a System poster, we have some ideas about the different parts of the body that were injured in Lesson 1. Looking just at the blood and nerves for now, we looked at where both blood/blood vessels and nerves are located in the body and what they look like up close. What did looking at these parts at different scales help us figure out?" (page 161).
- Lesson 12: "What to do: If students are struggling to fill in the event and provide evidence for their group, encourage them to look back at their Progress Tracker and the Our Body as a System poster to remind themselves what we figured out about how the different systems in the body work together when the body is healing" (page 258).

Support is provided for ensuring student sense-making is linked to learning in all three dimensions. Every lesson has at least one "Assessment Opportunity" call out box that highlights the learning in all three dimensions that is occurring in the lesson. Side boxes and notes in the Teacher Edition further support teachers in connecting sense-making to all three dimensions. For example:

- Lesson 3: "Students annotate the body part images that have been adapted for classroom use to indicate what they notice and wonder. This work gives students practice in interpreting scientific and technical images to find patterns (similarities and differences) in different views of common parts of the body. For example, students may notice that x-rays mainly show bones, whereas MRIs show bones and other structures…For now, it's sufficient for students to become accustomed to ways in which imaging can be used to see beneath the skin" (page 94).
- Lesson 6: "This question requires students to think about the body parts at different spatial scales - they've zoomed in with the microscopes and now they have to think about what's happening in the larger body parts to consider how each structural unit contributes to the tissue structure and function within the body part" (page 164). "How has looking at these different body parts using different scales helped you figure out more about the structure and function of these parts?" (page 32).
- Lesson 12: "Individually construct an explanation about healing. Display slide J. Say, Now that we have this list of key science ideas to explain how healing happens, you will use them to individually explain how the different systems of the body interact, or work together, for the

body to be able to heal. You can use your resources in your notebook, progress tracker, and from the artifacts around our classroom to help you if needed" (page 257).

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	Adequate *(None, Inadequate, Adequate, Extensive)*

The reviewers found adequate evidence that the materials support teachers in helping students engage in the practices as needed and gradually adjust supports over time because teacher-provided scaffolding is reduced over time for the SEP, **Developing and Using Models**; however, reduced scaffolding over time is not provided for all targeted SEP elements in the unit.

Teacher scaffolding is provided at the beginning of the unit and reduced over the learning sequence for the SEP element, *Develop and/or use a model to predict and/or describe phenomena*.

- "Developing and Using Models is a focal SEP. Therefore, numerous scaffolds exist to support students in this practice in the context of cells and healing. If you believe your students are ready to proceed with less support, we recommend first removing scaffolding related to practices that are not focal in this unit. For example, though analyzing and interpreting data is used in a number of activities, it is likely a familiar practice, as students have engaged with it in previous units. Therefore, consider asking students to use their own methods to note similarities and differences when comparing images, or to organize and present evidence for a phenomenon, without offering them supplemental data tables, graphic organizers, or handouts (often provided throughout this unit). However, take caution when removing scaffolding, as it is designed to ensure greater access and to help remove barriers to understanding complex phenomena" (pages 40–41).
- Lesson 1: The class forms a "Scientists Circle" and through a teacher-guided discussion and students sharing their ideas, a class initial consensus model of healing is made on a poster (pages 43–49).
- Lesson 8: "In your notebook you are going to be given about 5 minutes to develop a model that represents what you think is happening at the site of injury in the time-lapse so that the gap in the skin where the scrape occurred was filled, or healed over time. As you develop your model, use what we have figured out about the different parts, or structures of our body, what these different structures do and how the different structures interact with other systems in our body, to show what parts are involved in this process of closing the gap from the scrape. Include these structures as part of your model…. Tell students to use the directions on the slide to do a modified talking stick protocol with their group. Small Group Talking Stick Round 1: Take your model with you and meet with the small group you are assigned to. When given the

start signal, pass around a pencil as a talking stick and take turns, each person using their model to explain how the skin cells form new skin on the foot [1 minute per person]. As each person shares, think about how their idea compares with other models you've seen (including your own). Small Group Talking Stick Round 2: Pass the talking stick around again to have each person share at least one similarity, difference, or question you noted between the models that were shared [1 minute per person]. Students may also choose to share what they would revise about their initial model based on what they heard from their peers about their models" (page 191). Here students individually make a model of the foot healing. They then work in small groups to get peer feedback on what to improve on their models.

