

A Medical Mystery

DEVELOPER: BSCS

GRADE: Middle School | **DATE OF REVIEW:** November 2021



A Medical Mystery

EQuIP RUBRIC FOR SCIENCE EVALUATION

OVERALL RATING: Example of High Quality NGSS Design
TOTAL SCORE: 8

CATEGORY I: NGSS 3D Design Score	CATEGORY II: NGSS Instructional Supports Score	CATEGORY III: Monitoring NGSS Student Progress Score
2 (0, 1, 2, 3)	3 (0, 1, 2, 3)	3 (0, 1, 2, 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 Adequate	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 Adequate
E. Multiple Science Domains Adequate	E. Differentiated Instruction Adequate	E. Coherence Assessment System Adequate
F. Math and ELA Extensive	F. Teacher Support for Unit Coherence Extensive	F. Opportunity to Learn Adequate
	G. Scaffolded Differentiation Over Time Adequate	

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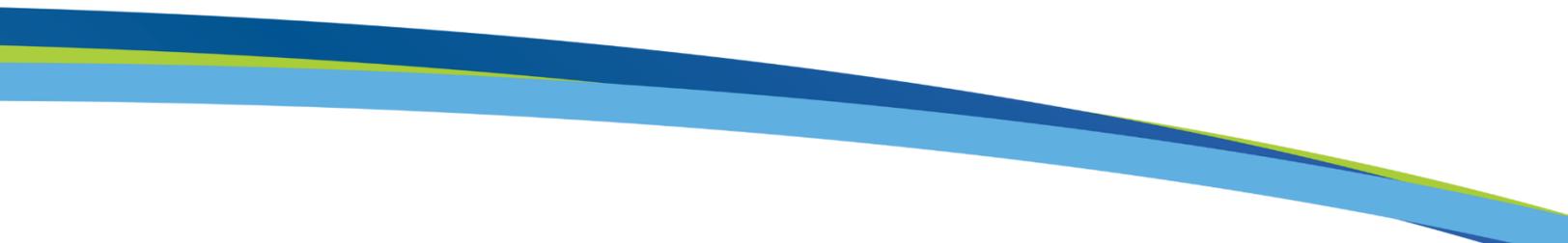
Summary Comments

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. The unit is strong in several areas, including the “Where are we in the storyline?” sections that clearly explain how students are supported in developing and using the three dimensions in every lesson, the opportunities for student to interact with phenomena in multiple ways (through animations, images, data displays, and interactive simulations, which allow students to investigate phenomena as directly as possible), the English Language Arts (ELA) Connections and Support supplementary document highlights ELA connections with clear examples that occur throughout the unit, the use of certain strategies and tools, such as the Communicating in Scientific Ways handout (which can support students in learning to speak scientifically and productively in partners or in groups), and the anchoring phenomena of M’Kenna’s mysterious illness, which is compelling and well developed, and which students may find relevant and interesting to investigate.

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

- **Adding Consistent Guidance for Differentiating Instruction for All:** Guidance to support differentiated learning of the elements of all three dimensions does not occur consistently or regularly across lessons, and the materials offer limited guidance for students with disabilities.
- **Support Teacher and Student Interpretation and Use of Assessments:** In many of the formative and chapter assessments, the three dimensions are currently implicit in the assessment items (rather than called out explicitly for each item) and the materials do not explain how the teacher could interpret responses to determine the level of students’ current proficiency with each of the three dimensions. In addition, an explanation of how the assessments work together to support teachers in understanding where students are in their learning of the three dimensions is not present.
- **Making the Crosscutting Concepts Explicit:** Consider incorporating language from the specific elements of the CCCs in the student materials and teacher supports as well as opportunities for students to reflect on the usefulness of the CCCs (in addition to the other dimensions) so that it is clear how lessons support students in developing an understanding of the CCCs and their role in three-dimensional learning and in science.

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 definitely WAS met; the purple text is simply not part of the argument for that Extensive rating.



CATEGORY I

NGSS 3D DESIGN

I.A. EXPLAINING PHENOMENA/DESIGNING SOLUTIONS

I.B. THREE DIMENSIONS

I.C. INTEGRATING THE THREE DIMENSIONS

I.D. UNIT COHERENCE

I.E. MULTIPLE SCIENCE DOMAINS

I.F. MATH AND ELA

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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**

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

The reviewers found adequate evidence that that learning is driven by students making sense of phenomena or designing solutions to a problem because the materials are organized so that students figure out a central phenomenon related to a girl named M’Kenna, who experiences a mysterious illness and sudden weight loss. Throughout the lessons, student sense-making is supported through the use of both the anchor and investigative phenomena. Students regularly return to the anchor phenomenon in every lesson to add layers to their explanation of the causes and symptoms of M’Kenna’s illness.

However, students’ questions or prior experiences related to the phenomena do not consistently create a need for the students to engage in learning throughout the materials, so students have few opportunities to feel as if they are driving the learning in the unit.

Students focus on making sense of an anchoring phenomenon, M’Kenna’s mysterious illness, and regularly return to the phenomenon to add layers of explanation. Related evidence includes:

- Unit Introduction: “For M’Kenna’s whole life, she could eat what she wanted and felt fine. But recently [...] Many foods she used to eat seemed to make her feel sick now. It wasn’t just the stomachache and diarrhea that caused her problems; she also started running out of breath all the time. She got muscle cramps when she ran and couldn’t run fast anymore. [...] And her heart would start racing even when she did something simple like climbing the stairs. [...] M’Kenna know that she needed good nutrition [...] But no matter how much she tried to eat, she just kept getting thinner” (Student Edition).
- Unit Introduction: In the Questions I Have section, students are asked to list questions in response to the prompt: “What questions does M’Kenna’s illness raise for you? [...]” (Student Edition). The teacher says “I noticed there are a lot of questions about individual body parts, but there are also questions about how body parts are related. [...] How can a problem in one part of my body cause symptoms in another part? I’m going to write this big question up here on this poster board so we can think about it. We are going to be thinking about this question for the whole unit” (Teacher Edition).

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- Chapter 1, Explain: In the Revising My Ideas section, students are told that “At the start of this unit you sketched a model of your ideas about what happens to food when you eat it. Now that you have learned more about digestion and the digestive system you can update your model” (Student Edition).
- Chapter 2, Explain 2: In the Healthy Tissue Sample: Evidence Sort section, students are told “You began this chapter making a claim about which of these micrographs belonged to M’Kenna. You now have more evidence to support or revise your claim. This information should help you determine which tissue sample is healthy and which sample was taken from M’Kenna” (Student Edition).
- Chapter 3, Explain: In the Using Body Fat to Power Cells section, students are told to “Use the animation and your storyboard to explain why M’Kenna is losing so much weight. Write your answer either as an exit ticket to turn in or in your notebook as directed by your teacher” (Student Edition).
- Chapter 3, Elaborate: In the Reflect and Connect section, students are told to “Revisit your initial model explaining M’Kenna’s weight loss in My Ideas about M’Kenna’s Weight Loss. Add any new information you have to the model” (Student Edition).
- Chapter 4, Explore: In the Reflect and Connect section, students are told “After M’Kenna got sick, she started to breathe really fast whenever she played basketball. She also said her “heart pounded” more than it normally did. Use the data you collected from the interactive to explain these changes” (Student Edition).
- Chapter 4, Explain: In the M’Kenna’s Systems: Where is the Problem? section, students are told that “Since M’Kenna is not feeling well and having symptoms in many parts of her body, there is something different about how her body systems are working with one another compared to a healthy body system. You’ve modeled how two systems work together. Now you will add to your model what might be happening in M’Kenna to change the way these systems work together” (Student Edition).
- Chapter 4, Elaborate: In the Explaining M’Kenna’s Symptoms section, students are told that “You have investigated a lot of questions about the human body and looked for answers to those questions. Along the way you figured out what happens in a healthy human body and how M’Kenna’s body is different. Now it’s time to explain M’Kenna’s symptoms. In this activity you will pretend like you are the doctor M’Kenna visited for help. You will try to answer questions from M’Kenna and her parents about what is wrong with her body and the causes of all her symptoms. You will use evidence you collected in the unit to support your claim as you write a scientific explanation” (Student Edition).

In many cases, student questions and prior experiences related to the phenomenon motivate sense-making. **In other cases, instruction is teacher driven.** Related evidence includes:

- Unit Introduction: In the A Medical Mystery section, students consider the focus question “Which part or group of parts of M’Kenna’s body might not be working right, and how do you know?” and then develop questions they have about M’Kenna: “next to each thing you noticed, write down any “why” or “how” questions you have about M’Kenna” (Student Edition).

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- Unit Introduction: In the Question I Have section, the teacher says “I noticed there are a lot of questions about individual body parts, but there are also questions about how body parts are related” and is told to “Write the driving question at the top of the Driving Question Board: How can a problem in one part of my body cause symptoms in another part?” (Teacher Edition).
- Chapter 1, Engage: At the very beginning of the chapter in the Food in the Body, My Ideas section, students are asked to “Write the Focus Question, What happens to food in a healthy person, and how is it different for M’Kenna? Draw a box around the question. Then write your ideas answering this question.” However, the teacher does not directly connect this focus question to students’ questions and students are not facilitated to ask this question.
- Chapter 1, Engage: In the Food in The Body: My Ideas section, the materials state that “Every day we eat and drink food to give our body the things we need to grow and stay healthy. Have you ever wondered where all the food goes once you eat it, and how it gets used by the body? In this activity, you will share your ideas in writing and by drawing a model of what happens to food in the body.”
- Chapter 1, Explore: In the A Trip Through M’Kenna’s Digestive System section, students are told “Now you will collect evidence about M’Kenna using the Exploring M’Kenna’s Digestion interactive. You will compare how food changes in a healthy system and in M’Kenna’s system to help you answer the Focus Question” (Student Edition).
- Chapter 1 Elaborate: In the Revisit Driving Question Board section, the materials describe how teachers should highlight students’ questions about food moving from the digestive system to the rest of the body.
- Chapter 2, Bridge: In the More Than Meets the Eye? section, students are told that “In the last chapter, you learned a lot about the digestive system, the main organs in the digestive system, and how M’Kenna’s digestive system is not healthy. [...] In this lesson you will look closer at what body parts are made of and start to think about what a doctor might see when looking closer at M’Kenna’s small intestine” (Student Edition).
- Chapter 2, Engage: At the very beginning of the chapter in the More Than Meets the Eye? section, students are asked to consider “If M’Kenna’s doctor took a closer look at the tissue in her small intestine, would the doctor be able to see something causing her illness?” and then are told to “Write the focus question: What would we see if we looked closer at body tissue? Draw a box around the question. Then write your ideas answering this question.” However, the teacher does not directly connect this focus question to students’ questions and students are not facilitated to ask this question.
- Chapter 2, Explore 2: “In this activity, you will think about a new Focus Question and what you already know about this question. You will revisit your claim about which tissue belongs to M’Kenna and update your evidence about your claim” (Student Edition).
- Chapter 2, Explain 1: In the Revisit Food Molecules: From Big to Small section, the materials state that “When you explored food molecules during digestion, you learned that the amount of some molecules increases during digestion, and then the amount decreases. You had some questions about why this happens and where these molecules come from. In this activity, you will review your digestion data to make sense of the up-and-down pattern you observed in the food molecule data. You’ll work with your team to explain why the amount of some large

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molecules decreases during digestion and why the amount of other small molecules increases (at least at first).”

- Chapter 2 Elaborate: In the Reflect and Connect section, the teacher is instructed to “Ask students to share their thoughts about what happens to nutrients that move into the body through the bloodstream. Get ideas from 3 or 4 students. The goal is to motivate students to recognize that they may not really understand what the body does with the nutrients it gets. Where do those small molecules go? What happens to them? These are questions that will be answered in Chapters 3 and 4” (Teacher Edition).
- Chapter 3 Reactions: Explore: In the Reflect and Connect section, the teacher is instructed to revisit the Driving Question Board and ask students “What questions can you answer? What questions still remain?” The teacher is encouraged to push students “to recognize that they may know that cells need nutrient molecules, but they have not yet figured out what cells do with those nutrient molecules. What happens to them and where do they go after they get into the bloodstream?” (Teacher Edition).
- Chapter 3, Explain: In the Revisit Focus Question: How Cells Use Body Stores section, the teacher is told to “Be sure to press students about questions they may have about why M’Kenna is losing weight” (Teacher Edition).
- Chapter 4, Conclusion: At the very end of the unit, students discuss in class: “Have you ever met anyone with the illness that M’Kenna has? If so, share your story with your classmates. About 1 out of every 100 people have this illness. Many of them don’t even know they have it” (Student edition). *However, because this activity occurs at the end of the unit, there may be a missed opportunity use students’ prior experiences to drive some of the learning in the unit.*

Suggestions for Improvement

- Consider providing more opportunities for eliciting and using students’ questions and prior experiences to motivate the learning throughout the unit.
- While it can be a sensitive topic, considering including opportunities for students to connect their own prior experiences with ideas related to medicine, illnesses, treatments, or the food that students eat. For example, students might share their ideas about medicine and or what they know about foods, symptoms, or activities that might be healthy or unhealthy. To support teachers in building student agency, consider including guidance for affirming the diverse ideas students may have (including ideas from different cultures and backgrounds) and leading the discussion back to questions about M’Kenna’s illness.

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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 there is a close match between the SEP elements that are claimed and evidence of SEP development and use in the materials. Many of the grade-appropriate elements that students are engaged in are in service of students making sense of phenomena.

Science and Engineering Practices (SEPs) | Rating: Extensive

The reviewers found extensive evidence that the materials give students opportunities to build understanding of grade-appropriate elements of the three dimensions because students are engaged with and develop grade-appropriate SEP elements throughout the unit.

