

EQulP Rubric for Science

Ecosystem Change & Survival

Why do animals and plants live where they do and what should we do when it changes?

Curriculum Developer: OpenSciEd

GRADE 3 | FEBRUARY 2026

Category I Rating

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

Score Category I: 3

Category II Rating

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

Score Category II: 3

Category III Rating

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

Score Category III: 3

UNIT 3.4

Sum Categories	9
Rating	E

Overall Summary Comments

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

- **Integrating the Three Dimensions:** The unit materials demonstrate clear evidence of students using grade-appropriate elements of the three dimensions together throughout the learning process in service of explaining a phenomenon.
- **Student Ideas:** This unit offers several opportunities for students to express, clarify, justify, interpret, and represent their ideas. The materials also provide opportunities for students to provide peer feedback and to receive and reflect on feedback related to their thinking and reasoning,

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

- **Scaffolded Differentiation over Time:** The unit materials do not have a consistent change in the level of independence in student use of the elements of the unit focal SEPs. The materials could be strengthened with such guidance and with teacher support to help all students explicitly build an understanding and proficiency in specific elements of the SEPs over the course of the unit.
- **Opportunity to Learn:** The materials provide students with multiple opportunities to evaluate and adapt their thinking; however, there are few opportunities for students to apply feedback related to targeted learning objectives from one assessment to improve performance on the next assessment. The materials could be strengthened by incorporating opportunities that provide explicit feedback to students, enabling them to grow in proficiency toward the targeted learning objectives.

Why are there two colors of text in this report?

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

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

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

CATEGORY I

NGSS 3D Design

I.A.	Explaining Phenomena/Designing Solutions	5
I.B.	Three Dimensions	10
I.C.	Integrating the Three Dimensions	30
I.D.	Unit Coherence	32
I.E.	Multiple Science Domains	36
I.F.	Math and ELA	39

I.A. Explaining Phenomena / Designing Solutions

EXTENSIVE

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

- i. Student questions and prior experiences related to the phenomenon or problem motivate sense-making and/or problem solving.
- ii. The focus of the lesson is to support students in making sense of phenomena and/or designing solutions to problems.
- iii. When engineering is a learning focus, it is integrated with developing disciplinary core ideas from physical, life, and/or earth and space sciences.

The reviewers found **extensive** evidence that making sense of phenomena and/or designing solutions to a problem drive student learning. Materials are organized so that students are figuring out the central phenomenon of a manatee joining a group of dolphins in the waters around Tampa Bay. This newly formed group was nicknamed The Odd Pod by scientists. Student questions and prior experiences related to the phenomenon or problem extensively motivate sense-making and/or problem solving. When engineering is a learning focus, it is integrated with the development of life science disciplinary core ideas.

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

- 3.4 Ecosystem Change and Survival Unit Front Matter cites student interest as one reason for choosing the Odd Pod as anchor phenomenon for the unit: “This phenomenon was chosen as the unit anchor for the following reasons: When we surveyed elementary students about four possible phenomena, phenomena related to ocean animal survival had the highest interest levels. This was especially true for female students. When prompted to pick the phenomena of highest interest to them 64% of students in our sample selected the ocean phenomena. When we piloted the odd pod phenomenon in classrooms, students showed high interest and generated questions about dolphin and manatee well-aligned to the NGSS content bundle.”
- Lesson Set 1 (Lessons 1 - 8) focuses on the phenomenon of an “Odd Pod” - a pod consisting of dolphins and a manatee together. Students figure out that different species have different needs that sometimes cause them to share habitats. For example:
 - Lesson 1, Explore, Step 2: “Observe a puzzling phenomenon. Display slide O. Introduce a puzzling phenomenon by telling students that one day, Michael observed something unusual as he traveled through the waters near Tampa Bay.” (Lesson 1, Teacher Guide)
 - Lesson 2, Navigate, Step 1: “Using students’ questions, summarize that we are wondering where manatees and dolphins live and what it is like there. Say something like, It sounds like we are curious about what it is like where they live, but where are we even talking about? We learned from Michael that they often share the same waters in Florida, but we observed in the map that there are a lot of different waters in Florida. Do they often share all those waters or only some? We need to figure out where they live first and then what it is like there.” Synthesize step 6: “Ask students to share a claim (or answer) they might have that answers the lesson question and press them to use some evidence either the maps, the videos, the Scientists cards, or the Class Consensus model. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart. It might be something like the following, but use words and context that is coming from your students.” (Lesson 2, Teacher Guide)

- Lesson 5, Navigate, Step 1: “Decide what to investigate next. Share that we’re going to use some of the ideas we listed on our Evidence We Need chart to help us answer our questions about seagrass. Acknowledge that we have lots of ideas about how we could investigate this more, and tell students you have a video we can watch to see seagrass in its usual habitat.” (Lesson 5, Teacher Guide)
- Lesson 6, Explore, Step 2: “Tell students that, as a first step to answering our questions about how seagrass gets to be so different, you have some living seagrasses that could help. Refer to the Evidence We Need chart as you ask how observing living seagrass could help us answer our questions. Ideas to look and listen for: We can see and feel how different they really are. We can see and feel if they seem the same, like maybe they’re in the same family.” (Lesson 6, Teacher Guide)
- Lesson Set 2 (Lessons 9 - 13) focuses on the problem of manatees needing protection, and the reasons they need it. Students generate possible solutions to three specific problems that affect manatee populations. For example:
 - Lesson 9, Explore, Step 2: “Celebrate how well the class noticed and kept track of so many details regarding each problem. Use this slide and give students time to briefly chat with a neighbor and then to share with the class any final questions or wonderings about the problems, their causes, and their locations.” Synthesize step 5: “Reflect on ideas to generate uncertainty. Ask students to reflect on what they are not certain about with their designs, and where they want more information or evidence. Jot a question mark onto the sticky note(s) to note uncertainty. To help generate uncertainty, and if students haven’t asked already, pose whether some of the ideas might work for multiple causes, or whether some ideas may meet more than one criteria.” (Lesson 9, Teacher Guide)
 - Lesson 10, Synthesize, Step 5: “Pass back or have students locate their Designs to Protect Manatees handout from Lesson 9. Invite them to review their initial design solutions and then give them time to revise their idea or generate a new idea based on the additional research. Students can record their ideas on the second page of the handout. As students are revising their design ideas encourage them to represent their thinking using both words and pictures and be specific about how their designs better meet our criteria and constraints.” (Lesson 10, Teacher Guide)
 - Lesson 11, Navigate, Step 6: “Remind students that we wanted to figure out how we could make sure manatees have access to warm water, seagrass, and protection from boats. Ask students to think for a minute on their own then to turn and talk with a partner about new ideas they figured out to answer this question. Then, have students either jot them down their thinking on a sticky note or share aloud.” (Lesson 11, Teacher Guide)