- Lesson 13: "Using words or pictures (or a combination), explain what happens in the different parts of the body (subsystems) that are around the growing bone you selected, as the bone grows." In the Summative Assessment document, students must make a model for bone growth based on what they learned about healing. In this assessment, students are expected to develop their model independently without teacher or peer feedback/collaboration.

Suggestions for Improvement

Currently, a general statement about releasing scaffolding over time is provided as guidance for teachers. Providing specific strategies for reducing scaffolding at specific times in the Teacher Guide for most of the targeted SEP elements would better support teachers to ensure students become more independent in their use.

How Do Living Things Heal?

EQuIP RUBRIC FOR SCIENCE EVALUATION

OVERALL CATEGORY II SCORE: **3** (0, 1, 2, 3)	
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

CATEGORY III

MONITORING NGSS STUDENT PROGRESS

III.A. MONITORING 3D STUDENT PERFORMANCES

III.B. FORMATIVE

III.C. SCORING GUIDANCE

III.D. UNBIASED TASK/ITEMS

III.E. COHERENT ASSESSMENT SYSTEM

III.F. OPPORTUNITY TO LEARN

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	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials elicit direct, observable evidence of students using practices with core ideas and crosscutting concepts to make sense of phenomena and/or design solutions because the unit materials frequently provide varied tasks to students that require three-dimensional sense-making using grade-appropriate elements.

The unit materials regularly elicit direct, observable evidence of student learning in all three dimensions while making sense of phenomena. Formal assessment tasks are driven by well-crafted, real-world scenarios and phenomena. For example:

- Lesson 2: Students revise an investigation procedure with chicken wings in order to test possible causes and effects of the foot injury phenomenon they are trying to explain. In this task, students use the following three dimensions:
    - SEP: **Planning and Carrying Out Investigations —** *Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.*
    - DCI: **LS1.A** *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
    - CCC: **Cause and Effect —** *Cause and effect relationships may be used to predict phenomena in natural or designed systems.*
- Lesson 4: Students observe prepared slides of blood in the microscope to try to better understand the foot injury healing process. Students individually write about what structures of the blood were observable at different scales and compare patterns with other groups to analyze and interpret their data they collected. In this task, students use the following three dimensions:
    - SEP: **Analyzing and Interpreting Data —** *Analyze and interpret data to provide evidence for phenomena.*
    - DCI: **LS1.A** *Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.*
    - CCC: **Scale, Proportion, and Quantity —** *Phenomena that can be observed at one scale may not be observable at another scale.*
- Lesson 6: Students update their Progress Trackers and it can be used as a formative assessment for the targeted lesson objective: "Building towards: 6.A Analyze and interpret observational data [**Analyzing and Interpreting Data**] in the microscopic structures of skin, bone, and muscle, relating those structures to the functions [**Structure and Function**] of those parts of the body [**LS1.A Structure and Function**]" (page 171). Students include what they have figured out so far: "The parts of the body are made of cells, and those cells have different structures depending

on their function in the body. Bone cells form ring-like patterns close together to provide structure and strength for the body. Skin cells squish together and overlap one another to create a protective layer that keeps things in or out of the body. Muscle cells are long and stringy so that they can stretch and contract, allowing the body to move" (page 170). In this task, students use the following three dimensions:

  - SEP: **Analyze and Interpret Data —** *Analyze and interpret data to provide evidence for phenomena.*
  - DCI: **LS1.A** *Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.*
  - CCC: **Structure and Function —** *Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.*