Developing and Using Models:

- *Develop and use a model to describe unobservable mechanisms.*
 - Chapter 4, Explain: In their final explanation of M’Kenna’s symptoms of her illness, students create a list to show how the body’s systems work together. From the Scoring Guideline for the Final Explanation Document, students are expected to include unobservable mechanisms such as “The chemical reactions in cellular respiration release the energy that the cells need to survive and to function” (Teacher Edition).
- *Develop and/or use a model to predict and/or describe phenomena.*
 - Chapter 2, Explain 1: In the Modeling Absorption section, students modify a model to explain what happened in the iodine and starch cell membrane demonstration. “Draw a model of your ideas about how food inside the small intestine gets to the rest of the body. Draw, label, and describe as much as you know right now. [...] Show how you think nutrients inside the small intestine get to the other side of cells to travel around the body” (Student Edition).
 - Chapter 4, Explain: In the M’Kenna’s Systems: Where’s the Problem? section, students are told that “You’ve modeled how two systems work together. Now you will add to your model what might be happening in M’Kenna to change the way these systems

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work together.” In the lesson, students are asked to “Place an “X” where you think her systems are different from the healthy system. Then, describe what is different in her systems to cause the symptom” (Student Edition).

Analyzing and Interpreting Data:

- *Use [Interpret] graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.*
 - Chapter 1, Explore: Students collect and compare data about what is same or different between M’Kenna and a healthy person’s digestive system: “Look at the data tables to decide if M’Kenna’s data is the same or different from the healthy person’s data. If the data are the same, write “same” in the middle column. Double-check that they are the same across all the foods” (Student Edition). *However, students are potentially using a Grade 3–5-level element, Compare and contrast data collected [...] because the data tables are not a large data set.*
- *Analyze and interpret data to determine similarities and differences in findings.*
 - Chapter 3, Bridge: In the Growth Needs of Cells interactive and the Keeping Cells Alive: Observation Sheet, students compare the four graphs from the oxygen, water, food, and carbon dioxide experiments. Then students “Describe similarities you observe in the graphs. Describe differences you observe between the graphs” and “Write an explanation to communicate the results of your study to someone who may not know what cells need to survive [...and...] use evidence from the interactive to support your explanation” (Student Edition).
- *Analyze and interpret data to provide evidence for phenomena.*
 - Chapter 2, Explain 1: “In this activity, you will review your digestion data to make sense of the up-and-down pattern you observed in the food molecule data. You’ll work with your team to explain why the amount of some large molecules decreases during digestion and why the amount of other small molecules increases (at least at first). Review the patterns in your digestion data and explain why the amounts of molecules might be changing. Look at the patterns between glucose and complex carbohydrates, amino acids and proteins, and fatty acids and fats” (Student Edition).

Constructing Explanations

- *Construct an explanation using models or representations.*
 - Chapter 2, Explore 2: In the What Affects Absorption section, students are told to refer to the Absorption interactive model and then “Identify the structure that leads to the most absorption and the structure that leads to the least absorption. What do you notice about the number of cells along the surface in each case? Discuss how the number of cells could affect absorption. Work together to construct an explanation of why each structure helped or hurt the absorption of nutrients” (Student Edition).
 - Chapter 3, Elaborate: In the M’Kenna’s Weight Loss: Explanation section, students are asked to “Locate the class consensus model from the end of the Chapter 3 Explain activity. You may use the model along with the evidence you have gathered to answer

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the Focus Question [i.e., Why is M’Kenna losing so much weight even though she is eating?]” (Student Edition).

- Chapter 4, Elaborate: In the Developing A Consensus Explanation, students are told to “Write a new explanation together. As you write, think about parts of the model you want to use to illustrate your ideas. Include these illustrations next to or below your written explanation” (Student Edition).
- *Apply scientific ideas, principles and or evidence to construct, revise, and/or use an explanation for real-world phenomena, examples, or events. Apply scientific reasoning to show why the data or evidence is adequate for the explanation or conclusion.*
 - Chapter 4, Elaborate: In the Explaining M’Kenna’s Symptoms section, students create a written explanation using evidence they have collected throughout the material to explain “How can a problem in one part of M’Kenna’s body cause symptoms in another part?” Students are given the following instructions: “Decide on 5–7 pieces of evidence that would help you develop a convincing explanation about M’Kenna’s problem. Remember, you need to include enough evidence to make your explanation strong and convincing to someone else. To do this, decide the most important evidence you need to include in your explanation and set aside less important evidence. You can decide to add in more evidence later if you think it is important” (Student Edition).
 - Chapter 4, Elaborate: In the Developing a Consensus Explanation section, students read that “You now have a claim and your own scientific explanation to support your claim. A scientific explanation needs to have convincing evidence and reasoning to support it. This is important because scientists must convince other people that their explanations are based on reliable data and that the conclusions they have drawn are supported by the evidence” (Student Edition).

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.*
 - Chapter 2, Elaborate: In the M’Kenna’s Absorption Problem: Develop an Explanation section, students are given the following task: “Below the title, write your question: ‘How are M’Kenna’s cells in the small intestine affecting how she absorbs food nutrients?’ Draw a table to help you organize your claim and explanation. [...] For each piece of evidence, write 1–2 sentences to summarize how the evidence will help you answer the question. [...] The goal of your explanation is to use scientific ideas to help you connect each piece of evidence to your claim” (Student Edition).
- *Compare and critique two arguments [claims] on the same topic and analyze whether they emphasize similar or different evidence and/or interpretation of facts.*
 - Chapter 3, Explain: In the Claims About M’Kenna’s Cells: Rebuttals (Optional) section, students are told to “Decide with your team which claim is most supported by the evidence and write that claim at the top of the page with your evidence and reasoning that supports it. Draw a table to write the evidence and reasoning against the other two

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claims. [...] Discuss with your team the reasoning that shows the evidence disproves the other claims. [...] Write a rebuttal that uses the evidence and reasoning you have against the claim” (Student Edition). *However, this activity is optional.*

- Chapter 4, Elaborate: In the Developing A Consensus Explanation section, students share their explanation of M’Kenna’s illness as a group, discuss similarities and differences and create a Team Consensus Explanation. “Copy the explanation table used in the last activity on this page. This time you will use the evidence, reasoning, claim, and explanation that your team develops and agrees upon. It may have some similarities to or differences from your own explanation. [...] Review each of your claims and choose one that your group wants to use, or write a new claim together. Write a new explanation together” (Student Edition).
- *Respectfully provide and receive critiques about one’s explanations, procedures, models, and questions by citing relevant evidence and posing and responding to questions that elicit pertinent elaboration and detail.*
 - Chapter 4, Elaborate: In the Developing A Consensus Explanation section, students are given the following instructions: “Most scientists work in teams to help one another develop explanations. Sometimes they might disagree, but when they come to agreement, we call this consensus. [...] Share your explanation and ask for feedback from your teammates. Listen carefully as others share their explanations. Ask questions and give your teammates feedback. Then make edits to your own explanation” (Student Edition).

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 there are numerous opportunities for students to use and develop grade-appropriate DCI elements and the elements are used in service of making sense of phenomena. There is a close match between elements claimed and those developed and used by students.

LS1.A Structure and Function

- *The body is a system of multiple interacting subsystems with organs that are specialized for particular body functions.*
 - Chapter 1: Students use interactives to investigate the digestive system and the function of each of its parts to figure out how M’Kenna is different.
 - Chapter 2 Explain 2: Students figure out how the small intestine absorbs nutrients and they get to the rest of the body.
 - Chapter 4, Explain: Students learn about the different body systems through a Virtual Body interactive and use what they find out to explain “How can a problem in one part of M’Kenna’s body cause symptoms in another part?” (Student Edition).
- *All living things are made up of cells, which is the smallest unit that can be said to be alive*
 - Chapter 2, Bridge: Students look at human tissue under a virtual microscope, drawing what they see and patterns they notice. The term “building block” is used before students are introduced to the term cells. Students then find out that these “building

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blocks” make up the tissues they’ve been looking at to try to figure out what is wrong with M’Kenna.

- *Within cells, special structures are responsible for particular functions, and the cell membrane forms the boundary that controls what enters and leaves the cell.*
 - Chapter 2, Explore 1: Students learn about what the cell membrane does to see how nutrients are absorbed in the small intestine to understand how M’Kenna’s small intestine might be different. *However, students primarily learn about the cell membrane as well as villi in the intestine; students do not fully address other special structures in the cell.*
- *In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
 - Chapter 1, Explain: In the A Closer Look at Organs section, students investigate the parts of the digestive system and their function in processing foods. “Read about the organ and what it does to food. Compare what you read about the organ to the graph showing how food molecules change. Watch an animation showing how food changes in the organ” (Student Edition).
 - Chapter 2, Bridge: In the Virtual Tissue: Human Tissue interactive, students observe tissue samples from different organs (e.g., liver, cartilage, and muscle) to identify patterns that are similar across all tissue samples. In the Building Blocks video, students learn that “Different types of cells work together to make up the different types of body systems that keep you alive” and how different types cells have different functions in the body.
 - Chapter 2, Engage: In the Modeling Absorption section, students are asked to “Draw a model of your ideas about how food inside the small intestine gets to the rest of the body. Draw, label, and describe as much as you know right now. Imagine looking even closer at what happens at a single cell as nutrients are absorbed” (Student Edition).
 - Chapter 3 Explain: Students use the “Exploring Healthy Digestion” interactive to figure out how different foods are broken down and molecules move throughout the body.

LS1.C Organization for Matter and Energy Flow in Organisms

- *Within individual organisms, food moves through a series of chemical reactions in which it is broken down and rearranged to form new molecules, to support growth, or release energy.*
 - Chapter 3 Explain: In the You Are What You Eat section, students explore how complex carbohydrates, proteins, and fats are broken down into smaller molecules during digestion and make up different parts of our body.

PS1.B Chemical Reactions

- Partial element: *The total number of each type of atom is conserved, and thus the mass does not change.*
 - Chapter 3, Explain: Students compare large complex molecules and small nutrient molecules: “These large molecules (complex carbohydrates, proteins, and fats) break

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down into simple nutrient molecules like the ones you just examined (glucose, amino acids, and fatty acids). Simple nutrient molecules aren't food molecules, but they come from the bigger food molecules we eat" (Student Edition).

- Chapter 4, Bridge: In the What Cells Need to Work section, students compare the atoms in the reactants and products of cellular respiration.

PS3.D: Energy in Chemical Processes and Everyday Life

- *Cellular respiration in plants and animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.*
 - Chapter 4, Bridge: Students read about cellular respiration and discuss how cellular respiration impacts the human body.
 - Chapter 4, Explore: Students add cellular respiration to their model to explain how bodies have energy and why M'Kenna doesn't have enough energy due to the lack of glucose and why her breathing increases.

Crosscutting Concepts (CCCs) | Rating: Adequate

The reviewers found adequate evidence that students have the opportunity to use or develop the CCCs in this unit, because there are sufficient CCC elements and time that students are engaged in the CCCs for the length of the materials. *However, there are mismatches between the CCCs that are claimed and evidence of the CCC use in the materials and students are not frequently facilitated to realize they are using a CCC or to deepen their understanding of grade-appropriate CCC elements.*

Patterns

- *Patterns in rates of change and other numerical relationships can provide information about natural and human-designed systems.*
 - Chapter 1, Explore: In the A Trip Through Digestion: Explore section, students are told "As you examine each food, record the changes in quantities of food molecules on your data sheet." Then in the A Trip Through Digestion: Analyze section, students are told "For each organ, examine what happened to the food molecules when the food entered a new organ. For example, in the "Mouth" row you will describe how food molecules changed compared to what the food was like before it was eaten. Your goal is to identify a pattern in the way the organ changes food" (Student Edition).
 - Chapter 3, Explore: In the A Cell's Survival: Data Collection section, students are told to "Explore the interactive by clicking different levels of damage to the small intestine to see how damage changes where cells get nutrients. [...] Describe how nutrient sources change as the damage level changes" (Student Edition).
- *Graphs, charts, and images can be used to identify patterns in data.*
 - Chapter 1, Explore: In the A Trip Through M'Kenna's Digestive System: Analyze section, students collect information on different food molecules as they travel through a healthy digestive system and M'Kenna's digestive system and record their findings in a table. Students then find patterns in this data to figure out how M'Kenna's digestive

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- system is different than a healthy digestive system. “Look across all the foods to see if there is a pattern in what is different. In the last column, describe the difference(s) between M’Kenna’s system compared to a healthy system” (Student Edition).
- Chapter 2, Explain 2: In the Best Tissue for Absorption: Evidence Sort (Optional) section, students look for patterns in the images of three tissue samples to figure out the features that are best for absorption. “Examine the Tissue Sample cards and share what you notice about each tissue. [...] Which tissue sample from the digestive system is best for absorption, and why? Now, look at the Absorption Evidence Cards handout. Sort the evidence into two groups: Relevant and Not relevant. Talk with your team about why you think each piece of evidence is relevant or not relevant for answering this question” (Student Edition). *However, students are not directly asked to identify a particular pattern in the images of the three tissue samples or evidence cards and the activity is optional.*
 - Chapter 3, Explore: In the A Cell’s Survival: Data Sheet handout, students look for the patterns in data from an interactive showing the quantity of nutrients able to be absorbed from different levels of damaged cells. “Explore each level of damage and consider how the amount of damage to the small intestine affects where cells get their nutrients. [...] What pattern do you notice between the level of damage to the small intestine and where cells get nutrients?”
 - *Macroscopic patterns are related to the nature of microscopic and atomic-level structure.*
 - Chapter 2, Explain 1: In the Differences Between Iodine and Starch section, students are asked to “Make observations of the molecules using the Iodine versus Starch handout. Write down differences you see between the molecules. Draw arrows and add labels to the diagram to show why iodine molecules could pass through the membrane while starch molecules could not” (Student Edition). The teacher facilitates a discussion about “how a tiny molecule like iodine can move across dialysis tubing, but a big molecule like starch can’t do that. But how can we connect all of this to M’Kenna? [...] Let’s go back and look at that data again to see what is going on and determine if we can figure out how to relate the changes in molecules to particle size, absorption, and M’Kenna’s illness” (Teacher Edition).
 - Chapter 3, Explain: In the You Are What You Eat section, students complete the following task: “You will zoom into different parts of the body to compare molecules that make up our bodies to the simple nutrient molecules that we have in our bloodstream after digestion. [...] Compare the Nutrient Molecule Cards to the Body Molecule Cards. Describe the similarities and differences among the molecules using the questions on the handout. Discuss and respond to the questions, “Do you agree or disagree that ‘you are what you eat’? Why?” *However, it isn’t clear what macroscopic patterns students are identifying or using to complete this task or that students connect macroscopic patterns to microscopic structures.*