The materials have consistent student-driven learning over time. Student questions from the Driving Questions Board (DQB) are revisited throughout the unit and moved to “Our Growing Ideas” when answered. For example:

- Lesson 1, Synthesize, Step 5: “Invite students to bring their questions to the Scientists Circle. Refer to slide BB for the steps to sharing and organizing questions. As students share questions, organize them into clusters or categories of questions. Use students’ words to label a cluster with a ‘topic’ or ‘phrase’ so students can quickly reference them (e.g., “waters” or “other animals” or “animal needs” or “animal groups”). For students who draw their question, have them explain it with words to the class (if needed, jot notes on a second sticky note and place both side-by-side on the DQB)” (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize, Step 6: “Introduce the Our Growing Ideas Chart. Display slide N and place the Our Growing Ideas chart in a spot that allows all students to see it. Add the lesson question to the “Our Questions” column of the chart: Where do manatees and dolphins live and what is it like there? Ask students if they have questions similar to this one on the DQB. If so, move those sticky note questions over to the Our Growing Ideas chart just below the lesson question.” (Lesson 2, Teacher Guide)

- Lesson 3, Synthesize, Step 7: “Transition to updating the Our Growing Ideas chart by adding the lesson question: Do manatees and dolphins share the same waters all year? Ask students to return to the similar questions on the DQB they identified earlier. Move those questions to the Our Growing Ideas chart near the lesson question. Ask students to share a claim (or answer) they might have that answers the lesson question. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart.” (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Step 2: “Ask students, If we examine data with more details about those different seagrasses you just saw and wondered about, are there other questions from our DQB we might answer, too? Work with students to identify other related questions from the DQB. Point out that we seem to be very curious about what exactly is going on with these different seagrasses,” (Lesson 5, Teacher Guide)
- Lesson 7, Navigate, Step 1: “Then, point out that we still have unanswered questions about why the manatee may have joined the dolphins’ group and formed the Odd Pod (Claim #2 on the Possible Claims chart). Revisit the Driving Question Board and point out questions related to these claims.” (Lesson 7, Teacher Guide)

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

- Lesson 5, Connect, Step 3: “Introduce identification cards. Display slide F. Explain that we have identification cards that contain information from patterns that a lot of other people have observed when they observe seagrass in nature. Identification cards use text features like images, captions, headings, and sentences to help people figure out which different kinds of plants they are observing. People often use identification cards to help them identify things in nature, like what kind of bird or tree they are looking at, so our identification cards and our other observations can help us figure out some general patterns about seagrass. Have students talk with a partner about what we might expect or what we hope we might find in the seagrass identification cards.” (Lesson 5, Teacher Guide)
- Lesson 7, Navigate, Step 1: “Point out that we’ve been investigating the Odd Pod to try to figure out why they might have formed a group that day. Then pose the question of how exploring other animals that live in groups, not only manatees and dolphins, could help us better understand animal groups and the Odd Pod.” (Lesson 7, Teacher Guide)
- Lesson 9, Navigate, Step 1: “Revisit a conversation from Lesson 1. Remind students that we introduced dolphins and manatees as protected animals back in Lesson 1. Use the slide to help explain that both have been protected by government laws for more than fifty years, and that data collected by scientists tells us that efforts to protect dolphins appear to be successful so far. Regarding manatees, continued protection is still needed as their numbers have not increased as dramatically. Very briefly, ask a few students to share why they think manatees might still need protection. Thank students for sharing ideas about why manatees still need protection and build on any predictions they have about problems manatees might be experiencing to share that you have an article to help us explore several problems manatees are facing.” (Lesson 9, Teacher Guide)
- Lesson 9, Explore, Step 2: “Introduce the problems that manatees face. Display slide B. Motivate this reading, Seeking Solutions for Manatees by reminding students that manatees are still in need of protection and this news article may help explain why. Have a piece of chart paper and markers ready to record noticings and wonderings from students. Title this chart, Manatees Need Help: Notice and Wonder.” (Lesson 9, Teacher Guide)

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

Each lesson states one to two Three-Dimensional Learning Goals. The goals relate to the lesson/level phenomenon in that lesson. For example,

- Lesson 4 Learning Goal: **”Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.”** (Lesson 4, Teacher Guide)
 - Lesson 4, Synthesize, Step 6: “Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain in writing why their claim is most likely the best answer to their question.” (Lesson 4, Teacher Guide)
- Lesson 10, Learning Goal: **”Compare multiple solutions for the loss of warm water places which causes Florida manatees to get sick or die.”** (Lesson 10, Teacher Guide)
 - Lesson 10, Explore, Step 4: “Obtaining information about solutions for protecting Florida manatees. Display slide G. Ask students What should we do to make sure manatees have access to warm water? Give students time to think and then respond to questions on the slide. Say something like, Let’s use our solution comparison tool to research three solutions for protecting Florida manatees from the loss of warm water. Pass out the Solution 1 Card to pairs of students (Fixing Springs). Tell students that we will explore Solution 1 as a whole group, and then they will investigate two additional solutions in partners.” (Lesson 10, Teacher Guide)