- Lesson 7: Students are provided with microscope images of many different materials/organisms. Students plan an investigation using microscope images to make an argument based on evidence of whether all things are made of cells or some things are made of cells. In this task, students use the following three dimensions:
  - SEP: **Engaging in Argument from Evidence —** *Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.*
  - DCI: **LS1.A** *All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).*
  - CCC: **Scale, Proportion, and Quantity —** *Phenomena that can be observed at one scale may not be observable at another scale.*
- Lesson 10: Students individually construct written arguments concerning what bacteria cells need to reproduce based on patterns seen with their observations of Petri dishes and their analysis of data. This is in service of determining what cells need to reproduce in order to explain how the body can repair itself through cell division. In this task, students use the following three dimensions:
  - SEP: **Engaging in Argument from Evidence- —** *Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.*
  - DCI: **LS1.A** *All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular).*
  - CCC: **Patterns —** *Patterns can be used to identify cause and effect relationships.*
- Lesson 12: Students observe related phenomenon of a lizard and a sea star regrowing body parts after an injury in order to better understand the anchor phenomenon of the healing, injured foot. Students construct explanation based on patterns they see in the healing process for these organisms. In this task, students use the following three dimensions:
  - SEP: **Constructing Explanations —** *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.*

  - DCI: **LS1.A** *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
  - CCC: **Patterns —** *Patterns can be used to identify cause and effect relationships.*
- Lesson 13: Students construct an explanation of bone growth in words and pictures while focusing on how different subsystems work together for healing. In this task, students use the following three dimensions:
  - SEP: **Constructing Explanations and Designing Solutions —** *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real-world phenomena, examples, or events.*
  - DCI: **LS1.A** *In multicellular organisms, the body is a system of multiple interacting sub-systems. These sub-systems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
  - CCC: **Systems and System Models —** *Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.*

Suggestions for Improvement
None.

III.B. FORMATIVE	
Embeds formative assessment processes throughout that evaluate student learning to inform instruction.	
Rating for Criterion III.B. Formative	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials embed formative assessment processes throughout that evaluate student learning and inform instruction because the Teacher Edition includes frequent highlights of formative assessment opportunities and links them with the three dimensions being assessed. Issues concerning equity are called out in side boxes. Teacher support for modifying instruction to meet individual student needs based on the assessments results is provided.

Formative assessment opportunities and support are frequently called out in the Teacher Edition and provide support for student thinking in all three dimensions. At least one formative assessment opportunity is highlighted in every lesson. For example:

- Lesson 2: "Assessment Opportunity: Building towards: 2.A Analyze and interpret data to highlight the interactions between subsystems (skin, muscle, bone) within the larger system (foot or wing)…What to do: Students watch this chicken wing dissection as a class to look closer at the different parts. Some students may struggle with recording observations while watching. Make these videos available to students to watch on their own outside of class multiple times, so that they have enough time to make sense of how the different parts look, move, and interact. Another option, if the technology is available in your classroom, is to watch the video

as a class once together, and then have students play it again in small groups on devices to make their observations" (page 72).

- Lesson 4: "Building towards: 4.A.2 Collect data at different scales to answer scientific questions about the components found in blood. What to look for: When skimming what students have written in their notebooks, look for ideas such as: With the microscope, I could see different parts of the blood (circles, dots, blobs, different colors). With the microscope, I can tell that blood is a mixture because I can see the different components that make it up. Without the microscope, the slide just looks like pink glass. Without the microscope, blood looks like it's all the same throughout. What to do: Take note of any students who are struggling to describe these differences in what they could see with the microscope versus without. Support those students in the Building Understandings Discussion in the next step. For instance, you might choose to have students talk with a partner before sharing their ideas, and make intentional decisions about pairing these students with others who have clearer understandings about what they observed. You might also ask these students to help scribe or draw what the class is describing during the discussion that follows. Those students should realize that blood (in humans and other animals) is composed of a mixture of things we cannot see without a microscope" (page 124).
- Lesson 7: "Building towards: 7.B Develop a model at a zoomed in scale to describe what happens to the structure and function of skin cells at the time of injury. What to look for/listen for: The purpose of this assessment is formative in nature. Students have now figured out a lot about how the different parts of the body are made of cells and that all of these cells are unique to that part of the body. Now we need to begin to shift and make sense of what happens at the cell level for the body to heal from an injury. At this point in the unit, this assessment is formative in the sense that students should include cells in their models, specifically the type of cell that corresponds to the body part they chose to model in their notebook. They should also include how the injured part results in a change in function of the foot. Students may represent the injured part at the cellular level in many different ways such as: Cells damaged or missing Cells pushed apart but not broken What to do: For students who are hesitant to brainstorm what this might look like at a cellular level, use probing questions such as the one below to help support them in incrementally developing this model: What do you already know about how the (part of the body they chose to model) looks under the microscope? When the weight fell on the student's foot and injured it, what did the (part of the body they chose to model) look like in the images from the doctor? Now imagine you could zoom in on (part of the body they chose to model) after the weight injured it - what do you think the cells would look like?" (page 182).
- Lesson 9: "Assessment Opportunity: Building towards 9.A.2: Analyze and interpret data from videos at varying spatial and time scales to conclude that new cells come from old cells following a predictable pattern of repeated steps… What to do: If students struggle to show how the gap is filled by new cells that result from old cells splitting, consider making a separate handout with the image to the right drawn at the top. Then ask students to draw 2-3 more blank boxes below and draw what is happening in these steps in order for the gap to be filled in the end. You could also replay Video #1 at this point, and then ask them to fill in the diagrams" (page 209).
- Lesson 10: "10.A Analyze and interpret data for patterns to identify the relationship between the amount of food (cause) and the amount of bacteria made (effect) to provide evidence that cells need food to live and make more of themselves. What to look for: Students are able to identify that as the amount of food available on the agar plates increased (as indicated by an increase in percentage of nutrients on the agar plate, or concentration), the bacteria increased.