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EQUIP RUBRIC FOR SCIENCE EVALUATION

Cause and Effect

- *Use cause and effect relationships to predict phenomena in natural or designed systems.*
 - Chapter 2, Engage: In the Evidence #4: Small Intestine Micrographs section, students are told that “In this activity, you will examine two micrographs and make observations of the tissue in both pictures. You may even be able to identify cells in the tissue you see. You will decide which tissue you believe is M’Kenna’s and why you think the tissue is not doing a good job absorbing nutrients” (Student Edition). *However, it is not clear that students are considering a cause-and-effect relationship when making their claims.*
 - Chapter 3, Elaborate: In the M’Kenna’s Weight Loss Explanation section, students are asked to explain “Why is M’Kenna losing so much weight even though she is eating? [...] you will write a scientific explanation for M’Kenna’s weight loss using the evidence and reasoning you developed with your team [...] Add each piece of evidence you believe is relevant and important to answering the question” (Student Edition). While students support their claims with evidence, *the idea that cause-and-effect relationships allow for predictions to be made in science is implicit (rather than explicit) in the student performance.*

System and System Models

- *Systems may interact with other systems; they may have subsystems and be a part of larger complex systems.*
 - Chapter 4, Explain: In the What More Do I Need To Know? section, students are told “You will develop a model of the two systems assigned to you and how they interact. [...] Using your Gotta-Have-It Checklist, decide what you need to know more about to develop your model of the two systems interacting. Consider these ideas and the ideas on your checklist when you are deciding: a. b. c. d. Where are important places in the body that the systems interact? How does one system influence the other? How do the systems respond? How does the transport of molecules (the matter) between systems occur?” (Student Edition).
- *Models can be used to represent systems and their interactions—such as inputs, processes, and outputs—and energy, matter, and information flows within systems.*
 - Chapter 4, Explain: In the Cells At Work: What It Means section, students are told “In this activity, you will brainstorm what you know about how body systems work together to move these molecules into and away from cells. [...] Describe what you know about how the molecule gets to a cell or leaves a cell. Also describe the systems that work together to move the molecule in the body.” In the What Cells Need to Work section, students realize that: “In the animation you saw glucose and oxygen moving into cells faster when the muscle cell was working and not as fast when the muscle was resting. All the cells in the body use glucose, and similar molecules, to get energy” (Student Edition). *However, the idea that models can be used to represent these systems, subsystems, inputs, outputs, and processes is implicit (rather than explicit) for students.*

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Structure and Function

- *The way in which an object or living thing is shaped and its substructure determine many of its properties and functions.*
 - Chapter 1, Explain: In the Reflect and Connect section, students respond to the following questions: “Which organ in M’Kenna’s digestive system is not working right, and how can you tell? Think about what you know about the small intestine’s length, shape, and overall structure. How is the small intestine’s structure related to how it digests food? Explain as much as you can. M’Kenna’s doctor thinks she’s not getting enough nutrients from food. How do the data you have support or not support this claim?” (Student Edition).
 - Chapter 2, Explain 2: In the Special Structures of the Small Intestine section, students gather more information about the small intestine and its substructures: “But the strange surface of the small intestine does not stop at the villi. If you zoom in even more, you see that each cell in the small intestine has similar structures on them called microvilli. [...] Write an explanation for how the structures seen at each of the scales help the small intestine function to absorb nutrients” (Student Edition).
- *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.*
 - Chapter 3, Engage: In the Claims About M’Kenna’s Cells section, students are told that “A healthy digestive system moves food molecules into the bloodstream from the small intestine, where the molecules travel to all the cells in the body. Even though M’Kenna’s small intestine is not healthy, the cells in her body are still alive. That means they are getting nutrients from somewhere. In this activity, you will examine this problem closely and make a decision about where you think M’Kenna’s cells are getting nutrient molecules.” Then students do the following task in their handout: “Three students disagree about where M’Kenna’s cells get nutrients to stay alive. [E.g., Malcom claims that “M’Kenna’s cells mainly need oxygen and water to stay alive. She can get those things even if her small intestine isn’t working.”] If this student is right, draw and label a model to show how M’Kenna’s cells get nutrients (e.g., what they need and where it comes from)” (Student Edition).

Energy and Matter

- *Energy flows through a natural system.*
 - Chapter 4, Bridge: In the What Cells Need To Work section, students have the following task: “Your body uses the energy from cellular respiration for all its activities. [...] Discuss with your team what you read about chemical reactions in cells. [...] How can we describe what is happening with energy before the reaction, during the reaction, and after the reaction?” **However, students do not explicitly consider the flow of energy through the cell or body systems.**

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EQUIP RUBRIC FOR SCIENCE EVALUATION

- *Matter is conserved because atoms are conserved in chemical processes.*
 - Chapter 4 Bridge: In the What Cells Need to Work section, students are asked to “In the first column draw the molecules that entered the cell (from the first picture). In the second column draw the molecules that left the cell (from the last picture). Count the number of atoms (carbon, hydrogen, oxygen) in the first picture before the reaction. Count the number of atoms in the last picture after the reaction. Then compare the counts” (Student Edition).

Stability and Change

- *Small changes in one part of a system might cause large changes in another part.*
 - Chapter 4, Conclusion: In the Systems and Symptoms section, students are asked to “Use what you already know about how body systems work together to brainstorm how problems in M’Kenna’s digestive system could cause symptoms in other parts of her body” (Student Edition). Students are expected to explain how damage to any one body system results in negative effects to other body systems. For example: “I claim that damage to M’Kenna’s digestive system results in fewer nutrients carried by the circulatory system to her muscles (muscular system), causing the symptom of muscle cramps” (Scoring Guidelines for Final Explanations).

Suggestions for Improvement

Science and Engineering Practices

- If there is only a partial match to the element claimed, consider including additional prompts, questions, or strategies to engage students in fully using or developing the element, or clarifying that students are only expected to use an elementary-level element.
- Where SEPs are claimed but are only currently used in optional activities, consider integrating that task into the required lesson or altering the claim.

Disciplinary Core Ideas

- Where there are partial matches to the DCI, consider striking out the aspect of the DCI not addressed in the unit and add an explanation of why that aspect is not addressed or where it will be addressed in a different unit. Alternatively, consider adding an activity that addresses the full DCI and linking the learning back to the unit phenomena.

Crosscutting Concepts

- Consider revising questions, prompts, or tasks strategically throughout the materials to prompt students to develop and use an understanding of the claimed CCC elements that are currently only implicitly or partially addressed. For example, in the Chapter 4 Bridge students could be directly prompted to consider how energy flows from the food we eat through the different processes and parts of the cell or body system, which is necessary for that body part to function.

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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 or designing solutions to problems because each lesson includes at least one three-dimensional experience that support students in developing the skills and knowledge to explain the central phenomenon of M’Kenna’s illness.

The materials clearly articulate three-dimensional learning targets in each lesson. For example:

- Chapter 1, Explore: The materials state that in the lesson, “Students **analyze data** looking for **patterns** in how **food molecules change from one organ to another**, developing an understanding of the **function of organs in the digestive system**” (Teacher Edition).
- Chapter 2, Elaborate: The materials state that in the lesson “Students **use evidence and their models of digestion to explain** why the **structure of tissue in M’Kenna’s small intestine (cause) is reducing her ability to absorb nutrients (effect)**” (Teacher Edition).
- Chapter 4, Explore: The materials state that in the lesson “Students **examine patterns in data to explain** how **body systems interact with one another** in response to exercise” (Teacher Edition).

Specific examples of where students use the three dimensions in an integrated way to explain phenomena are highlighted below:

- Chapter 1, Explore: The materials claim that “Students will **analyze and interpret data** of **food moving through organs of the digestive system** to **explain** how **food changes as it moves through the digestive system**. Students will **analyze patterns** in the **data** for a healthy person and for M’Kenna to figure out which organ is giving M’Kenna problems (not functioning well)” (Teacher Edition). In the A Trip Through Digestion: Analyze section, students are told to analyze the results to identify what is happening to food in each organ. [...] Look for patterns in what happens to food molecules in each organ to figure out what the organ is doing to the food” (Student Edition). Afterwards, in the Reflect and Connect section, students are asked to explain what is happening in M’Kenna’s body: “In both a healthy system and M’Kenna’s system, food molecules seemed to vanish in the small intestine. [...] What do you think happened to those molecules?”
- Chapter 2, Bridge: The materials claim that in the lesson, students “**Make observations** about **patterns** in human tissue samples under a microscope, to gather evidence that **organs are made of tissue, and tissue is made of cells that have common structures like a membrane and a**

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nucleus” (Teacher Edition). In the Observing Tissue with Microscope section of the lesson, students “use a virtual microscope to study tissue” and “make careful observations of the tissues to identify similarities and differences in the tissue.” Students are told to “Focus your observations on identifying similarities and differences in the sample. In particular, you should try to identify a pattern in the sample. A pattern is something that repeats itself over and over again. After you draw each sample, write down the different patterns you see before moving to the next sample” (Student Edition). In the Building Blocks of Life activity, students discover that “When you look at tissue, you can see a repeating pattern. While tissues can look very different from one another, there are some similar structures found in all types of tissues in the body. Watch the animation about what makes up the building blocks of these tissue samples” (Student Edition).

- Chapter 4, Explain: The materials claim that in the lesson, “Students develop a model to explain how two body systems interact with one another, facilitating the transport of matter into and out of cells, into and out of body systems, and into and out of the entire human body” (Teacher Edition). In the Model: Gotta-Have-It Checklist section of the lesson, students are asked to “develop a model showing how several body systems interact to keep us healthy [... in order to] explain M’Kenna’s symptoms” (Student Edition). In the What More Do I Need to Know section, students consider the following questions as they develop a Gotta-Have Checklist for their models: “Where are important places in the body that the systems interact? How does one system influence the other? How do the systems respond? How does the transport of molecules (the matter) between systems occur?” (Student Edition).

Suggestions for Improvement

None

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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 the materials include a variety of strategies for students to see how each lesson builds towards the next lesson. Additionally, there are “Bridges” between each chapter that help students connect one chapter to the next. Across lessons, there is evidence that students need to refer back to prior lessons to figure out what has happened to M’Kenna. Students work toward developing proficiency on a targeted bundle of PEs in all four chapters.

Lessons regularly build directly on prior lessons in a way that makes sense from students’ perspective using a variety of strategies, such as engaging students in asking questions based on what they have learned so far or pursuing relevant questions unanswered in the previous lesson. Related evidence includes:

- Unit Introduction: In the Questions I Have section, the teacher is told that “students start thinking about questions M’Kenna’s illness raises for them. The goal is to surface the broader questions of body systems interacting. Students will generate questions for the Driving Question Board that will motivate their learning for the rest of the unit” (Teacher Edition).
- Chapter 1, Engage: In the Reflect and Connect section, the materials provide the next questions that will be investigated to students: “Think about your model for digestion. Describe one part of your model that you are confused about or would like more information about to help make your model better. Why do you think our bodies need to digest food? What is the purpose of digestion?” (Student Edition)
- Chapter 1, Explore: In the A Trip Through Digestion: Analyze section, students are told that “In the Exploring Healthy Digestion interactive, you saw evidence that food’s appearance and molecules change as food moves to different organs in the digestive system. Now you will analyze the results to identify what is happening to food in each organ. Pay attention to whether the amounts of molecules are going up or down and how these data can help you identify the organ’s job in digestion” (Student Edition)

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- Chapter 1, Explore: In the Model Tracker and Evidence #2 section, the teacher is instructed to refer to the Driving Questions Board and “Ask students to identify any questions for which they now have evidence. [...] You may want to put a check mark on these questions or use some other visual representation to indicate that you are moving toward answering the questions” (Teacher Edition).
- Chapter 1, Elaborate: In the Reflect and Connect Section, the teacher is told that “If students have posted questions on the DQB that ask about how food can possibly move from inside the digestive system to the rest of the body, highlight those questions. They will be part of the next chapter” (Teacher Edition).
- Chapter 2, Bridge: In the More Than Meets the Eye? section, students are told that “In the last chapter, you learned a lot about the digestive system, the main organs in the digestive system, and how M’Kenna’s digestive system is not healthy. [...] In this lesson you will look closer at what body parts are made of and start to think about what a doctor might see when looking closer at M’Kenna’s small intestine” (Student Edition).
- Chapter 2, Explore 2: In the Helping Absorption of Nutrients section, students are told that “You know one of the tissue samples is a healthy sample, while the other sample is M’Kenna’s tissue. If you can figure out which sample is better at absorption, you will have more information to identify M’Kenna’s sample. This will also help you make sense of why M’Kenna’s small intestine is not absorbing as many nutrients as a healthy system. In this activity, you will think about a new Focus Question and what you already know about this question. You will revisit your claim about which tissue belongs to M’Kenna and update your evidence about your claim” (Student Edition).
- Chapter 2, Explain 1: In the Reflect and Connect section, the teacher is instructed to “Gather students around the Driving Question Board (step 5). Identify questions students have answered or partially answered. [...] Ask students to consider what questions they still need to answer. Remind students that they have an idea of how nutrients can move through cell membranes, but they don’t yet know why very few nutrients move through M’Kenna’s cell membranes” (Teacher Edition).
- Chapter 2, Elaborate: In the Reflect and Connect section, the materials provide the next question that will be investigated to students. “Revisit the Driving Question Board. Participate in a discussion with your class about what happens to food after it passes into the rest of your body. Do we know where those small molecules go? What happens to them next?” (Student Edition)
- Chapter 3, Bridge: In the Keeping Cells Alive: Revisit the Focus Question section, the teacher is told to “gather students around the Driving Question Board. Students may find that they might have partial answers to more of the questions. For example, they know that M’Kenna’s cells aren’t getting nutrients, and they know that cells need nutrients to survive. Some of M’Kenna’s symptoms might be related to these two ideas. But it is likely students still have many questions about the details of how cells use nutrient molecules, and what cells rely on if they don’t get nutrient molecules” (Teacher Edition).
- Chapter 3, Explore: In the Reflect and Connect section, the teacher is told that “As students consider the Driving Question Board, push them to recognize that they may know that cells

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need nutrient molecules, but they have not yet figured out what cells do with those nutrient molecules. What happens to them and where do they go after they get into the bloodstream?” (Teacher Edition).