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

Though engineering PEs and DCI are not claimed for this unit, the idea of using criteria and constraints to evaluate solutions to problems runs throughout Lesson Set 2. The Practice of Creating Arguments and Designing Solutions ARG-E6 “Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem” is foregrounded in this Lesson Set. For example:

- Students leverage parts of the life science DCI “When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. (LS2.C-E1)” as they investigate three problems that manatees face and design solutions to them. For example:
 - Lesson 10, Explore, Step 4: “As a class, investigate the solution of fixing warm water springs. Begin by reading problem 1, which tells the story of the problem with Warm Mineral Springs in Southwest Florida. You may choose to read the text aloud to students, or ask student volunteers to read one of the text boxes aloud for their peers. After reading problem one, invite students to turn and talk to partners about how the problem makes it hard for manatees to meet their needs. Students should individually record their ideas in the “additional notes” section of their Warm Water Solutions: Comparison Tool. Invite 2-3 students to share what their partner said.” (Lesson 10, Teacher Guide)
 - Lesson 11, Connect, Step 2: “Using the Why Do Manatees Still Need Protection chart from Lesson 9, share with students that we are going to dig deeper into the seagrass and boat problems. When we hear from experts, we want to figure out more about why less seagrass and boats are a problem for manatees. Share that we will add new ideas and details to the problem on our chart, similar to what we did when we investigated the warm water problem in Lesson 10.” Synthesize step 4: “Acknowledge that we have a bunch of different

solutions, but constraints would limit us from installing all of them. Explain that we will use what we know from our research to make claims about which solution we think is the best for each problem. We will use evidence from the research cards and the notes on their Seagrass and Boat Solutions: Comparison Tool handout to support these claims. Emphasize that the goal is not to come to consensus, but rather to present claims and evidence and listen to others' claims and evidence. Share that we will do this by moving around the room in a four corners activity.” (Lesson 11, Teacher Guide)

- Students leverage the Life Science DCI “Populations live in a variety of habitats, and change in those habitats affects the organisms living there.” (LS4.D-E1) as they figure out why manatees need protection (the problem).
 - Lesson 9, Synthesize, Step 4: “Ask students what a successful solution should do so that manatees don’t get cold during winter. Listen for a student to suggest “providing or making warm water”. When you hear this, write this on top of the arrow connecting the cause to the effect. Explain that if our design can provide warm water for the manatees, then it meets our criteria, and we call it a successful design. Point out that our design stops the effect from happening, and so we draw a large “X” over the arrow. For each of the other causes, elicit ideas for the criteria for a successful design. Listen for students to suggest ideas closely aligned with the “causes” listed on the class chart, such as: Design needs to provide more seagrass. Design needs to prevent or reduce the number of boat strikes.” (Lesson 9, Teacher Guide)
 - Lesson 12, Synthesize, Step 2: “Make a claim for a design and support it with an argument. Then, tell students they will complete Steps 3-6 on their own. Preview these questions with students and give students time to ask clarifying questions. Reorient students to slide C. Tell students that there are many possible options to consider - there is no “right” answer to this problem. They will need to consider all the possible solutions and argue for the one they think might be the best overall solution to meet the criteria for protecting manatees. Encourage students to use the information they have on the Warm Water Solutions: Comparison Tool handout and the Seagrass and Boat Solutions: Comparison Tool handout as evidence. They may want to revisit their revised design ideas from Designs to Protect Manatees, too. This is a handout they used across Lessons 9, 10, and 11. Remind students that they need to: Circle the one solution they want to implement. Focus students on picking the best one (not all of them!) Draw the one solution they have chosen on the map where it needs to go. Then, write a claim to answer the questions and construct an argument to support their claim. Depending on which solution they choose, they will also need to consider constraints on that solution (e.g., if they choose to plant seagrass, one constraint might be time it takes to grow; if they choose to put in boater lanes, one constraint might be people not following the rules).” (Lesson 12, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

I.B. Three Dimensions

[All 3 dimensions must be rated at least “adequate” to mark “adequate” overall]

EXTENSIVE

Builds understanding of multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs) *that are deliberately selected to aid student sense-making of phenomena and/or designing of solutions.*

Document evidence and reasoning, and evaluate whether or not there is sufficient evidence of quality for each dimension separately.

Evidence needs to be at the *element level* of the dimensions [see rubric introduction for a description of what is meant by “element”]

The reviewers found **extensive** evidence that the materials give students opportunities to build understanding of grade-appropriate elements of the three dimensions. Students regularly engage in elements of all three dimensions in order to make sense of the anchoring or lesson-level phenomenon. The unit centers on students using targeted elements of all three dimensions that are clearly identified and addressed throughout the unit to explain why groups of animals live in certain places and how humans can support animals if their habitats change.

Rating for Criterion: SEP

EXTENSIVE

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

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

- Constructing Explanations and Designing Solutions, Engaging in Arguments from Evidence, and Obtaining, Evaluating, and Communicating Information.

DATA: Analyzing and Interpreting Data

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

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of DATA-E1 in Lessons 7 and 8. Evidence was found in Lessons 7 and 8, examples include:

- Lesson 7, Explore, Step 2: “Co-construct a data table. Display slide D and distribute the Animal Group Observations to each student and explain that you have a book that features each of the animals listed across the top of the table, and we can use the book to investigate how and why animals form groups. Point out that the data table on the handout already includes some of the reasons we thought animals might form groups, but there is also space to add other reasons we mentioned in our earlier discussion. Pause to clarify the term mate, if needed (the way that animals create babies, also called reproduction).” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 3: “Prepare for partner work. Display slide E. Ask students to use their prior experience to generate ideas for what clues they are looking for and how they can record their data. Listen for them to suggest looking at the pictures, reading the text, and when we see or read something, we can place a check mark on the data sheet.” (Lesson 8, Teacher Guide)

Claimed Element: **DATA-E2: Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.**

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of DATA-E2 Lessons 5 and 6. Evidence was found in both, examples include:

- Lesson 5, Explore, Step 4: “Introduce a tool to organize and record data from the identification cards. Display slide H. Distribute the Seagrass Data Sheet handout and walk students through it. Have students point out where and how they can write and draw to record data on the handout that can help them notice patterns among the seagrasses.” (Lesson 5, Teacher Guide)
- Lesson 6, Explore, Step 3: “Provide guidance for data analysis. Use slide F to show the Seagrass Data Tables handout and explain that every group will have two data tables that a scientist recorded from growing seagrass parents and offspring, in their lab. Using the graphic on the slide, invite students to recall and describe what they know from prior units about how plants reproduce: pollen is moved from one plant to another, and then seeds are produced. The seeds grow into new plants, which we are calling ‘offspring’ here. This is the same for seagrass, even though they live in water. Just like land plants, seagrass plants get pollinated by small animals carrying the pollen or through the pollen floating in water to the other plant.” (Lesson 6, Teacher Guide)

Claimed Element: **DATA-E4: Analyze data to refine a problem statement or the design of a proposed object, tool or process.**

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of DATA-E4 in Lessons 10 and 11. Evidence was found in both, examples include:

- Lesson 10, Synthesize, Step 5: “Revise our design solutions to protect manatees based on additional evidence. Display slide L. Pass back or have students locate their Designs to Protect Manatees handout from Lesson 9. Invite them to review their initial design solutions and then give them time to revise their idea or generate a new idea based on the additional research. Students can record their ideas on the second page of the handout. As students are revising their design ideas encourage them to represent their thinking using both words and pictures, and be specific about how their designs better meet our criteria and constraints.” (Lesson 10, Teacher Guide)
- Lesson 11, Synthesize, Step 5: “Revise or redesign our solutions. Ask students to locate their Designs to Protect Manatees from the previous lessons and find the last page. Give students time to individually work on the final page of the Designs to Protect Manatees handout. Cue them to use words and/or pictures to argue for a solution they think best meets the criteria and constraints. It may be the same one they argued for in the four corners activity or different. Encourage students to include evidence in their design using the solution cards and/or data they gathered on their Seagrass and Boat Solutions: Comparison Tool handout.” (Lesson 11, Teacher Guide)

ARG: Engaging in Argument from Evidence

Claimed Element: **ARG-E1: Compare and refine arguments based on an evaluation of the evidence presented.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of ARG-E1 in Lesson 12, Evidence was found in Lesson 12. Examples include

- Lesson 12, Synthesize, Step 4: “When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Ask each student to show on their map where their design solutions would work best. Encourage partners to ask questions about each other’s claims and arguments. After both partners have shared, have them trade handouts and read one another’s ideas, examining the map Step 4 and the argument in Step 5. Using Design Peer Feedback ask students to write down their 1-2 feedback ideas to their

partner. Remind students of the purpose of giving feedback by emphasizing things to look for (see slide F), such as: A solution from one of the options we researched. Where the solution should be done in the system drawn on the map. Evidence and science ideas about how the solution will help protect manatees to survive and reproduce. Mention of how it meets criteria and at least 1 constraint. Use slide G to support students to receive feedback. After the students have reviewed each other's work, give students time to improve their designs and/or arguments before turning in this work for additional feedback from you." (Lesson 12, Teacher Guide)

Claimed Element: **ARG E3: Respectfully provide and receive critiques from peers about a proposed procedure explanation or model by citing relevant evidence and posing specific questions.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of ARG-E3 in Lessons 12 and 13. Evidence was found in all claimed lessons, examples include:

- Lesson 12, Synthesize, Step 4: "Provide peer review and feedback. Display slide E. When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Ask each student to show on their map where their design solutions would work best. Encourage partners to ask questions about each other's claims and arguments. After both partners have shared, have them trade handouts and read one another's ideas, examining the map Step 4 and the argument in Step 5. Using Design Peer Feedback ask students to write down their 1-2 feedback ideas to their partner." (Lesson 12, Teacher Guide)
- Lesson 13, Synthesize, Step 5: "Give and receive feedback. When students have completed Part 3, display slide N and distribute the Giving and Receiving Feedback handout and pair them up to give and receive feedback about their claims and evidence. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints. The purpose of giving feedback is to help improve our claims by emphasizing things to look for." (Lesson 13, Teacher Guide)

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

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of ARG-E4 in Lessons 1-4, 7-8, and 12. Evidence was found in all claimed lessons, examples include:

- Lesson 1, Synthesize, Step 3: "Make initial claims about the Odd Pod. Distribute the My Initial Claims handout to each student. Remind students that we know, from Michael, that manatees and dolphins often share the same waters in and around Florida. Direct students to the 'Claim #1' part of their handout and have them write and/or draw their answer to the question, Why do manatees and dolphins often share the same waters?" (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize, Step 6: "Ask students to share a claim (or answer) they might have that answers the lesson question and press them to use some evidence either the maps, the videos, the Scientists cards, or the Class Consensus model. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart." (Lesson 2, Teacher Guide)
- Lesson 3, Synthesize, Step 8: "Use the claim and evidence cards to start an argument. Display slide R. Ask students to work with a partner to pick one claim that they think best answers our question and select the evidence cards that they think help support their claim. Partners can lay their deck out on a table and move the evidence cards under the claim that they have selected. The evidence cards include a sentence starter to support students in describing what we observed in the evidence that supports their claim. As students are working with partners, circulate the room and use the Following Student Sensemaking (Lessons 2-4) to document student's individual sense making. During this lesson, students have the opportunity to expand their thinking of how to connect evidence to claims, and they start

to verbally construct an argument with a peer. In the next lesson, students will have an opportunity to revisit the same question and individually write an argument using evidence to support a claim.” (Lesson 3, Teacher Guide)