They should be able to interpret these data as an indication that the bacteria do need food (and other nutrients) to make more of themselves. What to do: If students are struggling to identify patterns in the data, it may help to have them trace the streaks they can see on each plate with a highlighter. Ask, Which plate has the most highlighting? What was different about that plate? It may help to refer back to the independent, dependent, and control variables in these investigations. Say, How does changing ____ affect _____? If students are struggling to use cause and effect language when discussing patterns in the data, point out that it helps to identify the effect by thinking about what happened or what was one finding from the investigation (i.e. lack of bacterial growth). Then, you can identify the cause by looking at what was done in order to produce that effect, or obtain that outcome (i.e. provide no nutrients). As additional support, consider offering sentence starters to help students discuss cause and effect such as the following" (page 223).

- Lesson 11: "11.A.2 Construct an explanation to show that the structure of cell membranes and/or cell walls (tiny openings) let certain things in and out of cells (function). What to look for/listen for: Students should connect the changes in the pigmented part of the cell to movement of water through the cell boundaries (cell wall and cell membrane). Refer to the Key Ideas above. What to do: If students had trouble seeing the changes caused in the cells by the salt water and plain water, you might want to have them carefully look at the images in Reference: Red Onion Investigation Images and have them identify specific changes they see in the cells" (page 242).

Formative assessment processes attend to some issues of student equity but supports for equity in assessment are not provided regularly for all formative assessments. A few examples of supports are given below:

- "Scaffolds such as sentence starters can model and facilitate particular oral or written language production skills such as formulating questions, hypotheses, explanations, or arguments based on evidence (see Communicating in Scientific Ways poster). Such scaffolds may be of particular benefit for emerging multilingual students to help them develop language skills to write or communicate their ideas to peers. It is important that scaffolds be used purposefully and removed when no longer needed" (page 43).
- "In order to support students who might benefit from other options for representation, you may choose to print Microscopic Images of Animal Blood and direct them to annotate those images with ideas about how they compare to what students see in their microscopes and/or ideas about the patterns they notice in the structures they see across the samples" (page 120).
- Lesson 4: "Assessment Opportunity: Building towards: 4.B Critically read scientific text to make sense of patterns within structures we observed in the blood related to their function in the body… What to do: If students struggle to answer this question on the handout, first make sure they know the terms 'structure' and 'function.' You may want to rephrase the question to ask, 'What is one way the shape of a blood cell helps it do its job?' You may also want to offer a sentence frame using a specific structure of the blood, such as 'The function or job of the platelets is to _____. Their structure or shape helps them do this because _____' [sic] Refer students to the images in the reading as well. They may be more comfortable making inferences about the structure/function relationship of the blood parts based on images rather than what they read in the text. Finally, it may help students to consider, 'What if the opposite were true?' For example, 'What if the blood plasma was really thick and sticky? How would that make it hard to do its job?' or 'What if the blood cells were square-shaped? Would they be able to do their job well?'" (page 127).