- Chapter 3 Explain: In the Revisit the Focus Question: How Cells Use Body Stores, Teacher Moves section, the teacher is instructed to “Ask students to update their Model Tracker with the Focus Question and their answer to the Focus Question” (Teacher Edition)
- Chapter 4, Bridge: The teacher is told that “In steps 2–3, have students find their Model Tracker that they have been using for this unit. Tell them that the class will work together to add a new row to the Model Tracker. In the first column, have students record the question they are trying to answer, Why do we need more nutrients when we are more active? In the second column, ask students to record the source of evidence they have collected to answer this question” (Teacher Edition).
- Chapter 4, Explain: In the What More Do I Need to Know? section, students are told to “Use your notebook to record ideas about the interactions between your two systems that your team decides they need to know more about. To do this, write “I need to know more about” and then make a bulleted list based on your team’s conversation” (Student Edition). The next lesson revisits questions that students are encouraged to ask about in the Virtual Body: A Closer Look section: “You have identified ideas you need to know more about to develop your model to explain interacting body systems. But you will need to know about all body systems to explain M’Kenna’s symptoms—not just your assigned system” (Student Edition).

The unit claims to address four PEs, one fully and the other three partially. Throughout lessons, students have opportunities to develop and demonstrate the skills and knowledge to perform the targeted PEs claimed by the end of the unit. For example:

- **MS-LS1-1** (partial) Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
 - Chapter 2, Bridge: By the end of the Building Blocks of Life section, students are able to identify that tissues are made of cells and that cells have parts. “After watching the animation, revisit your observations from the Virtual Microscope found on your A Closer Look: Observation Sheet. Identify the cell membrane and nucleus on your diagrams and add labels as needed. If necessary, revisit the Virtual Microscope to review images of body tissues” (Student Edition).
- **MS-LS1-2** (partial) Develop and use a model to describe the function of the cell as a whole and ways the parts of cells contribute to the function.
 - Chapter 2, Elaborate: By the end of Chapter 2, In the M’Kenna’s Absorption Problem: Evidence Sort, students are able to answer “How are M’Kenna’s cells in the small intestine affecting how she absorbs food nutrients?” (Student Edition).
- **MS-LS1-3** (full) Use argument supported by evidence for how the body is a system of interacting subsystems.
 - Chapter 4, Explain: By the end of the lesson in the Reflect and Connect Section, students develop a final explanation to the question “How can a problem in one part of M’Kenna’s body cause symptoms in another part?” At this point, students “now know

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more about how body systems work together” and must develop “a model to explain important interactions between systems” (Student Edition).

- **MS-LS1-7** (partial) Develop a model to describe how food is rearranged through chemical reactions forming new molecules that support growth and/or release energy as this matter moves through an organism.
 - Chapter 3, Explain: By the end of the lesson in the You Are What You Eat section, students are able to “compare simple nutrient molecules (that came from breaking down food molecules) to molecules that make up the body” to answer the question “Do you agree or disagree that ‘you are what you eat’? Why?” (Student Edition).

Suggestions for Improvement

None

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

Adequate
(None, Inadequate, Adequate, Extensive)

The reviewers found adequate evidence that links are made across the science domains when appropriate because in order to figure out what is wrong with M’Kenna, students must develop and use DCIs from both Life Science and Physical Science. *However, the utility of the crosscutting concept in making connections across science domains is not explicitly pointed out to students.*

The unit largely focuses on developing Life Science DCIs. In order to fully explain M’Kenna’s illness, students also address two DCI elements from the Physical Science domain:

- **PS3.D Energy in Chemical Processes and Everyday Life** *Cellular respiration in animals involves chemical reactions with oxygen that release stored energy. In these processes, complex molecules containing carbon react with oxygen to produce carbon dioxide and other materials.*
- **PS1.B Chemical Reactions** *The total number of each type of atom is conserved* (partial).

Students develop and use these Physical Science DCIs in Chapter 4 as part of the explanation to why M’Kenna experiences in different parts of her body. For example:

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- Chapter 4, Bridge: In the What Cells Need to Work section, students watch an animation and learn that “All the cells in the body use glucose, and similar molecules, to get energy. This process is called cellular respiration. [...] these atoms are rearranged to form new molecules [...] As the atoms come together to make the carbon dioxide and water, energy becomes available to the cell.” Students then answer a series of questions about what they saw and read: “What does your atom count tell you about what happens to atoms in a chemical reaction?” “From what you learned before, if your body does not have glucose, what other molecules might it use for this chemical reaction?” “How can we describe what is happening with energy before the reaction, during the reaction, and after the reaction?” and “develop an explanation for what happens to the molecules (the matter) during cell respiration.”
- Chapter 4, Engage: In the Moving Molecules in the Body section, students “Describe how the molecule goes to or comes from cells” and “What systems work together to move the molecule around?”

The usefulness of crosscutting concepts to make sense of phenomena across Life and Physical Science domains is not explicitly pointed out to students. For example, in the Chapter 4, Bridge, the materials point out in that “As students work through the chapter, the crosscutting concept of energy and matter is evident throughout” (Teacher Edition). Later in the Chapter 4, Engage section, the materials state that students “use the idea that the transfer of energy from cellular respiration drives the cycling of matter throughout these systems” (Teacher Edition). Although students develop and use **Matter and Energy** CCC elements in the lessons, there is a missed opportunity to directly highlight this concept to students and engage students in thinking about how the linkage between multiple domains with this CCC is useful or necessary, including for explaining the causes of M’Kenna’s illness.

Suggestions for Improvement

For an extensive rating, consider providing specific prompts for students to reflect on the usefulness of the CCC across science domains in lessons or chapters where students draw upon ideas from multiple domains using a CCC.

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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 CCSS-ELA/Literacy and CCSS-Mathematics standards are listed in the materials. In addition, appropriate connections are made to the literacy and mathematics standards during the lessons, and students are supported to see how their literacy work supports their sense-making.

Students have multiple opportunities to read, write, and speak throughout the unit. In the Teacher Edition and the English Language Arts (ELA) Connections and Support supplementary document, the materials explicitly state where students address English Language Arts standards. reading, writing, speaking and listening standards to explain or help understand the scientific concepts, phenomena, or results. For example:

- **CCSS.ELA-Literacy.RST.6-8.2** *Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.*
 - Chapter 2, Explain 2: In the Special Structures of the Small Intestine section, students read about structures in the small intestine, make observations from photos, and are prompted to “Write an explanation for how the structures seen at each of the scales help the small intestine function to absorb nutrients” (Student Edition).
- **CCSS.ELA-Literacy.W.6-8.1** *Write arguments to support claims with clear reasons and relevant evidence.*
 - Chapter 2, Explain 1: In the Differences Between Iodine and Starch section, students “Write a claim about the iodine molecules and support this claim with evidence from the lab and your observations of the molecules” (Student Edition).
- **CCSS.ELA-Literacy.SL.6.3** *Delineate a speaker’s argument and specific claims, distinguishing claims that are supported by reasons and evidence from claims that are not.*
 - Chapter 4, Elaborate: In the Reviewing the Evidence section, students “Discuss the evidence you did not use in your copy of the class model. Ask your classmates questions about whether the evidence is important for showing body systems working together” (Student Edition).

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The materials also describe a couple of mathematics extensions in the lesson where appropriate. However, these mathematical extensions are optional, and how the mathematics concepts help students to better explain or understand scientific concept, phenomena, or results is unclear.

- **CCSS.MATH.CONTENT.6.G.A.1** Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems. **CCSS.MATH.CONTENT.7.G.B.6** Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
 - Chapter 2, Explore 2: In the Optional Mathematics Extension, the teacher is told that “You may want to ask students to sketch the tall villi and the small villi and superimpose rectangles on the drawings in such a way that [...] students can estimate the surface area of the villus [...]. Students will get a numerical estimate showing how much more surface area exists with tall villi” (Teacher Edition). However, this guidance does not specify or explain to students how this result might help students to better understand a scientific concept or phenomenon.
- **CCSS.MATH.CONTENT.8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.
 - Chapter 2, Explain 2: In the Opportunity for Differentiation and Mathematics Connection section, the materials suggest that “Some students who are mathematically advanced might be interested in quantitatively comparing the scales of the images of intestinal folds, villi, and microvilli. [...] If you like, you may ask students to represent these sizes and compare them using scientific notation” (Teacher Edition). However, this guidance does not specify or explain to students how this result might help students to better understand a scientific concept or phenomenon.

Suggestions for Improvement

- Consider including more varied reading materials, such as news articles or scientific journal articles adapted for the middle school classroom.
- For both the ELA/literacy and mathematics connections, consider providing guidance so students can explicitly understand how the literacy and mathematics work can be useful to help students to better understand or explain a phenomenon, scientific concept, or result.

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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

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EQUIP RUBRIC FOR SCIENCE EVALUATION

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 students experience and investigate the phenomenon of M’Kenna’s illness as directly as possible through a variety of artifacts, evidence sources, and scenarios. The materials generate compelling lines of student inquiry that students may find relatable based on their personal experiences. **However, there are missed opportunities for the materials to provide multiple opportunities for students to make connections between the phenomenon and their homes, neighborhoods, communities, and cultures.**

The phenomenon of M’Kenna’s mysterious illness reflects a real-world scenario and will likely be compelling for students to investigate and figure out. The fact that the phenomenon centers on a person the same age of the students with perhaps some of the same interests is probably engaging to students. Related evidence includes:

- Unit Introduction: Students are introduced to M’Kenna, a real student their age, who appears to have a mystery illness. “This is M’Kenna. M’Kenna loves basketball and track. She also loves spending time with her friends. When M’Kenna was 13, something strange started happening. She started to lose weight, even though she was trying to eat normally [...]” (Student Edition).
- Unit Introduction: Students are given the doctor’s note that describes M’Kenna’s symptoms and are asked to examine the note for clues about what is wrong with M’Kenna. “The doctor wrote down the symptoms M’Kenna described to her during the visit. [...] Read the note closely to find all the symptoms that M’Kenna has” (Student Edition).
- Chapter 3, Elaborate: Students are likely motivated to figure out M’Kenna’s illness because they are able to see the real data about her health over the past few years. “M’Kenna has seen her pediatrician every year since she was a baby. At each exam, the doctor enters her height and weight into the growth chart to see if M’Kenna has a normal height and weight for her age” (Student Edition). Students analyze M’Kenna’s chart to determine if M’Kenna’s weight and height were normal during her last visit.

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- Chapter 4, Conclusion: Students are given an update on M’Kenna and improvements in her health once the causes of her illness is determined. “Eventually, M’Kenna recovered. She regained the weight she lost and was able to start playing basketball and running track again” (Student Edition).

Students experience phenomena as directly as possible through various media representations, demonstrations, interactives, and animations. For example:

- Chapter 1, Explore: In the A Trip Through Digestion: Explore section, students use the Exploring Healthy Digestion interactive to record data about how different foods are processed in different parts of the body. Students can select from different common foods to test such as graham crackers, gouda cheese, apples, milk, fruit punch, or green peas.
- Chapter 2, Explore 1: Students explore how nutrients enter cells through a demonstration that “uses dialysis tubing to simulate a biological membrane” (Teacher Edition).
- Chapter 2, Bridge: In the Observing Tissues with Microscopes section, students make and record observations from an interactive Virtual Microscope that shows magnified images of real tissues at different scales.
- Chapter 2, Explore 1: In the In and Out of Cells: Observe and Interpret sections, students make and interpret observations from an Iodine and Starch Demonstration to figure out what cell membranes do.
- Chapter 2, Explain 1: In the From Big to Small section, students are asked to “Watch the animation to learn what happens to large molecules, like starch, as they move through the digestive system” (Student Edition).
- Chapter 3, Explore: In the A Cell’s Survival: Data Collection, students collect data from a Body Stores interactive, that allows them “to change the amount of damage in the small intestine to see what has to happen for cells to survive” (Student Edition).
- Chapter 3, Explain: In the Using Body Fat to Power Cells section, students watch and record information from a Fatty Acid Animation to explain why M’Kenna is losing so much weight.
- Chapter 4, Bridge: In the Cells at Work: What It Means section, students compare how resting muscle cells and working muscle cells process molecules differently by gathering data from a Muscle Cell animation.
- Chapter 4, Explore: In the Reflect and Connect section, students use a Body Systems interactive to collect data about how different measures of body functions (i.e., heart rate, respiration rate, blood glucose levels, calories burned) change with different activities (e.g., sleeping or sitting).
- Chapter 4, Explain: In the Virtual Body: A Closer Look section, students gather more information about different body systems through a Virtual Body interactive.

The materials provide supports for teachers to make connections to students’ everyday experiences, particularly in the images and captions at the beginning of each lesson in the Student Edition. Related evidence includes:

- Chapter 1, Engage: In the Food in the Body: My Ideas section, the materials state that “Lunch is an important meal in the day. Your body depends on getting food during the day, but why? [...]

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Every day we eat and drink food to give our body the things we need to grow and stay healthy. Have you ever wondered where all the food goes once you eat it, and how it gets used by the body?" (Student Edition).