- Lesson 4, Synthesize, Step 6: “Construct an argument based on evidence. Display slide N. Show students the Odd Pod Claim and Evidence Cards for L3, L4, L8 from Lesson 3 with an additional evidence card: Wildlife in our Waters Website. Explain that students will use the cards to help them revise their claims and construct an argument. Distribute only the cards labeled Lessons 3 & 4 or Lesson 4. (Do not yet distribute cards labeled Lesson 8.)” (Lesson 4, Teacher Guide)
- Lesson 7, Synthesize, Step 6: “Introduce the Springer assessment. Distribute the Orca Named Springer assessment to each student. Display slide N and read the introduction of the assessment together. Introduce the new question, which is a slight variation on the lesson question: Does living in a group help an orca survive?” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Have students choose the argument format best suited to their needs. Display slide K. Pass out 1 copy of the Odd Pod New Argument assessment to each student with the side you chose for them (see the Materials Preparation section). Have a set of Odd Pod Claim and Evidence Cards for L3, L4, L8 with the new Lesson 8 evidence cards readily available for students to use. You can remove the two claim cards from Lessons 3 and 4, but keep the evidence cards. The set of evidence cards match the list of evidence under option 1 on students’ handout.” (Lesson 8, Teacher Guide)
- Lesson 12, Synthesize, Step 2: “Make a claim for a design and support it with an argument. Then, tell students they will complete Steps 3-6 on their own. Preview these questions with students and give students time to ask clarifying questions. Reorient students to slide C.” (Lesson 12, Teacher Guide)

Claimed Element: **ARG-E6: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.**

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of ARG-E6 in Lessons 10, 11, 12, and 13. Evidence was found in Lessons 10, 11, 12, and 13, examples include

- Lesson 10 Handout 1 Warm Water Solutions Comparison Tool: “Compare how the three solutions address each of our criteria and constraints...Which solution would you choose now? Make a claim about which solution you would choose. Support your claim with at least two pieces of evidence.” (Lesson 10, Warm Water Solutions Handout)
- Lesson 11 Slide Deck slide J: “Argue from evidence: What solution best meets our criteria and constraints? Move to the corner that fits your thinking. Discuss for 2 minutes. Pick someone to share for the group.” (Lesson 11, Slide Deck)
- Lesson 12 Student Assessment 1 Plan to Protect Manatees: “Step 5. Make an argument to answer the question: How does your design solution protect manatees and help them survive and reproduce? Your claim is the first sentence. It should answer the question. Then, add sentences for how your plan meets the criteria. Use evidence we have and ideas from Our Growing Ideas chart to support your claim. Step 6. What are possible constraints on your design? List one constraint and describe how it might affect your design idea.” (Lesson 12, Student Assessment Plan 1)
- Lesson 13
 - Explore, Step 4: “Set the context for comparing three solutions. Display slide K and direct students to Part 2: Investigate solutions on their Sea Turtle Task. Read aloud the text for this part and briefly discuss the criteria and new constraints...How are these criteria and constraints similar to the ones we used for manatees?...How are they different?...Why are the criteria and constraints different now?” (Lesson 13, Teacher Guide)
 - Lesson 13 Slide Deck slide M: “Argue from evidence. On your own, compare solutions and make a claim.” (Lesson 13, Slide Deck)

INFO: Obtaining, Evaluating and Communicating Information

Claimed Element: **INFO E1: Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.**

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of INFO-E1 in Lessons 4 and 5. Evidence was found in Lesson 4, examples include:

- Lesson 4, Explore, Step 2: “Give students time to obtain information about their animal or plant. Display slide E. Explain that you have a website with information and images/videos about different kinds of plants and animals that may help us figure out what lives in the shared waters and how they may interact with manatees and dolphins. Help students get connected to the Wildlife in Our Waters Website and preview with students how the site is organized. Distribute a copy of the Wildlife Data Sheet handout to each student. Remind students of the question we are investigating, What else lives in these waters that could help us explain the odd pod?” (Lesson 4, Teacher Guide)
- Lesson 5, Connect, Step 3: “Motivate reading the identification cards with a partner to look for patterns. Point out that we just explored one of the identification cards, and it said Turtle Grass is one type of seagrass. Suggest that we can work with partners to read other identification cards about other types of seagrasses to answer our questions and look for patterns - how are seagrasses the same and different? Then we can come back together to find out if other students notice the same patterns we observed.” (Lesson 5, Teacher Guide)

Claimed Element: **INFO E2: Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.**

This SEP is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of INFO-E2 l in Lessons 2, 4, 7, 8, and 10. Evidence was found in all claimed lessons, examples include:

- Lesson 2, Synthesize, Step 5: “They will use their observation and evidence from their Explore Shared Waters handout to sketch or write some initial descriptions of each type of water on the model. Give students about 5 minutes to work quietly on describing each system. Have them wait to add stickers or anything more permanent until the whole class comes together for consensus.” (Lesson 2, Teacher Guide)
- Lesson 4, Explore, Step 2: “Give students time to obtain information about their animal or plant. Display slide E. Explain that you have a website with information and images/videos about different kinds of plants and animals that may help us figure out what lives in the shared waters and how they may interact with manatees and dolphins. Add to our model. Display slide F. Ask students to bring their individual work from Wildlife Data Sheet to a Scientists Circle.” (Lesson 4, Teacher Guide)
- Lesson 7, Synthesize, Step 4: “Examine and discuss our data in a Building Understandings Discussion. Display slide I and facilitate a Building Understandings Discussion. Have the Better Together: Animals in Groups available for students to point to and use follow up prompts to push for students to identify evidence from images and text or the class data chart to support their ideas.” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 4: “Share and discuss data. Bring the students back together to share data for typical dolphin and manatee groups. Facilitate a Consensus Discussion. Use slide G to orient students to the questions the class will share and discuss. Elicit ideas for manatees first.” (Lesson 8, Teacher Guide)
- Lesson 10, Connect, Step 2: “Gather more information from a second video. Display slide D and remind students of our guiding questions: What change is happening in the habitat? How is it affecting manatees? Play the Causes of Warm Water Problems video. Then have students turn and tell a partner what changes have happened and how they are affecting manatees. Invite 2-3 students to share and record the additional information on the chart.” (Lesson 10, Teacher Guide)