- "For some students, processing which questions can be answered with evidence may take longer than others and when this is done in a whole group, they may struggle to follow all the answered questions. By giving this activity as home learning, students will have an opportunity to process all the questions the class has which will allow more to be ready to share the next day in class" (page 182).

Suggestions for Improvement

- Consider providing additional detailed scoring guidance for teachers for all formative assessments, including a range of student responses.
- Consider adding additional opportunities within formative assessments that allow multiple ways for students to demonstrate their thinking in order to attend to students' individual levels and needs.

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	Adequate *(None, Inadequate, Adequate, Extensive)*

The reviewers found adequate evidence that the materials include aligned rubrics and scoring guidelines that help the teacher interpret student performance for all three dimensions because while all major assessment opportunities include scoring or feedback guidance, there isn't sufficient evidence of guidance for the teacher to provide on-going targeted feedback for students. Student exemplars are often provided but do not show examples of student responses at a range of different mastery levels.

Guidance for teachers to interpret student progress and to modify instruction is provided for teachers, but not ongoing, targeted feedback for students.

- "Assessment Opportunity" boxes in every lesson define the learning targets for all three dimensions each time an assessment comes up. These boxes provide a "What to look for" section to help teachers interpret student progress and a "What to do" section to help teachers modify their instruction based on the student responses. Feedback for students who do not meet the expected learning is often provided but not consistently for all assessments and not for a range of different student responses. Some examples are provided here:
    - Lesson 5: "Building towards 5.A: Gather and synthesize information from scientific text and other sources to describe the basic structure of nerves and nerve cells and explain how the structure supports both the function of nerves within the nervous system and the interactions that occur between nerves and other body systems (e.g., skin, bone, muscle). What to look for :[sic] As students use the prompts and strategies outlined on Obtaining Information from Scientific Text while Reading: The Body's Nervous System, they should highlight and document information in the reading that supports the

following ideas: There are nerves in skin, bones, muscles, and other parts of the body. Nerve cells have a very unique structure - they have long, skinny 'branches' or 'tentacles' protruding from a central portion. The structure of nerve cells is perfectly suited for their function. Nerve cells branch out and connect to other nerve cells throughout the body, forming a network of nerves that carry signals between all parts of the body and the brain. What to do: If students struggle to find the information they need in the reading, call attention to the strategies and prompts in Obtaining Information from Scientific Text. Remind them to: Read for the gist (or central idea) by skimming the title, headings, and captions on images. Markup the text by keeping track of questions we have in the margins, circling key words, putting question marks by words they want to learn more about, and underlining main ideas. Examine images, graphs, and tables and look for the central point of each. Identify the ideas from the text that support what we have figured out so far. If students struggle to identify ideas from the text to support what they've figured out so far, cue them to think about the structure and function of nerves. Remind them about how the structure of blood cells supports their function, and ask them to point to ways in which the structure of nerve cells helps them perform their job. Alternatively, ask students first how the reading describes the job that nerves perform. Then ask what it is about the nerve cell's shape that allows them to perform this job well. If students continue to struggle with the reading, allow students to read and discuss with a partner" (page 148).

- Lesson 10: "10.B Construct a written argument using cause and effect relationships to conclude that the cells that make up multicellular organisms need food to make more cells as do the cells of unicellular organisms. 10.B Engaging in Argument from Evidence; Cause and Effect When to check for understanding: When students complete (CL.L10.SA) at the end of day 2. What to look/listen for: See Key: What do bacteria need to make more of themselves? for scoring guidance" (Assessment System Overview, page 7). "Answer Key: 2. Think back to when we saw the mammal cells making more of themselves in the last lesson. Construct an argument: What do you think our cells need to reproduce and make more of themselves to heal the wound? Look for the following ideas represented in written, oral, or pictorial form. Encourage students to use annotations and/or a key if choosing to use a pictorial form. Student responses should include: + food or nutrients; + I know my body needs food; + I know my body is made of cells; + We saw that bacteria cells are similar to the cells of the multiple cell organisms that we saw grow and split (evidence); they have similar structures, edges or cell membranes…+ Since the single cells we investigated needed food to grow and make more of themselves, and I saw that cells in a mammal also grow and make more of themselves (evidence), I think my cells would also need food to grow and make more of themselves to heal the wound [fill the gap]. A complete and exemplary response should include some combination of the ideas listed above including: At least one clear reference to evidence from the bacteria investigation in this lesson, and/or the cell growth videos from lesson 9. At least one clear reference to cause and effect. A partial response might include only one of the ideas above, or multiple ideas without… a clear reference to any specific evidence from the bacteria investigation or the cell growth videos from lesson 9a clear reference to cause and effect" (page 339.)
- Lesson 13: "Lesson 13 Answer Key: Scoring Guidance: Growth Summative Assessment: Directions: The alignment table shown here indicates how students work on Growth Summative Assessment supports each element of this three-dimensional lesson-level performance expectation. The descriptors listed with the elements describe possible