- Chapter 2, Bridge: In the More Than Meets the Eye section, the materials help students connect the learning to what doctors do in the real-world. "Doctors look at organs, like M’Kenna’s doctor did during an endoscopy exam. The doctor can also take a sample of tissue more closely using a microscope" (Student Edition).
- Chapter 3, Explain: In the What Makes a Nutrient a Nutrient? section the materials state that "A food’s nutrition label tells us the amount of different types of molecules in the food. [...] You know that carbohydrates, proteins, and fats are three types of molecules in food. But what makes these molecules important for your body?" (Student Edition).
- Chapter 4, Bridge: In the Activity and Cell Needs section, the materials ask students "Why do we need more nutrients when we are more active? [...] Think about all the things you do in a single day, from waking up in the morning to sleeping at night. Sometimes your body works hard to keep up with your activities, and other times your body rests" (Student Edition).

Students have **some** potential opportunities to connect their explanations of a phenomenon to their own personal experiences. **However, these opportunities occur at the end of the unit despite places where these connections could be made throughout the unit. The reviewers did not find evidence where students had opportunities to make connections between the phenomena and their homes, neighborhoods, or communities.** Related evidence includes:

- Chapter 4, Conclusion: In the Conclusion—A Happy Ending for M’Kenna section, students discuss their answers to the question "Have you ever met anyone with the illness that M’Kenna has? If so, share your story with your classmates. About 1 out of every 100 people have this illness. Many of them don’t even know they have it" (Student Edition). The materials explain that "The class discussion at the end is an opportunity for students to share their own stories about friends or family members with celiac disease. It’s helpful if you can make the point that all sorts of people—young, old, rich, poor, and from all racial and ethnic groups—can have celiac disease" (Teacher Edition). **However, because this is the last question students discuss in the unit, there is a missed opportunity for students to make personal connections to their learning earlier in the unit or throughout the unit.**
- Chapter 4, Assessment: "Aside from what happened to M’Kenna, think of another time you have seen that body systems are clearly working together. [...] Describe the situation and what is happening to the whole body. Then use the model to develop an explanation for what may be happening to cause different changes to the body" (Teacher Edition). **However, like in the example above, the opportunity for students to make personal connections to their learning occurs at the end of the unit.**

At the end of the unit, students are also asked to take on the role of a doctor and explain M’Kenna’s symptoms.

- Chapter 4, Elaborate: In the Explaining M’Kenna’s Symptoms section, students are told "In this activity you will pretend like you are the doctor M’Kenna visited for help. You will try to answer

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questions from M’Kenna and her parents about what is wrong with her body and the causes of all her symptoms.” However, there is a missed opportunity to invite students to take on this role at the beginning of the unit and throughout lessons such that students may see earlier how their learning reflects the practices of science in the real world.

Suggestions for Improvement

- Consider providing students with multiple opportunities to connect the phenomenon of M’Kenna’s illness with their own experiences, community, or culture earlier in the unit or throughout lessons in the unit.
- Consider expanding the suggestions and guidance for teachers to address students’ ideas and personal connections to medicine, treatments, or illnesses in a sensitive way, particularly if students from share ideas from different cultures or backgrounds. This guidance occurs in Chapter 4 Conclusion of the Teacher Edition and in the Unit Introduction.
- Consider adding more non-digital experiences for students to interact with phenomena. For example, if students are present in a physical classroom, viewing actual cells under a microscope (rather than an interactive or animation) could be very engaging.

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 because students are provided with opportunities to share their ideas with others throughout the lesson and opportunities exist for students to receive and respond to feedback from the teacher and other students.

Students have numerous opportunities to share and respond to each other's thinking during discussions and team. For example:

- Chapter 1, Engage: In the Food In the Body: Compare Ideas section, the teacher is instructed to “Engage students in a class discussion about points of disagreement in their models” (Teacher Edition).
- Chapter 1, Explore: In the A Trip Through M’Kenna’s Digestive System: Analyze section, the teacher is asked to “Engage students in a class discussion about the patterns they saw. Press students to provide evidence for the patterns they see. If students note an incorrect pattern,

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continue to ask for evidence and ask students to agree and disagree with one another” (Teacher Edition).

- Chapter 2, Bridge: In the More Than Meets the Eye? section, the teacher is given the following guidance: “After students have had time to record their ideas privately, ask 3–5 students to share their ideas with the class. Encourage students to share their pictures and describe what they think they might see” (Teacher Edition).
- Chapter 2, Engage: In the Comparing Absorption Models section, “students join with a team to share their initial models.” The teacher is told to “Encourage them to share the questions they have and the limitations they see in their own models, ask questions of one another, and revise their own models if they see something in a teammate’s model that makes sense to them” (Teacher Edition).
- Chapter 3, Engage: In the Keeping M’Kenna’s Cells Alive section, the teacher is given the following instructions: “After students have had time to share models with a classmate, ask 3 students to share their initial ideas about the Focus Question and model with the class. [...] The goal is to get [as] many ideas out as possible. If students use technical or scientific terms, use probe questions to find out if they really understand what the terms mean” (Teacher Edition).
- Chapter 3, Bridge: In the Observing Tissue With Microscopes section, the teacher is instructed to “engage students in a discussion about the meaning of the patterns they are seeing” (Teacher Edition).
- Chapter 3, Engage: In the Claims About M’Kenna’s Cells section, the teacher is given the following guidance: “After students have had time to share their claims and models with their team, ask 3–5 students to share their thinking with the class. As students share, prompt students to elaborate and explain more, particularly if the student uses technical or scientific terms. As students share, prompt students to suggest evidence that would help them support a claim or decide between claims, and why they believe this evidence would be useful” (Teacher Edition).
- Chapter 4, Elaborate: The Sharing Explanations Protocol handout provides detailed guidance for students to share their explanations in their groups. For example: “If you are the one sharing... Share your explanation by reading it word for word. Ask for feedback from your team to make your explanation stronger [...]” “If you are not sharing... Listen as your classmate shares. Listen for... evidence that supports their explanation, reasoning that explains [...]” (Teacher Edition).

In multiple lessons, the materials provide sample student responses and questions for the teacher to elicit, probe, and clarify students’ ideas. For example:

- Chapter 1, Engage: In the Agree or Disagree? section, the teacher is provided the following guidance: “In step 2, students brainstorm to determine what evidence they would need to see if they were right or wrong. You might work through an example or two if students are struggling” (Teacher Edition). A couple examples of student claims and evidence are provided.
- Chapter 2, Explore 2: In the What Affects Absorption? section, the teacher is told to “Listen for students to make the following connections: taller villi → more cells → more cell membrane → more absorption. If students are struggling, help them by asking them some challenge questions, like the ones below [...]” (Teacher Edition).

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- Chapter 2, Explain 2: In the Special Structures of the Small Intestine section, the teacher is instructed to “Move around the room and listen to students as they discuss the structure of the small intestine and how it relates to the function of the small intestine. Listen for the following ideas: [...]” (Teacher Edition).
- Chapter 3, Bridge: In the Keeping Cells Alive: Revisit the Focus Question section, the teacher is told to “Ask 3–5 students to summarize what they have learned in answer to the Focus Question, and share their new drawings. Listen for key ideas such as: Cells need oxygen, water, and food to stay alive. [...]”
- Chapter 4, Bridge: In the Cells At Work: What It Means section, the teacher is told that “If students are struggling to distinguish the key ideas from the animation, sit with them and ask them to verbally respond to what they see before they record their ideas” (Teacher Edition).

Students receive feedback and revise their thinking accordingly throughout the unit. In addition, student artifacts show changes in student thinking over time. For example:

- Chapter 2, Explore 2: The I Can Develop a Scientific Explanation: Teacher Edition document tells the teacher that “Through class discussion or feedback from you or their peers, these students may collect new data and revise their claims. Encourage students to describe and explain any revisions or new data” (Teacher Edition).
- Chapter 2, Elaborate: In the M’Kenna’s Absorption Problem: Evidence Sort, the teacher is told that “In steps 6–7, students share their sorting decisions with their team. As you move around the room, encourage students to articulate why they agree or disagree with their teammates. [...] Students are free to revise their evidence sorts based on peer feedback”
- Chapter 3, Bridge: In the Keeping Cells Alive: Revisit the Focus Question section, the teacher is told to “Encourage students in step 1 to revise their original answers to the Focus Question. When students reflect back on how their thinking has changed, they are more likely to remember key ideas” (Teacher Edition).
- Chapter 3, Engage: In the Keeping M’Kenna’s Cells Alive section, “In step 5, students share their models with another classmate. Prompt students to revise or add to their models if they figured something out during their peer conversations” (Teacher Edition).
- Chapter 4, Bridge: Teacher Moves During Lesson: Steps 4–5: In the Cells At Work: What It Means section, “In step 4, students share their statements with their team. They revise their statements based on feedback from their peers. As students share, move around the room and listen for the following ideas: [...]” (Teacher Edition).
- Chapter 4, Explain: In the Team Model Peer Review section, the teacher is told that “In step 3, students will move around the room and provide feedback to other teams. [...] Encourage students to provide both positive and critical feedback that will be useful to the team to improve their model. Tell students to avoid feedback like “This is good” or “I don’t understand.” Their feedback should be specific and address things like: What is good? How is it good? How does it help me to understand? Also encourage students to offer answers to any questions the team may have written on yellow sticky notes” (Teacher Edition).

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Suggestions for Improvement

None

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 materials clearly describe the expected level of proficiency students should have with all three dimensions at the beginning of the unit and how prior learning will be built upon in each lesson.

In the Where Are We In the Storyline section of the Unit Introduction, the materials identify what learning students are expected to come in with for all three dimensions at the beginning of the unit:

- DCIs: "The DCIs in this unit (see overview page) build on and support the fourth grade DCI LS1.A "structure and function", which states, "Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction."
- SEPs: "[...] Students also build on elementary elements of the SEP "asking questions" to engage in middle school elements of the practice. In this introduction, students ask questions from careful observations of the unit phenomena to build a Driving Question Board. These questions may be to identify additional evidence that they need or to clarify evidence that they already have. Students also consider questions that they can investigate in their classroom."
- CCCs: "Students bring to this unit their understanding from previous grades that a system is a group of related parts that work together to carry out functions. In this unit introduction, students begin to consider how the complex human body (a system that is made of subsystems) can have symptoms in one part of the body (or one subsystem) and the problem be in another part (or subsystem) of the body."

Following the Unit Introduction, every subsequent lesson includes the "Where are we in the Storyline?" section that details where students should be in each of the three dimensions during that lesson and how each dimension is built upon. For example:

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- Chapter 2, Elaborate: In the Where Are We In the Storyline? section, the materials explain for the DCIs that students have “figured out that large molecules break down chemically when they move through the digestive system. In this lesson, they apply their learning to explain why M’Kenna’s small intestine tissue affects her ability to absorb nutrients.” For the SEPs “Students use models to explain why M’Kenna is not absorbing nutrients like a healthy person does. They practice and apply what they have done in previous lessons (using models to explain).” For the CCCs, “Students have been using structure and function in the chapter. Now they move from structure and function to cause and effect. Namely, if the structure of an organ is such that it cannot function, then that structure and lack of function are a cause of an illness (effect)” (Teacher Edition). Note that this only describes student use of their prior knowledge of the SEPs and CCCs, rather than student development of new understanding.
- Chapter 3, Elaborate: In the Where Are We In the Storyline? section, the materials explain that for the DCIs, “In previous activities, students evaluated evidence and supported a claim that cells in the body can use nutrient molecules derived from body tissue when nutrient molecules from digestion of food are not sufficient. In this activity, students synthesize science ideas and evidence they’ve collected from Chapters 1 through 3 to explain M’Kenna’s weight loss.” For the SEPs, “Students construct an explanation for M’Kenna’s rapid weight loss using evidence from the entire unit. At this stage, students are engaging in a fairly advanced form of argumentation because they must (1) make their own claim, (2) sort through evidence and use only the evidence most relevant to supporting their claim, and (3) link the evidence to the claim with reasoning.” For the CCCs, “Students ultimately make a claim linking cause and effect relationships to explain M’Kenna’s weight loss” (Teacher Edition). Note that this only describes student use of their prior knowledge of the SEPs and CCCs, rather than student development of new understanding.

Evidence was also found that, where appropriate, the materials point out partial or alternative conceptions that students may have and provide guidance for addressing incomplete or partial understanding. For example:

- Chapter 1, Engage: In the Agree or Disagree? section, students complete an Agree or Disagree handout. “The handout is designed to tap into common student ideas that contain accurate, partially accurate, or inaccurate science ideas.” The teacher is instructed to “not give students the right answer at this point” and to “Leave it as a mystery to be solved in the upcoming lessons” (Teacher Edition).
- Chapter 1, Explore: In the A Trip Through Digestion: Analyze section, the teacher is informed that “Students should get the gist, but they don’t need to be completely accurate yet. They will have more opportunities [to] engage in three-dimensional thinking and to revise their ideas about what role each organ plays in the digestive system later in the unit” (Teacher Edition).
- Chapter 2, Bridge: In the Building Blocks of Life section, the materials also point out that “A common misconception is that cells are “inside” the body (like marbles in a bag). It’s important that students understand that cells build the body just like bricks build a wall” (Teacher Edition).
- Chapter 3, Engage: In the Claims About M’Kenna’s Cells, the materials explains that “This is an Engage activity. It is acceptable for students to choose the wrong claim at this point in the

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chapter. Students will revisit these claims several times before the end of Chapter 3.” The materials also describe an example of how it is acceptable for students to engage productively with one of the claims that are inaccurate: “Even though Malcolm’s claim is not accurate, the student supports the claim using evidence. This indicates that the student is productively trying to support a claim with evidence” (Teacher Edition).

Suggestions for Improvement

- Consider providing guidance, instructions, or strategies to scaffold the learning in each dimension for students who do not come to the unit with the necessary prior knowledge.
- In the “Where are we in the Storyline?” sections, consider describing how students are progressing from the elementary elements to the middle school elements in the three dimensions. This type of explanation could support teachers in seeing how prior learning is built upon in the unit.