AQDP: Asking Questions and Defining Problems

Claimed Element: **AQDP-E2: Identify scientific (testable) and non-scientific (non-testable) questions.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of AQDP-E2 in Lessons 5. Possible evidence located in claimed lesson, for example:

- Lesson 5, Navigate, Step 1: “Brainstorm evidence we need. Display slide B. Explain that to answer our questions, we can gather and use evidence. Have students turn and talk about ideas for kinds of evidence they want to see (photographs, data, written information, videos) to help answer our new questions...Decide what to investigate next. Share that we’re going to use some of the ideas we listed on our Evidence We Need chart to help us answer our questions about seagrass. Acknowledge that we have lots of ideas about how we could investigate this more, and tell students you have a video we can watch to see seagrass in its usual habitat.” (Lesson 5, Teacher Guide) Though a video is provided, *students are not prompted to identify testable/non-testable questions.*

Claimed Element: **AQDP-E3: Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of ADQP-E3 in Lessons 1 and 9. Partial evidence was found in lessons 1 and 9, examples include

- Lesson 1:
 - Synthesize, Step 5: “Display slide X and pass out 1 sticky note to each student. Give students time to review charts from class. Tell students to use a marker to write one question in any language on each sticky note. They should write and/or draw their questions so they are big and bold—we want to be able to see the questions clearly. If students struggle to come up with questions, use slide Z to provide the class with useful question frames.”(Lesson 1, Teacher Guide) Though students do ask questions about cause and effect relationships, *students are not prompted to make predictions about reasonable outcomes.*
 - Slide deck slide Z: “ Ask Questions; “How does ____ cause ____? How does ____ relate to ____? Why do ____ look like ____? Why was ____ similar for all of them? Why was ____ different between them?” (Lesson 1, Slide Deck)
- Lesson 9
 - Navigate, Step 6: “Ask questions about problems and solutions. Pass out 1-2 sticky notes and a dark marker to each student. Give students time to write 2 questions - 1 about the problems facing manatees and 1 about design ideas - with a partner. If students struggle to come up with questions, use slide M to provide useful question frames.” (Lesson 9,Teacher Guide)Though students do ask questions about cause and effect relationships, *students are not prompted to make predictions about reasonable outcomes.*
 - Navigate, Step 6 Asking Questions and Defining Problems sidebar: “To support more independent engagement with this practice, instead of giving students question frames (as seen in Lesson 1), have students come up with question frames that could be useful. For example, elicit from students the kinds of questions they could ask right now (how questions, why questions, when and where questions, etc.). Also, if you still have DQBs from previous units, ask students to find question frames from earlier questions that could be appropriate now. Jot down their ideas for question frames for the class to use.” (Lesson 9, Teacher Guide) Though students do ask questions about cause and effect relationships, *students are not prompted to make predictions about reasonable outcomes.*

MOD: Developing and Using Models

Claimed Element: **MOD E1: Identify limitations of models.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of MOD-E1 in Lesson 2. Evidence was found in Lesson 2, examples include:

- Lesson 2, Synthesize, Developing and Using Models sidebar: "Use this opportunity to discuss how the Shared Waters model might be limited in what it currently represents. Students may have additional questions about the waters, what is found in the water, when certain animals are in the water, or how animals interact with one another. These are examples of additional ideas that our current model does not represent and can be used to motivate further investigations." (Lesson 2, Teacher Guide)

Claimed Element: **MOD E4: Develop and/or use models to describe and/or predict phenomena.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of MOD-E4 in Lessons 2 and 4. Evidence was found in both, examples include:

- Lesson 2, Synthesize, Step 5: "Develop an individual model first. Display slide L. Say something like, Now that we have gathered so much information about these habitats, let's describe what we know about these three different waters. Pass out 1 copy of the Individual Model handout to each student. Tell students to use the evidence they have to describe as much as they know about each type of water onto their individual handout. They will use their observation and evidence from their Explore Shared Waters handout to sketch or write some initial descriptions of each type of water on the model." (Lesson 2, Teacher Guide)
- Lesson 4, Synthesize, Step 4: "Update the model to show interactions. Ask students to come up as partners to draw a line between components of the model and then explain the connection (interaction) between them. Encourage students to add text near the line to explain in more detail (or as the teacher, write the text based on what students tell you). Students can also add these lines and their own text to their individual models on the Individual Model handout. Continue until all of the interactions have been added to the model. See the updated example model shown here." (Lesson 4, Teacher Guide)

CEDS: Constructing Explanations and Designing Solutions

Claimed Element: **CEDS-E5: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.**

This SEP is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of CEDS-E5 in Lessons 9, 10 and 11. Evidence was found in lessons 9, 10 and 11, examples include

- Lesson 9
 - Synthesize, Step 5: "Chart design ideas. Point to 'lack of warm water', and ask for a volunteer to share their idea and which of the given criteria does their idea meet. After a student shares their idea, check for clarification with the class, and then have the student place their sticky note below the arrow corresponding to the criteria their idea meets. If students have similar ideas, ask them to share aloud first, and then place it near the previous idea. If a student shares an idea where the cause and criteria do not match, let them know that there may be a better match on the chart. You can also allow the student to choose a classmate to help if needed. When all designs for one cause have been shared, move to the next cause and repeat until all ideas are posted." (Lesson 9 Teacher Guide)