evidence that the element is used effectively in the student's explanation. The rubric that follows offers the same descriptors as the alignment table, but in a format that may allow you to more easily record student progress and/or communicate feedback to students. This rubric does not attempt to predict all the possible ways students may still show that they are developing their understandings and use of practices, nor does it attempt to forecast all the possible ways students may show they have advanced understanding and/or especially deep use of practices. Instead, you may mark examples of evidence you see and jot notes about where specifically a student has room for improvement or has shown above-and-beyond understanding. This feedback can then be shared with students (in writing or in a conversation) to support their learning. 13.A Apply science ideas and evidence from classroom investigations to explain a common, real-world phenomenon in which the specialized cells of living things serve particular functions as they work together to interact with each other and other systems to make more cells and grow" (Teacher Edition, page 355). This key provides a summary of what to look for in all three dimensions, e.g., "Students apply key science ideas using evidence they collected over the course of the unit to construct an explanation for real-world phenomena in which they must draw upon the science ideas related to the healing process to explain growth" (page 356). A one-point rubric using + signs to indicate what students should include is also provided. A range of student responses is not provided and it is unclear how feedback should be provided to students in order for them to track their own progress.

All major assessment opportunities include scoring or feedback guidance for teachers found near the end of the Teacher Edition and includes exemplar student responses. This is provided for the following assessments: Lesson 7 – "Are Other Things Made of Cells", the Lesson 10 – "What do bacteria need to make more of themselves", the Lesson 11 – Data from Investigating Red Onion Cells", the Lesson 12 – "How do the systems in the body interact during the healing process", and the Lesson 13 Summative Assessment.

Suggestions for Improvement

- More specific guidance for providing ongoing, targeted feedback for individual students based on their responses
- Provide a range of sample student responses on major assessments to help guide teachers.
- Providing rubrics and self-assessment guidance to students on major assessments.

III.D. UNBIASED TASK/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	Extensive *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials assess student proficiency using accessible and unbiased methods, vocabulary, representations, and examples because the unit materials include grade-level appropriate tasks, assessments, representations, and vocabulary. The scenarios and representations are fair and unbiased. Some tasks include options for students to present information using multiple modalities.

Vocabulary use and text volume in student assessments are grade appropriate and usually accompanied by visual communication. For example:

- Support for developing a word wall to assist students with vocabulary use, especially emergent multilingual students, is provided throughout the materials.
- Text volume used in assessment tasks use appropriate middle school vocabulary and text length. Places where unfamiliar vocabulary might be used is sometimes highlighted in the teacher materials.
- All major assessment handouts include visual cues such as diagrams and photos/images along with the assessment text prompts.

Representations, phenomenon, and scenarios are fair and unbiased and support teachers in ensuring all students can engage with the phenomena.

- "Attending to Equity" side boxes provide potential scaffolds for students who may not have the background or abilities to be successful with an assessment task or learning task.

Multiple modalities are occasionally used both in assessment tasks and in expected student responses. Student choice of modalities is not present in the assessments, however.