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 the science ideas and representations included in the materials were found to be scientifically accurate and appropriate for the middle school level.

The Background Information sections occur throughout the unit and provide teachers with scientifically accurate information beyond the DCIs. For example,

- Chapter 1, Explore: “The purpose of the digestive system is to break down the food we eat and extract nutrients from it. [...] Various organs are encountered along the digestive pathway. Each plays a specific role in the digestion of food” (Teacher Edition).
- Chapter 2, Bridge: “The cell is considered to be the smallest unit of living matter [...] It may be noted that viruses are smaller and simpler than cells. However, a virus is not generally considered to be alive since it can only reproduce after it infects a living cell and hijacks the cell’s machinery to make copies of itself” (Teacher Edition).
- Chapter 4, Explore: “The energy needs of people vary, largely due to their activity levels. Athletes who regularly engage in vigorous physical activity need more chemical energy than people who lead sedentary lifestyles. According to the most recent Dietary Guidelines for

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Americans, an active man needs to consume an average of 3,000 calories per day while a sedentary man needs only 2,400 calories per day [...]” (Teacher Edition).

Except for a couple of examples, the information, images, and representation in the Student Edition were also found to be scientifically accurate and grade appropriate. For example:

- Chapter 2, Engage: In the Modeling Absorption section, the materials state that “Food nutrient molecules are really small when the molecules are ready to be absorbed. The molecules that make up food look nothing like the food we see with our eyes. Food changes when you look closer and closer at what it is made of” (Student Edition).
- Chapter 2, Explain: In the Healthy Tissue Samples: Evidence Sort section, the materials provide accurate micrograph images of a healthy and unhealthy intestine.
- Chapter 3, Explore: In the A Cell’s Survival: Data Collection section, the materials state that “Many cells start to die without oxygen and water in a matter of minutes. Without food, cells start to die in a matter of hours” (Student Edition).
- Chapter 3, Explain: In the “The saying, ‘You are what you eat’ originated from a French doctor named Dr. Brillat-Savarin. In 1826 he wrote in his book, ‘Tell me what you eat and I will tell you what you are’” (Student Edition).
- In two instances—in the In the Agree or Disagree? section of Chapter 1, Engage, and in the Claims About M’Kenna’s Cells section in Chapter 3, Engage—students are told “if you disagree with a teammate about a claim, what evidence would **prove** you right or wrong?” **Note that evidence cannot prove this kind of idea “right” but can only support claims like this.**

Suggestions for Improvement

Although not necessary for an extensive rating, including citations for information and images in the Student Edition may support middle school students with recognizing information from reliable sources, and thus can support the SEP **Obtaining, Evaluating, and Communicating Information**.

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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

Adequate
(None, Inadequate, Adequate, Extensive)

The reviewers found adequate evidence that the materials provide guidance for teachers to support differentiated instruction because the materials provide multiple, varied learning strategies to support sense-making for different groups of students. **However, the support for differentiation with the three dimensions do not occur consistently or regularly across lessons, and the materials offer limited guidance and strategies for students with disabilities.**

The materials provide guidance to support the needs of students struggling to meet expected performance in the three dimensions, particularly in the Assessment Guidance sections. For example:

- Chapter 2, Explore: “Students may be mystified about what the experiment has to do with M’Kenna. Ask questions to make sure students see the connections. If they are struggling, it’s OK to spell out for them what the parts of the experiment represent” (Teacher Edition).
- Chapter 3, Elaborate: “If students have difficulty with the Disciplinary Core Ideas related to the function of individual body systems, revisit the Healthy Digestion interactive in Chapter 1 or the Absorption interactive in Chapter 2” (Teacher Edition).
- Chapter 4, Engage: “If students are still struggling with the Claim-Evidence-Reasoning (CER) framework, you may want to give them additional practice. Struggling students often have difficulty with reasoning. Emphasize for these students that reasoning is how they connect evidence to their claim. What science ideas can they use to support their ideas? Why does the evidence support their claim? Referring them to the Anchor Chart to remind them of this structure can help” (Teacher Edition).
- Chapter 4, Explain: “If students are struggling with the idea of the body as a system of interacting subsystems, then ask them to explain how their assigned body system functions. Probe their ideas by asking them where the energy to perform this function came from (cellular

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respiration). Then follow up by asking how the nutrients get to the cells in the system they are describing for cellular respiration (through the bloodstream)” (Teacher Edition).

- Chapter 4, Elaborate: “If some students are still struggling with the idea that body systems interact and these interactions can help answer the Focus Question, give them extra support by discussing the interaction between the circulatory system and the digestive system—two foundational systems—to explain M’Kenna’s symptoms” (Teacher Edition).
- Chapter 4, Explore: “Students that struggle to analyze and interpret data will benefit from contributing to and hearing team predictions about the data. Thinking ahead by predicting and trying to explain anticipated trends in the data provides a necessary scaffold for struggling learner” (Teacher Edition).

The materials provide **some** guidance to support the needs of English learners and struggling readers. For example:

- Chapter 1, Explain: “The Communicating in Scientific Ways sentence starters are particularly helpful for English learners. The sentence starters can help them build confidence and participate more fully in class discussions” (Teacher Edition).
- Chapter 1, Elaborate: “The Evidence Table is a scaffold to help students learn to recognize that some evidence is better than others. [...] English learners will benefit from the scaffold because it allows them to have a visual representation of the various pieces of evidence while they develop language associated with evidence quality” (Teacher Edition).
- Chapter 2, Explain: “Check with students to make sure they understand what the words structure and function mean. This is particularly important for struggling learners and English learners. You may ask students to add the words structure and function to their personal glossaries or to a Word Wall” (Teacher Edition).
- Chapter 3, Explain: “The reading about glycogen and the liver’s role in providing nutrients will be particularly difficult for students who are learning to speak English and for struggling readers. To support these students, you may want to read the text together as a class. You might include an image of the body and body systems to help students understand that the liver is an organ that is separate from the small intestine, stomach, large intestine, bladder, etc. You may also want to use molecular models to show glucose molecules attaching to one another in the liver to form glycogen, and then breaking apart again as they go into the bloodstream to provide fuel for cells. Be sure to have students add new terms to their personal glossaries or to a Word Wall” (Teacher Edition).
- Chapter 4, Bridge: “If students struggle with writing tasks or are ELL students, consider allowing them to identify features verbally and record themselves on their phones or computers” (Teacher Edition).
- In the Student Edition, Spanish translations can be enabled by clicking a button on the student page. **However, the materials do not provide guidance on when the translations are appropriate, whether or not students can respond in their native language, or how to assess responses from English Learners.**

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A few teaching notes and strategies are provided for students who have already met the PE or one of the targeted elements of the three dimensions. For example:

- Unit Introduction and Chapter 1 Overview: “Note that in Chapter 1 students simply consider the changes in the amounts of different types of molecules in each organ. More advanced students may consider the changes as the result of chemical reactions” (Teacher Edition).
- Chapter 2, Explore 2: “The demonstration and optional lab activity provide opportunities to differentiate instruction for students with different needs. [...] The optional lab activity is an ideal opportunity for more advanced students to plan and carry out their own investigations” (Teacher Edition).
- Chapter 3, Explain: “students who have mastered the earlier components of argumentation and/or older or more advanced students may be ready to engage with rebutting a claim” (Teacher Edition).
- Chapter 4, Bridge: “Students with early success in identifying key features should be encouraged to record all of their ideas as “What I see” statements. These students can also begin to interpret what they see by thinking about what each feature means. This is the next step in using the I² Tool” (Teacher Edition). However, all students eventually complete this step in the next lesson.
- Chapter 4, Engage: “For advanced students, you can eliminate the structure and scaffold of the CER framework and emphasize that they should include all aspects of the framework in their arguments or explanations” (Teacher Edition).
- Chapter 4, Explain: “Opportunity for Differentiation: Assigning the second body system is an opportunity for you to differentiate between struggling learners, learners on track, and learners that have exceeded expectations. [...]” (Teacher Edition).

A few extensions are found throughout the materials. [As a minor note, these appear to teacher guidance for differentiation rather than extension opportunities.](#) Some examples include:

- Chapter 1, Elaborate: “Extension Opportunity: You may wish to omit the Evidence Table scaffold if you have a class of students already familiar with evaluating evidence quality. Students who are the most adept at evaluating the quality of evidence should be able to discuss it without using the scaffold.”
- Chapter 2, Explain 1: “Extension Opportunity: [...] Depending on students’ knowledge of molecules, atoms, and chemical reactions, you may wish to emphasize the idea that iodine is a small molecule made with just two atoms and starch is a macromolecule made of hundreds of atoms.”
- Chapter 4 Bridge: “Extension Opportunity: Ask students that move through this task quickly and successfully to write a caption for their “What I see” and “What it means” statements. A caption is a summary statement that synthesizes and summarizes their ideas from their previous statements. See the handouts for both student and teacher support for writing a caption.” [This strategy is an extension but does not directly support students in developing deeper understanding of the three dimensions.](#)

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The materials provide limited support for students with disabilities. For example, in Chapter 2, Explain 2: “Opportunity for Differentiation: You may choose to vary the short story assignment. For example, students may want to create comic strip panels that illustrate and describe what happens to food at each step of the way. Encourage students to be creative. Some students may thrive given the opportunity to express their understanding in an alternate format” (Teacher Edition). However, the materials do not specify for which groups of students this strategy may be appropriate for, or how it supports students in learning with the three dimensions.

Suggestions for Improvement

- Consider including the “Opportunity for Differentiation” and “Support for Differentiated Instruction” teaching notes more regularly throughout the materials and especially for all central or three-dimensional tasks in the unit.
- Consider including more regular supports for students with special needs and for students who have already met the targeted learning in one or more of the three dimensions. For students who have already met the lesson PEs, consider extensions that directly deepen student understanding and use of at least one of the three dimensions.
- Consider providing more guidance to teachers on when to know if a student has met the intended learning target and what extension students could do to deepen their thinking.
- Consider renaming the extension sections since the guidance in these sections are more closely related to strategies for differentiation than extensions.

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 frequent guidance or tools are provided to teachers to support linking student engagement across lessons. The materials provide supports for teachers to

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ensure that students see how their learning in the three dimensions is linked to making sense of M’Kenna’s illness.

The materials regularly provide guidance for teachers to make the linkages between lessons apparent from the students’ perspectives. For example:

- Unit Introduction: At the start of the unit, students “generate questions for the Driving Question” and the teacher “organize[s] the students’ questions into categories of similar types of questions.” The teacher says “I noticed there are a lot of questions about individual body parts, but there are also questions about how body parts are related.” The teacher writes the driving question at the top of the Driving Question Board “How can a problem in one part of my body cause symptoms in another part?” and says [...] We are going to be thinking about this question for the whole unit” (Teacher Edition).
- Chapter 1, Elaborate: In the Revisit Driving Question Board section, the teacher is told that “This is a good time to revisit the Driving Question Board (DQB). Place a check mark on questions that have been answered or write answers directly on them. If students have posted questions on the DQB that ask about how food can possibly move from inside the digestive system to the rest of the body, highlight those questions. They will be part of the next chapter. [...] Motivate the question for the next lesson by asking students to brainstorm ideas for how they might figure out exactly what is wrong with M’Kenna’s small intestine” (Teacher Edition).
- Chapter 2, Bridge: “Ask students to consider what questions they still need to answer. Remind students that they do not yet know how food moves from inside the small intestine to the rest of the body. They know that the small intestine is made of cells, and cells have a membrane and a nucleus, but they have not figured out what role cells play in helping nutrients move throughout the body” (Teacher Edition).
- Chapter 2, Explain 1: “Gather students around the Driving Question Board. [...] Ask students to consider what questions they still need to answer. Remind students that they have an idea of how nutrients can move through cell membranes, but they don’t yet know why very few nutrients move through M’Kenna’s cell membranes” (Teacher Edition).
- Chapter 3, Explore: In the Reflect and Connect section, the teacher is told that “As students consider the Driving Question Board, push them to recognize that they may know that cells need nutrient molecules, but they have not yet figured out what cells do with those nutrient molecules. What happens to them and where do they go after they get into the bloodstream?” (Teacher Edition).
- Chapter 3: “Gather near the Driving Question Board. [...] You can keep the questions on the DQB, or move them to a different section of the DQB once they are answered by the class. Be sure to press students about questions they may have about why M’Kenna is losing weight” (Teacher Edition).
- Chapter 3, Elaborate: “At this point, students have answered the main unit driving question, but there are still a lot of symptoms from M’Kenna’s Doctor’s Note yet to be explained. Have students jot these questions in their notebook. Then ask students to share new questions to add to the DQB as you have done previously. [...] End the discussion by summarizing, ‘We’ve learned a lot to explain M’Kenna’s illness and some of her symptoms, but we still need to know why

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there are symptoms in other parts of her body.’ This will help to segue students into Chapter 4” (Teacher Edition).

The materials provide strategies for the teacher to support students in seeing how what they are learning in the three dimensions is related to the progress they are making to explaining M’Kenna’s illness. Across the unit, the materials have regular “Three-dimensional learning opportunity” sections that highlight where students are using all three dimensions in an activity. Teaching notes are provided to support students in addressing the three-dimensional targets. Additionally, the Student Edition frequently uses language from the three dimensions which can support students in seeing how the use of the three dimensions can help them make progress towards explaining M’Kenna’s illness. For example:

- Chapter 4, Explore: In the Systems Working Together: Fasting Comparison section, the teacher is told that “As students work through the tasks on this page, they have the opportunity to engage in three-dimensional learning. Support their learning by questioning students about: the patterns they are observing in the data, how they are using the data to form their explanations of the data, and how the patterns they observe and the ideas they share include how body systems are interacting and working with one another in response to exercise and fasting.”
- Chapter 2, Elaborate: In the M’Kenna’s Absorption Problem: Develop An Explanation section, The teacher is told that “Students individually complete the CER framework, using evidence, reasoning, and their models of absorption to support a claim. Because students conduct this work independently, this is an excellent opportunity to assess student three-dimensional learning. Move around the room and check that students are making good progress. They should be using evidence and reasoning to support a claim [...]”
- Chapter 2, Bridge: In the A Closer Look: Observation Sheet handout, students are told that “When you enter the Virtual Microscope, you will examine different tissues from the human body at different magnifications. You will draw what the tissue looks like. To make your drawing, you can choose any magnification. After you complete your drawing, focus on identifying a pattern in the drawing. In other words, point out anything that seems to repeat over and over in the drawing” (Student Edition).