- Synthesize, Step 5 Constructing Explanations and Designing Solutions sidebar: “When students create and share initial designs to protect manatees from the three problems introduced in the news article, push them to explain how their idea meets at least one criteria and considers at least one constraint agreed upon by the class. It may help to refer to the ‘Problem faced by manatees’ chart and ask students to point to the criteria and constraints they think their design addresses. If you prefer not to single out any students, you can provide this feedback in writing on the Designs to Protect Manatees handouts, or you can pose the solution to the whole class as a hypothetical one or one from a previous student.” (Lesson 9, Teacher Guide)
- Lesson 10
 - Explore, Step 3: “Pass out 1 copy of Warm Water Solutions: Comparison Tool to each student and say something like, I used our ideas about criteria and constraints for solutions and created a tool to help us compare solutions using these criteria and constraints. Orient students to the solution comparison tool by asking them to point to each of the three columns for solution A, B, and C as well as the different rows for the three criteria (warm water in winter, sea grass to eat all year, safety from boats) and four constraints (money, time, effect on animals, effect on people). Point out the ‘additional notes’ section of the handout where we can record additional information that will help us decide at the end which solution we think is best based on the evidence we gather.” (Lesson 10, Teacher Guide)
 - Synthesize, Step 5: “Revise our design solutions to protect manatees based on additional evidence. Display slide L. Pass back or have students locate their Designs to Protect Manatees handout from Lesson 9. Invite them to review their initial design solutions and then give them time to revise their idea or generate a new idea based on the additional research. Students can record their ideas on the second page of the handout. As students are revising their design ideas encourage them to represent their thinking using both words and pictures and be specific about how their designs better meet our criteria and constraints.” (Lesson 10, Teacher Guide)
- Lesson 11
 - Explore, Step 3: “Call back to criteria and constraints. Display slide F. Using the Why Do Manatees Still Need Protection chart from Lesson 9, have students share what criteria they need to meet to successfully design a solution to these problems. Remind them they have some initial ideas already on the table. Revisit constraints that they need to consider, such as time, money, and possible harm to other animals or plants. Ask students how they might investigate solutions. Look and listen for ideas such as: finding places that have tried a solution, researching with information cards, testing new solutions to see how they work.” (Lesson 11, Teacher Guide)
 - Synthesize, Step 5: “Give students time to individually work on the final page of the Designs to Protect Manatees handout. Cue them to use words and/or pictures to argue for a solution they think best meets the criteria and constraints. It may be the same one they argued for in the four corners activity or a different one. Encourage students to include evidence in their design using the solution cards and/or data they gathered on their Seagrass and Boat Solutions: Comparison Tool handout.” (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

Rating for Criterion: DCI**EXTENSIVE**

- ii. Provides opportunities to develop and use specific elements of the DCI[s].

The reviewers found **extensive** evidence that the materials provide opportunities to develop and use specific elements of the DCIs. Students have multiple opportunities to build knowledge around the life science DCIs (LS2.C-E1, LS2.D-E1, LS3.A-E1, LS3.B-E1, LS4.C-E1, LS4.D-E1).

LS2.C: Ecosystem Dynamics, Functioning, and Resilience

Claimed Element: **LS2.C-E1: When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.**

Claimed in Lessons 3, 9, 10, 11 and 12. Evidence was found in Lessons 3, 9, 10, 11 and 12; examples include

- Lesson 3, Connect, Step 5: “Prompts to use...Why do manatees move between the ocean and rivers or springs?...Ideas to Listen For...Manatees need water that is at least 68 degrees F. During the winter months, ocean water gets cold. Manatees move to rivers or springs during the winter months because the water is warm all year...Do dolphins behave similarly to manatees?...There are a lot of types of dolphins. Some bottlenose dolphins live in coastal waters all year, and some live in the deep ocean all year. They don’t move between water types like manatees. They move in one type of water. Manatees do this too. Manatees and dolphins move because they need food.” (Lesson 3, Teacher Guide)
 - As noted in the 3.4 Ecosystem Change and Survival Matrix: “This lesson does not address reproduction nor animals moving into a transformed environment; those ideas are included in the unit’s second lesson set.”
- Lesson 9
 - Explore, Step 2: “Have a piece of chart paper and markers ready to record noticings and wonderings from students. Title this chart, Manatees Need Help: Notice and Wonder. Uncover causes and effects. Read aloud the news article as a class. Stop after each paragraph to record noticings and wonderings from the class... Prompts to Use/Ideas to Look and Listen For: What did you notice after reading this paragraph? Manatees need warm water in the winter. With more people moving in, there are less warm water places for manatees. Natural warm springs are disappearing as people build on top of them... If students have not already noticed where the three problems occur from the reading, take a moment to ask them, and then record their responses under ‘Notice’ on the class chart. Refer to the class’ Class Consensus model and ask students in which of our three marine habitats each problem occurs. You can expect responses like these: Lack of warm water - near Apollo Beach in Tampa Bay - freshwater areas like rivers, lakes, and streams, Not enough seagrass - Indian River Lagoon - coastal waters, Boat strikes - freshwater and coastal waters (Indian River Lagoon, Apollo Beach, Tampa Bay, and wherever else you might find boats)” (Lesson 9, Teacher Guide)
 - Explore, Step 2 Cause and Effect sidebar: “A student may say, ‘It says that manatees need warm water to survive the winter, but the natural springs are being destroyed.’ To help students see cause and effect more clearly, you might reframe this by saying, ‘So manatees are threatened by a lack of warm water in the winter (effect), which is caused by the destruction of natural springs.’...Examples for the second and third paragraphs may look like: Manatees are threatened by a lack of seagrass (effect), which is caused by pollution from people in coastal waters. Manatees are hurt or killed by boats (effect), which is caused by increased boat traffic in all coastal and freshwater areas.” (Lesson 9, Teacher Guide)