- Some examples of multiple modalities used in tasks and student responses include:
    - Lesson 2: "The goal in this moment is two-fold: (1) to support engagement by optimizing choice of how they would proceed with the investigation, and (2) to allow students to express their ideas using multiple modalities supports student ownership of their learning by giving students choice, access, and control in navigating their own understanding around the science ideas. All versions of responses can productively contribute to the next day's discussion" (page 76).
    - Lesson 10: "Based on the data you analyzed and the information you obtained in this lesson, what do bacteria and other single-celled organisms need to reproduce and make more of themselves? Use words or pictures (or a combination) to show your ideas" (Lesson 10 Assessment — What do bacteria need to make more of themselves?).
    - Lesson 13: "Using key science ideas from the unit, explain what you think happens to the structures of the bone at the growth plate as a child grows into an adult? Use words or pictures (or a combination) to explain your answer to this question. Think about what you have figured out about how the different parts and systems of the body work together. Use your key model ideas, science notebooks, the posters we have created together, and evidence from the growth plate images. Be sure to include the interactions between the different systems in our body that need to happen to support this" (Lesson 13 Assessment — Growth Summative Assessment).

Suggestions for Improvement

Provide multiple modalities/representations of information in assessment tasks more often and allow students choice in modality on some major assessments.

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 *(None, Inadequate, Adequate, Extensive)*

The reviewers found extensive evidence that the materials include pre-, formative, summative, and self-assessment measures that assess three-dimensional learning because the unit materials provide all four assessment types and the assessments require students to apply elements of the three dimensions to make sense of a phenomenon.

While multiple examples of each type occur during the unit, evidence of at least one example of each type is provided below.

Pre-assessment:

- Lesson 1: "Healing Initial Model" assessment as well as the DQB are highlighted as a pre-assessment of student knowledge and learning for the unit in the "Assessment System Overview" part of the Teacher Guide (page 298).

Formative assessment:

- Lesson 7: The two-part student assessment is highlighted as a "Mid-point" formative assessment of learning towards *MS-LS1-1: Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells*.
- Lesson 11: "Formative Assessment: Students construct an explanation from evidence for what is happening when stuff gets into and out of cells. Use Key: Data from Investigating Red Onion Cells to assess where students are at in their thinking about the structure of the cell and how things could get in and out of the cell" (Assessment System Overview, page 2).

Summative assessment:

- Lesson 12: "Students develop explanations to explain how different parts of the body of the student from Lesson 1 heals over time. Summative Assessment: Students use the different events from the Healing Timeline as pieces of evidence that different parts of the student's body had healed. In their explanation they include the interactions between the systems that need to occur for that part to heal. Collect How do the systems in the body interact during the healing process? and use the science ideas in Key: How do the systems in the body interact during the healing process? to assess student explanations and check for understanding they are bringing from their experience with the unit thus far. Provide students feedback on their explanations using the single point rubric found in the Key: How do the systems in the body interact during the healing process?" (Assessment System Overview, page 2).

- The Unit 13 Summative Assessment on bone growth and plant growth serves as a summative assessment of student learning in three dimensions.

Self-assessment:

- Progress Tracker: "Formative and Student Self-Assessment: The Progress Tracker is a thinking tool that was designed to help students keep track of important discoveries that the class makes while investigating phenomena. This tool can also be used to figure out how to prioritize and use those discoveries to develop a model to explain phenomena. It is important that what the students write in the Progress Tracker reflects their own thinking at that particular moment. We strongly suggest it is not collected for a summative "grade" other than for completion. The Progress Tracker is added to in Lessons 2, 4, 5, 6, 9, 10, 11, and 14" (Assessment System Overview, page 3).
- Lesson 10: Students construct an argument based on evidence about what bacteria need to reproduce. This is followed with an optional self-assessment and peer feedback guided with a protocol to assist students in this assessment.

Suggestions for Improvement

The Lesson 10 Self-Assessment and Peer Feedback exercise is very valuable to student learning. Consider removing the suggestion that this be an optional activity in the unit and incorporating more self-assessment and peer feedback opportunities in other lessons like this one.

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 *(None, Inadequate, Adequate, Extensive)*

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 because the unit provides frequent opportunities to assess student performances to demonstrate growth over time, however detailed guidance for teacher feedback is limited.

Multiple opportunities are provided for student performance of **Developing and Using Models** in connection with DCI and CCCs.

- Students create initial models in Lesson 1 to show the healing process in the injured leg system. The teacher provides oral feedback to the class during the Scientist Circle in the form of class questions.
- Lesson 8: Students individually make a model of how the skin heals, focusing on how different systems and structures interact to close the gap in the skin. Students then use a talking protocol to share with a group and receive feedback.