Suggestions for Improvement

Consider including some opportunities for students to reflect directly on how their use of the SEPs, CCCs, or DCIs helps them to make progress towards explaining phenomena. This can help students build awareness of their use of the three dimensions.

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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 use of the targeted SEP elements. **However, differentiated supports for reducing scaffolds for different groups of students, particularly for students with special needs and abilities, were not found in the materials.**

The materials reduce the scaffolds for students for the SEP **Constructing Explanations** over the course of the material. For example:

- Chapter 1, Elaborate: “The Evidence Table is a scaffold to help students learn to recognize that some evidence is better than others. Struggling students may find this scaffold particularly useful because it helps them organize the evidence they have seen so far. English learners will benefit from the scaffold because it allows them to have a visual representation of the various pieces of evidence while they develop language associated with evidence quality” (Teacher Edition).
- Chapter 2, Explore 2: “The scaffolding for students is the CER framework. Students connect evidence (from interactive) to a claim that a long villus allows more nutrients through a membrane than a shorter a flat villus allows. Students connect the claim to the evidence with reasoning.” (Teacher Edition).
- Chapter 4, Bridge: In the Reflect and Connect section, the teacher is told, “In this activity, you can assess students’ ability to develop a logical explanation using key ideas and evidence from the reading and animation—this time without the scaffolding provided in earlier explanation activities” (Teacher Edition). Students are told to “Return to the Focus Question in your notebook. Now that you know more about how cells work, update your thinking about this question” (Student Edition).
- **Although scaffolds for some of the SEPs are reduced over time, there are limited teacher supports to help all students, including those with special needs and abilities, in developing increasing independence in using the SEPs.**

The materials also reduce the scaffolds for students for the SEP **Analyzing and Interpreting Data** over the course of the material.

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- Chapter 4, Explore: The materials state that the data analysis activity “is similar to the one identified on the previous page. Students will be using the same SEP and CCC to explain the DCI as they did before. [...]. Expect students to be more independent while analyzing the fasting data than they did will analyzing Ben’s original data” (Teacher Edition). *However, there are limited teacher supports to help all students, including those with special needs and abilities, in developing increasing independence in using the SEPs.*

Suggestions for Improvement

In lessons where scaffolds are being removed for the SEPs, consider specifying accommodations or modifications that can be made to make the learning accessible for different groups of students: students with disabilities, English learners, etc. These teaching notes could be specific to supporting students with the elements of the three dimensions and could describe strategies for reducing these scaffolds for the three dimensions over time.

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

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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 or design solutions because each lesson contains one or more opportunities for the teacher to assess observable evidence of three-dimensional learning from students in a large group, small group, or individual setting. Student performances are driven by a need to figure out M’Kenna’s illness, and there is a close match between elements claimed and those assessed. Some examples of these opportunities are listed below.

Related evidence includes:

- Chapter 2, Bridge: In the A Closer Look: Observation Sheet, students are told “When you enter the Virtual Microscope, you will examine different tissues from the human body at different magnifications. You will draw what the tissue looks like. To make your drawing, you can choose any magnification. After you complete your drawing, focus on identifying a pattern in the drawing. In other words, point out anything that seems to repeat over and over in the drawing” (Student Edition). In this task, students show evidence of learning with the following elements:
 - **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.*
 - **Analyze and Interpret Data** *Analyze and interpret data to determine similarities and differences in findings.*
 - **Patterns** *Graphs, charts, and images can be used to identify patterns in data.*
- Chapter 2, Explain 2: In the Special Structures of the Small Intestine section, students complete the following tasks: “1) Make Observations of three scales in the small intestine. Use Specialized Structures and Absorption to record your observations. 2) Write an explanation for how the structures seen at each of the scales help the small intestine function to absorb nutrients.” In the Specialized Structures and Absorption handout, students are asked to “make observations of the small intestine at three scales. As you examine images at these three scales, illustrate the special structures that you see. Explain how each structure helps with absorption of nutrients” (Student Edition). In this task, students show evidence of learning with the following elements:
 - **Constructing Explanations** *Apply scientific ideas, principles, and/or evidence to construct, revise and/or use an explanation for real world phenomena, examples, or events.*

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- **LS1.A Structure and Function** *In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions*
- **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.*
- Chapter 4, Engage: In the Claims About M’Kenna’s Cells section, the materials explain that “students consider two claims about M’Kenna’s health. One specifically relates to the idea of body systems working together. The other does not. As students respond to this task, you can gain more insight into what they are currently thinking about how body systems interact” (Teacher Edition). Students are asked to think about “if you disagree with a teammate about a claim, what evidence would **prove you right** or wrong?” and to “Write your ideas about evidence below your model” (Student Edition). **Note that evidence cannot prove this kind of idea to be “right.”** In this task, students show evidence of learning with the following elements:
 - **LS1.A Structure and Function:** *In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions.*
 - **Engaging in Arguments from Evidence** *Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretation of facts.*
 - **Systems and System Models** *Systems interact with other systems; they may have subsystems and be part of larger complex systems. They can use models to represent systems and their interactions—such as inputs, processes, and outputs—and energy and matter flows within systems.*

Formal individual assessment tasks at the end of each Chapter of the materials are driven by real-world phenomena and require students to use multiple elements of the three dimensions.

- Chapter 1 Assessment: “Draw a model to explain what happens during healthy digestion. In your model, include the following details: label the important organs in the system; label each organ’s function in digestion; show how the organs work together to digest food. [...] Predict how digestion might be different if the small intestine were missing. Use what you know about the role of the small intestines and patterns from digestion data to support your prediction [...] Use the two graphs of data and the model for M’Kenna’s digestion to explain the symptoms M’Kenna has in her digestive system, such as diarrhea and abdominal cramps” (Student Edition).
- Chapter 2 Assessment 2: “What would happen to the food that someone ate if they didn’t have the digestive enzymes they needed? Use a sketch to help explain your answer. Use evidence from the activities in the chapter to support your claim” (Student Edition).
- Chapter 3 Assessment: Students construct explanations about what would happen if they were lost on a hiking trail with water but no food. “1. Describe what will happen to your cells during the first four or five hours that you are lost. What do your cells need to survive? 2. What happens to the molecules your cells need once they are in your bloodstream? Use pictures and

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words to show what happens. 3. Imagine that you are lost overnight. It's a warm evening and there is no rain, but you are hungry and tired. a. Will your cells have access to everything they need during the time you are lost if you are lost for the next 10 to 12 hours? If so, where do those molecules come from? If not, why not?" (Student Edition).

- Chapter 4 Assessment: "3. You examined Ben's data from when he was eating and when he was fasting. Even though Ben is healthy, explain how this data helps you to explain what is going on with M'Kenna. Why do you think that? 4. What relationship would you expect to see between eating and glucose levels? For example, would glucose go up or down with eating and what would glucose levels be like a few hours after eating? 6. Another one of M'Kenna's symptoms was muscle cramps. She had sore muscles a lot of the time. Use your model for body systems working together to explain why M'Kenna's muscles were sore" (Student Edition).

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 <i>(None, Inadequate, Adequate, Extensive)</i>

The reviewers found extensive evidence that the materials embed formative assessment processes throughout that evaluate student learning and inform instruction because frequent and varied formative assessment opportunities are explicitly called out in the Teacher Edition along with clear guidance for how the teacher can modify instruction to address different student responses. **However, the unit does not include culturally and linguistically responsive strategies explicitly and regularly in formative assessments to attend to equity issues.**

Formative Assessment opportunities are called out throughout the materials and give teachers suggestions on what to do if students need more support. Some examples include:

- Chapter 1, Engage: "Formative Assessment Opportunity: [...] In question 2, students might respond that 'food is for energy' or 'we need to digest food so we can grow.' Don't score these answers correct or incorrect at this point, but also don't feel satisfied from superficial answers that students 'get it'. It's unlikely at this point that students have a deep understanding of how and why our bodies digest food" (Teacher Edition).

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- Chapter 1, Elaborate: “Formative assessment opportunity [...] Use students’ responses to the Focus Question as a formative assessment of how their understanding has changed in this chapter. [...] Initially, students may have thought that M’Kenna’s problem was in her stomach, small intestine, or large intestine. By the time students revisit the Focus Question, they should have an understanding that M’Kenna’s problem is in her small intestine. If students are struggling with this idea, revisit the three pieces of evidence and guide students to this conclusion” (Teacher Edition).
- Chapter 2, Explore 1: “Formative assessment opportunity: Step 7 is a good formative assessment opportunity to see how well students can engage in the Analyzing and Interpreting Data NGSS practice to make sense of the color change phenomenon in the starch and iodine lab. [...] If students have trouble understanding that iodine moved into the dialysis tubing, remind them that before the reaction, there was only starch inside the tubing and then the inside turned blue. [...]” (Teacher Edition). **However, this formative assessment task does not quite match a middle school element in Analyzing and Interpreting Data.**
- Chapter 3, Explain: “Formative assessment opportunity: Question 1 asks students to use the content representations for oxygen and water to explain why these two molecules are not sufficient to support cells. Students should identify that both molecules are missing a key atom—carbon. [...] If students have difficulty with this idea, you may want to have them take out the Nutrient Molecule Cards and Body Molecule Cards once again and ask them if anything is missing” (Teacher Edition).
- Chapter 4, Engage: “Formative assessment opportunity: In steps 1–2, students consider two claims about M’Kenna’s health. [...] Don’t correct students at this point but be sure to get an idea of what each student thinks by reading or listening to their responses. As the chapter unfolds, students will have opportunities to move their thinking forward. [...] This is a good opportunity to formatively assess whether students are able to use evidence and reasoning to support a claim” (Teacher Edition).

While nearly all of the formative assessment opportunities include strategies if students struggle with the learning performance, **the teacher guidance seldom provides strategies for different groups of students as shown in the examples above.**

Suggestions for Improvement

Consider routinely adding guidance for attending to issues of equity whenever an assessment opportunity is called out, especially if the assessment requires reading or writing to demonstrate learning. For example, consider including more than one way that students could show their thinking. Strategies could be provided particularly for assessments that are critical learning steps so that all students are supported in their three-dimensional learning.

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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 assessment targets are clearly stated and grade-appropriate elements of the dimensions being assessed are incorporated into the scoring guidance throughout the unit. However, the scoring guidance does not always provide enough support for teachers to interpret different student levels of proficiency or progress with the three-dimensional learning targets.

Explicit guidance is provided for interpreting student progress and assessing three-dimensional student performances in each of the chapter assessments. Student exemplars are often provided but do not show examples of student responses at a range of different mastery levels. For example:

- Chapter 1 Assessment Guidance: “At this point, students should be able to use their models to explain how food moves through the digestive system, the function of each organ, and how those organs work together as part of a larger system.”
 - “Question 1 [...] A successful model will include symbols such as arrows or sketches of food in different states of digestion, descriptions of how food changes in each organ, and descriptions of how the organs work together. If students are struggling with using a model to explain digestion, the function of organs, and how they work together, consider showing them two separate drawings. [...]”
 - “Question 2. [...] In this question, students must consider not only what each organ does on its own, but how each organ relies on the others (using a modified model to support their responses). If students are struggling with question 2, it might be helpful to [...]”
 - “Question 5–6 [...] students analyze data and apply what they have learned about the function of each organ in the digestive system to describe how organs work together and influence one another. If students are struggling, revisit the model of healthy digestion and connect the evidence in the graph to the function of organs and how they work together.”
- Chapter 2 Assessment Key:
 - “Assessment Guidance: Modeling: Students should include sketches with each response. In question 1, the sketch should illustrate food molecules as long chains of smaller components and should show those long chains throughout the digestive system. The images should include captions with action words that describe what is happening. For

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example, a long molecule might be described as moving through the system and not breaking apart. In question 2, students should show the villi and/or microvilli with large molecules not passing through the cell membrane. Students might use action words such as “blocked” or “stuck.” Alternately, they could describe the molecules as “too big to pass through.” It should be clear that students are using their models to explain their prediction about what would happen.”

- “Assessment Guidance: Crosscutting Concept: Students should make some reference to the structure and function of the small intestine, and the structure and function of nutrient molecules that are smaller than food molecules. The structure of the small intestine is such that it only allows small molecules through. When molecules are big, they can’t pass through the cell membranes”
- Chapter 3 Assessment Key:
 - “Assessment Guidance: Assessing Modeling: Using a model to explain and predict a phenomenon is at the heart of the NGSS practice of modeling. Student responses should go beyond merely drawing the digestive system and labeling parts. Instead, look for evidence that students are actually using the model to explain and predict. The evidence can include [...]”
 - “Assessment Guidance: Assessing Crosscutting Concept, Cause and Effect: Crosscutting concepts can be difficult to assess. Ideally, students will begin to see them as helpful explanatory ideas that apply across multiple disciplines. At this stage, it is important that students recognize a cause-and-effect relationship. In this case, if cells have everything they need, they will survive. If cells are lacking nutrients stored in the liver, they will need to consume fat and protein molecules from body stores.”
- Chapter 4, Elaborate: In the Scoring Guidelines for Final Explanations, sample ideal responses are provided for four possible explanations to “How can a problem in one part of M’Kenna’s body cause symptoms in another part?” For each explanation, a detailed list of “Indicators of success” are provided that teachers can look for in student responses. For example, “Student cites appropriate and sufficient evidence. Uses 5–7 pieces of evidence from those listed as appropriate to cite for this explanation.” “Student either states or uses appropriate general science principles. [e.g] Body systems work together—In this explanation it should be clear that the student knows that the digestive system and the circulatory system work together. [...]” Additionally, “Indicators of difficulty” are described to highlight common errors such as “Student does not mention directly that body systems interact or work together” or “Student fails to use sufficient evidence in their explanation” (Teacher Edition).
- Additionally, the Scoring Guidelines for Final Explanations in Chapter 4 includes “indicators of success” that support evaluating full student proficiency with the three dimensions. For example:
 - SEP: “Student states a clear claim. From ideal response: I claim that damage to M’Kenna’s digestive system results in the symptom of weight loss. M’Kenna’s weight loss is caused by damage to her digestive system.”
 - SEP: “The student refers to their model at least two times in their explanation to help explain unobservable mechanisms that are critical to the explanation”

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- CCC: “Student includes the ideas from the targeted crosscutting concepts that include systems and system models and stability and change. [e.g.] For this delivery of nutrients to happen, body systems like the circulatory and digestive systems have to work together like we saw in Evidence #9. (Systems and System Models) [...]”
- DCI: “Student either states or uses appropriate general science principles. [E.g.] The chemical reactions during cellular respiration release the energy cells need to function.”