- Lesson 13 Summative Assessment: Students use words and/or pictures to develop a model of how a bone grows and how different subsystems work together to make it happen.

Students receive some written and oral feedback from the teacher and peers.

- Students receive oral feedback from the teacher regularly through class discussion and "Scientist Circles".
- Students provide oral feedback on initial models for healing in Lesson 1 when they share and compare models with an elbow partner.
- Lesson 8: "Students share their initial model with their group. Display slide F. Tell students to use the directions on the slide to do a modified talking stick protocol with their group. Small Group Talking Stick Round 1: Take your model with you and meet with the small group you are assigned to. When given the start signal, pass around a pencil as a talking stick and take turns, each person using their model to explain how the skin cells form new skin on the foot [1 minute per person]. As each person shares, think about how their idea compares with other models you've seen (including your own). Small Group Talking Stick Round 2: Pass the talking stick around again to have each person share at least one similarity, difference, or question you noted between the models that were shared [1 minute per person]. Students may also choose to share what they would revise about their initial model based on what they heard from their peers about their models" (page 191).
- Lesson 9: "Keep in mind that the Progress Tracker should not be used as a summative assessment, but rather as a formative assessment to understand what students are thinking at this point. We recommend that you provide feedback to students in the form of questions to probe student thinking and push for more sensemaking" (page 209).
- Lesson 10: "Alternate: Self-Assessment & Peer Feedback: Before scoring individual assessments, scan a sampling of student work to look for patterns in how they use evidence to support an argument, and in how they use cause and effect language. If you notice students struggling to do either, or both, consider returning the work and providing students with an opportunity to self-assess and to receive peer feedback, following similar guidelines below… Distribute 1 copy of Peer Feedback Guidelines to each student. Review elements of quality peer feedback. Give examples of productive and unproductive feedback. While students provide peer feedback, circulate the class and probe students for places where they think their peers could include additional science ideas, evidence, and cause and effect language" (page 230). "Receiving Feedback from Peers The purpose of feedback is to get ideas from your peers about things you might improve or change to make your work more clear, more accurate, or better supported by evidence you have collected. It can also help you to communicate your ideas more effectively to others. When you receive feedback, you should take these steps: Read the feedback carefully. Ask someone else to help you understand it, if necessary. Decide if you agree or disagree with the feedback and reflect on why you agree or disagree. Revise your work to address the feedback" (Peer Feedback Guidelines, page 2). This is the only formal peer-assessment opportunity for students to receive feedback from peers (and it is listed as an optional activity).
- Lesson 13: "Provide time for students to work on Growth Summative Assessment individually. Display slide H. Distribute one copy of Growth Summative Assessment to each student. This assessment will take students the remainder of the class period to complete. Once completed, students should turn in their assessment to you for feedback" (page 271).

Suggestions for Improvement

- Additional specific guidance for teachers on providing students written feedback, and time and support/protocols for students to integrate that feedback into their future responses would be valuable and increase the rating of this criterion.
- Consider providing additional opportunities for peer written and oral feedback. Supports for formal written feedback from the teacher and students using the feedback to revise their explanations and models would be very beneficial. Also, consider using strategies such as a gallery walk to allow students to provide peer feedback to each other and then modify their model, explanation, etc. based on that feedback.

OVERALL CATEGORY III SCORE: 3 (0, 1, 2, 3)	
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

SCORING GUIDES

SCORING GUIDES FOR EACH CATEGORY

UNIT SCORING GUIDE – CATEGORY I (CRITERIA A-F)

UNIT SCORING GUIDE – CATEGORY II (CRITERIA A-G)

UNIT SCORING GUIDE – CATEGORY III (CRITERIA A-F)

OVERALL SCORING GUIDE

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)

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

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

How Do Living Things Heal?

EQuIP RUBRIC FOR SCIENCE EVALUATION

OVERALL SCORING GUIDE	
E	**Example of high quality NGSS design—**High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. (total score ~8–9)
E/I	**Example of high quality NGSS design if Improved—**Adequate design for the NGSS, but would benefit from some improvement in one or more categories; most criteria have at least adequate evidence (total score ~6–7)
R	**Revision needed—**Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5)
N	**Not ready to review**—Not designed for the NGSS; does not meet criteria (total 0–2)