The reviewers also did not find evidence that scoring guidance was provided for students to interpret their own progress in relation to the targeted standards.

Suggestions for Improvement

- Consider including scoring guidance for assessments on how to determine the extent to which students are accomplishing or achieving proficiency along each of the three dimensions claimed. For example, a simple table or rubric that describes criteria for “meeting” and criteria for “approaching” might be included for each chapter assessment or in key formative assessment opportunities.
- Consider including supports for students to build understanding of the learning targets so that, for example, students are able to track their own progress in relation to the targeted learning in all three dimensions.

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

Adequate
(None, Inadequate, Adequate, Extensive)

The reviewers found adequate evidence that the materials assess student proficiency using accessible and unbiased methods, vocabulary, representations, and examples because the materials use developmentally appropriate text, provide tasks that do not assume all students know culturally specific knowledge, and use a variety of modalities to collect information from students. However, strategies and supports, such as potential scaffolding, are not provided for all major assessments, and assessments do not leverage students’ funds of knowledge or provide students choice of response across multiple modalities.

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Related evidence includes:

- The reviewers found the vocabulary, representations, and scenarios in assessments to be generally fair and unbiased. For example, in the Chapter 1 Assessment, students are asked to “Think about how the digestive system organs work together and what would happen to digestion if an organ could not do its job” (Teacher Edition).
- Assessments are primarily driven by the central phenomenon of M’Kenna’s illness, which is relatable to all students (a person their age who is sick) and does not require culturally specific knowledge in the process of making sense of the phenomenon.
- Strategies for supporting students in vocabulary, reading, speaking, and listening are provided throughout the lessons (as described in II.E of this report), **however these strategies are not regularly provided on assessment opportunities**. For example, in Chapter 4 Assessment, the first question includes the following complex instruction: “Return to the Muscle Cells at Work animation in the Bridge at the beginning of Chapter 4. You made “What I see” and “What it means” comments on the Muscle Cells at Work handout. Now that you have completed Chapter 4, write a caption for the illustrations on the handout. You should know more now and can add to or revise your “What it Means” statements. Write a caption to summarize the animation of the muscle working and resting. To write a caption, first begin with a topic sentence that explains what the illustration shows (“This illustration shows _____”). Then use your “What I see” and your new “What it means” statements to write sentences about what you observed in the animation and why things happened the way they did. Make sure to use what you learned about cell respiration and body systems working together in your caption” (Teacher Edition). **No guidance is provided on how to make this task accessible to students who may, for example, struggle with multi-step instructions or with reading.**

The assessment opportunities across lessons offers a structured variety in the modalities expected for students’ responses. For example:

- Chapter 3 Assessment: “Work individually to complete the assessment. You may use your models of the body systems and your model explaining M’Kenna’s weight loss on the assessment” (Student Edition).
- Students respond to prompts in written form in their notebooks, such as recording their Initial ideas to the lesson Focus Questions and completing prompts in the Reflect and Connect sections at the end of each lesson.
- Students develop and revise models, such as the cell membrane model in Chapter 2, Lesson 3 and Chapter 4, Explain.
- Students share their thinking orally with small groups and the whole group multiple times throughout the unit, such as in Chapter 1, Lesson 3.
- While there are multiple modalities throughout the material, **the reviewers did not find evidence that the materials provide students with a choice of response across multiple modalities in any of the major assessments.**

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Suggestions for Improvement

- Consider providing opportunities for students that allow them to demonstrate their learning with the modality of their choosing in at least one significant task.
- For all of the assessment opportunities in the unit, and especially on summative assessments, consider explicitly pairing the task with the UDL strategies (e.g., multiple modes of communication, graphic organizers, alternative representations) that are likely to increase access for all students to comprehend the task and complete the assessment successfully.
- Whenever possible, consider providing suggestions for ways that assessments or scenarios in assessments can capitalize on the funds of knowledge students bring to the classroom. This strategy can potentially increase engagement for all students.

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

Adequate
(None, Inadequate, Adequate, Extensive)

The reviewers found adequate evidence that the materials include pre-, formative, summative, and self-assessment measures that assess three-dimensional learning because the unit uses a variety of assessment types that are mapped to three-dimensional learning goals. However, opportunities for students to self-assess their learning in the three dimensions were not found in the materials. The reviewers also could not find evidence of an explanation of the system of assessment that might outline how the different assessments work together to provide information about students' level of proficiency in the three dimensions.

Related evidence includes:

- Although optional, the material provides a pre-assessment in the Unit Introduction. The A Medical Mystery Assessment Activity includes "questions that assess students' understanding of the elements from the three dimensions." However, there isn't explicit guidance that explains how the different items on the 28-question assessment are mapped to the three dimensions.
- Formative assessments opportunities occur in each lesson as described in III.B of this report.
- Summative assessments opportunities occur in each chapter of the unit and are described in III.A of this report.

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- Although there are “Reflect and Connect” opportunities in each chapter, the reviewers could not find explicit opportunities for students to self-assess their learning in the three dimensions in the unit.

Suggestions for Improvement

- Consider providing an explanation of how the different types of assessments in the unit work together to measure student learning in all three dimensions.
- Consider providing opportunities for students to self-assess their progress and learning in the three dimensions.

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 there are clear assessment opportunities for students to demonstrate their growth in proficiency over time with *some* of the claimed focal SEPs, CCCs, and DCIs as students figure out M’Kenna’s illness. *However, student growth in other focal learning goals is not supported in the same way, and teachers are not guided to provide students with feedback in both written and oral modalities.*

Related evidence includes:

- Students demonstrate their proficiency in multiple elements of the SEP **Engaging in Argument from Evidence** over the course of the material. Evidence can be found in Chapters 1, 2, 3, and 4. For example:
 - Chapter 1, Engage: In the Food in the Body: Compare Ideas section, students are asked to “Work with your team to compare your ideas [claims] about what happens to food.” In the Agree or Disagree? section, students are asked to “read about several claims trying to answer the question about what happens to food in the body” and then “decide if you agree or disagree with each claim and decide the evidence you need to support your choice” (Student Edition).

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- Chapter 1, Explain: In the Agree or Disagree? section, students have opportunities to compare their ideas with their peers “Compare your agree and disagree decisions with your team. Discuss the evidence used to support each decision” (Student Edition).
- Chapter 2, Elaborate: In the M’Kenna’s Absorption Problem: Evidence Sort, student are asked to “Sort evidence that is relevant or not relevant to answer the question” about “How are M’Kenna’s cells in the small intestine affecting how she absorbs food nutrients? [...] For each card, select the correct column and write the piece of evidence and 1-2 sentences summarizing your reasoning for why the evidence is relevant or not relevant to answering this question.” Students share their evidence and reasoning in their team and are told that they can “make revisions to your evidence sort based on feedback from your team” (Student Edition).
- Chapter 3, Explore: In the A Cell’s Survival: Reviewing the Claims section, students are asked to revisit three different claims about whether M’Kenna’s cells are getting enough nutrients: “Review the evidence you have collected [in the unit or in your science notebooks] about what cells need to survive and how damage to the small intestine affects where cells get what they need. Write whether or not each piece of evidence supports the claim. If you think there is no evidence to support or not support the claim, write “no evidence.” After discussing their ideas with their team, students are told “you can add to or revise your ideas” (Student Edition).
- Chapter 4, Explain: In the Reviewing the Evidence section, students are asked to “Discuss the evidence you did not use in your copy of the class model. Ask your classmates questions about whether or not the evidence is important for showing body systems working together” (Student Edition).
- Chapter 4, Elaborate: In the Explaining M’Kenna’s Symptoms section, students are told to “pretend like you are the doctor M’Kenna visited for help. You will try to answer questions from M’Kenna and her parents about what is wrong with her body and the causes of all her symptoms. You will use evidence you collected in the unit to support your claim [...] Decide on 5-7 pieces of evidence that would help you develop a convincing explanation about M’Kenna’s problem. Remember, you need to include enough evidence to make your explanation strong and convincing to someone else. To do this, decide the most important evidence you need to include in your explanation and set aside less important evidence” (Student Edition).
- Chapter 4, Elaborate: The SEP element claimed states that students *Compare and critique two arguments on the same topic and analyze whether they emphasize similar or different evidence and/or interpretations of facts*. In the Explaining M’Kenna’s Symptoms, students write a scientific explanation to explain M’Kenna’s symptoms. “Write a scientific explanation. This is a short paragraph where you use evidence and reasoning to support your claim. You want to convince M’Kenna and her parents that your claim is correct because it’s supported by the evidence. Connect your evidence and reasoning using science ideas you have learned” (Student Edition). A CER graphic organizer or table is provided to students. Students create their individual explanation first before developing a consensus explanation with their team. Finally, in the Reflect

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and Connect section, students reflect on “How similar or different” their explanations were from their teams’ consensus explanations, as well as “how working in a team on a consensus explanation improved your understanding” (Student Edition). **Although implied, the instructions do not prompt students to directly consider similarities and differences in their evidence and interpretations.**

- Students demonstrate their proficiency in multiple elements of the CCC **Systems and System Models** over the course of the material. **However, opportunities for feedback and revisions based on feedback are not directly called out in the formative assessment opportunities related to this key claimed learning.** Related evidence includes:
 - Chapter 1, Engage: In the Food in the Body: My Ideas, students are told “A model represents important parts of a system, how the parts are connected, and the role of each part in the system. Draw, label, and describe as much as you know about where food travels in the body once it is eaten and how the food is changed inside the body” (Student Edition).
 - Chapter 2 Assessment: Students are asked to “Use the model you developed and taped in your notebook to explain what happens to the starch, fiber, protein, and fat in James’ breakfast when it moves through James’ digestive system. Draw the key parts of your model and be sure to illustrate and describe what is happening. Be sure to predict where the food molecules will end up. In your prediction about where molecules end up, include those that might break down into small molecules and those that don’t.” The Chapter 2 Assessment 1 Key points out that “it is important that students recognize and state that the organs in the digestive system are working together as part of a larger system” and students might demonstrate this understanding by saying, for example “The small intestine can only absorb small molecules, so it relies on the mouth and stomach to break food down from large pieces to smaller molecules.” However, students are not directly asked to describe how systems may interact with other systems.
 - Chapter 4, Explain: In the What More Do I Need to Know? section, students discuss questions such as “Where are important places in the body that the systems interact? How does one system influence the other? How do the systems respond? How does the transport of molecules (the matter) between systems occur?” and then discuss their ideas as a team to develop a consensus about what they need to learn more about.
 - Chapter 4, Explain: In the Model: Systems Work Together handout, students are asked to “develop a model for how the circulatory system interacts with another body system” and answer the question “When and how do body systems work together?” Students must “Draw zoomed-in illustrations at the important locations where the two systems work together. Draw these zoomed-in illustrations on a separate piece of paper. In these zoomed-in illustrations, add structures that help them work together. Then add molecules that move between the two systems.”
 - Chapter 4, Explain: In the Model: Gotta-Have-It Checklist section, students “develop a model showing how several body systems interact to keep us healthy.” In the lesson, students are asked to “Discuss ideas your team disagrees about and try to come to

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consensus on whether these ideas are necessary to explain where/how the two body systems interact. Discuss any science ideas that should be included but are not on the list. Add these ideas to your list” (Student Edition).

- Chapter 4 Assessment: In Question 1, students are asked to revisit images from the animation of muscle cells functioning as a person moves and write a caption about what each image shows. In their caption, students are asked to “Make sure to use what you learned about cell respiration and body systems working together.” In Question 6, students are asked to explain another of M’Kenna’s symptom: “Another one of M’Kenna’s symptoms was muscle cramps. She had sore muscles a lot of the time. Use your model for body systems working together to explain why M’Kenna’s muscles were sore.” In Question 7, students are also asked to think about “Aside from what happened to M’Kenna, think of another time you have seen that body systems are clearly working together. You can use examples your class shared at the beginning of the unit or you can think of a new example. Describe the situation and what is happening to the whole body. Then use the model to develop an explanation for what may be happening to cause different changes to the body.”

Students receive feedback from their peers and are encouraged to use that to improve their learning with respect to **Developing and Using Models**. Related examples include:

- Chapter 4, Explain: Students and Teachers provide feedback during Team Model Peer Review. Students are then asked to use the feedback as they combine the models.
- Chapter 4, Elaborate: In “Developing a Consensus” students use feedback from the previous section to build their team consensus.

Suggestions for Improvement

- Consider calling out explicitly and consistently in the materials where there are multiple opportunities to assess students’ use and understanding of all of the focal CCCs, SEPs, and DCIs claimed in the unit. This could help teachers to assess and provide targeted feedback to students to reach proficiency in the targeted three dimensions.
- Consider providing guidance for when it could be helpful for students to receive feedback from teachers in both oral and written modalities on all of the focal learning targets in the unit.

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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

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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

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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

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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)