- Synthesize, Step 4: “Before moving to the next slide, model how we can use this chart to summarize why manatees still need protection, by saying something like, There is a lack of warm water in freshwater areas due to fewer natural springs, and this leads to (arrow) manatees getting cold, sick, and sometimes dying. Explain that the arrow helps symbolize how each specific cause (lack of warm water) leads to a specific effect (manatees not surviving). Ask for student volunteers to summarize the other two relationships from the chart.” (Lesson 9, Teacher Guide)
 - Lesson 9 Article Seeking Solutions for Manatees: “Without enough seagrass, the manatees will starve,” said Gillian Reede. Scientists have also noticed that when there is not enough food for manatees, they stop having babies.” (Lesson 9, Article Seeking Solutions for Manatees)
 - As noted in the 3.4 Ecosystem Change and Survival Matrix: “This lesson will not explicitly address the movement of organisms to new locations, but will instead focus on threats to survival and reproduction.
- Lesson 10
 - Connect, Step 2: “Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees? Play the Wildlife Nation: Endangered Underwater video. Have students turn and tell a partner what change has happened and how it’s affecting manatees.” (Lesson 10, Teacher Guide)
 - Lesson 10 Cards Warm Water Solutions: “How does this solution affect other animals? Removing dirt, sand, and rocks can harm the plants and animals who live there. Growing plants along the sides of the river to keep the dirt and rocks in place also creates shelter and food sources for animals in the area.. Building new warm water canals removes the habitats for lizards, trees, and other plants and animals that live on land. Building new warm water canals creates habitats for more than just manatees. Other animals and plants like grasses, fish, and turtles can also live in these new waters...The heaters could warm the water to a temperature that is too high for the other plants and animals in the area. People and companies need to pay money for every hour that the heaters are turned on. We are not sure yet if or how water heaters affect other plants and animals.” (Lesson 10, Cards Warm Water Solutions)
 - Lesson 11
 - Connect, Step 2: “When we hear from experts, we want to figure out more about why less seagrass and boats are a problem for manatees. Share that we will add new ideas and details to the problem on our chart, similar to what we did when we investigated the warm water problem in Lesson 10. Watch two videos to gather more information about the seagrass problem. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees?...Have students share noticings from the video, and look and listen for ideas such as these. Algae is that brown stuff growing on and around the seagrass. There are big clumps of algae in the water. There is grass growing but it’s covered in algae. The algae makes it so the seagrass can’t get the light it needs to survive.” (Lesson 11, Teacher Guide)
 - Lesson 11 Cards Warm Water Solutions: “How does this solution affect other animals? Adult seagrass provides habitats for many different fish and animals in the ocean. When there is more seagrass, there are more nearby animals and fish. People like this because they can catch more fish while fishing in the ocean. Seagrasses are an important source of food for many animals, including manatees...Seagrasses and other water plants become healthier when there is less algae. More fish, crabs, and turtles will return to an area once algae is removed...This solution helps seagrasses and other water plants grow and stay healthy. Fish, crabs, shrimp, turtles, and other animals stay healthy in unpolluted water.” (Lesson 11, Cards Warm Water Solutions)

- As noted in the 3.4 Ecosystem Change and Survival Matrix: “This lesson does not address changes in temperature. This lesson only slightly addresses new organisms moving into a transformed environment (e.g., algae growing well in polluted waters).”
- Lesson 12
 - Lesson 12 Student Assessment 1: “Step 5. Make an argument to answer the question: How does your design solution protect manatees and help them survive and reproduce?” (Lesson 12, Student Assessment 1)
 - As noted in the 3.4 Ecosystem Change and Survival Matrix: “In this lesson, students do not consider impacts to organisms beyond manatees. Students do not develop an understanding of how solutions might cause a change in reproduction or how organisms might move into a transformed environment. They are focused on changes in the physical characteristics, such as temperature and availability of seagrass, and how that can cause manatees to move within the system and/or cause death to manatees if not fixed.”

LS2.D Social Interactions and Group Behavior

Claimed Element: **LS2.D-E1: Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (Note: Moved from K-2). (LS2.D-E1)**

Claimed in Lessons 1,7, and 8. Evidence was located in all claimed lessons, examples include:

- Lesson 1, Synthesize, Step 4: “Connect to related examples of animals forming groups. Display slide U. Remind students that manatees often form manatee groups and dolphins often form dolphin groups, but the Odd Pod was unusual because a manatee joined a dolphin group. Ask students to share examples using words or gestures of other living things, like plants and animals, that form groups. Accept all responses at this point.” (Lesson 1, Teacher Guide)
- Lesson 7
 - Explore, Step 2: “Co-construct a data table. Display slide D and distribute the Animal Group Observations to each student and explain that you have a book that features each of the animals listed across the top of the table, and we can use the book to investigate how and why animals form groups. Point out that the data table on the handout already includes some of the reasons we thought animals might form groups, but there is also space to add other reasons we mentioned in our earlier discussion. Pause to clarify the term mate, if needed (the way that animals create babies, also called reproduction).” (Lesson 7, Teacher Guide)
 - Lesson 7, the book, *Better Together: Animals in Groups*, is used by students to conduct research about eleven different animals. The students use this book to answer questions about the size of the animal group, if the sizes vary and how it helps the animals survive in their environment.
- Lesson 8, Explore, Step 2: “Watch the videos and make observations. Display slide C and play the Solving Manatee Mysteries video. Pause the video when students are noticing evidence of reasons manatees live in groups. Encourage them to share their noticings and to agree on check marks to jot down on their observations sheets. Then display slide D and play the Dolphin Pod Behaviors video. Repeat the same process for dolphins.” (Lesson 8, Teacher Guide)

LS3.A: Inheritance of Traits

Claimed Element: **LS3.A-E1: Many characteristics of organisms are inherited from their parents.**

Claimed in Lessons 5 and 6. **Some** evidence was found in claimed lessons, for example:

- The 3.4 Ecosystem Change & Survival Unit Front Matter document states, “This unit only focuses on plant inheritance since students figure out in Unit 3.3: Why do animals look and act the way they do? that many characteristics of animals are inherited from their parents.” (3.4 Ecosystem Change & Survival Unit Front Matter document)
- Lesson 5, Synthesize, Step 5: “Name these different characteristics of seagrasses as traits. Emphasize that we have described the characteristics or features that seagrasses have, and a word that scientists use for this idea is trait. Point to examples you have added to the chart, emphasizing that each of these describes a trait - characteristics or features of a living thing that can vary. Add this word to the Word Wall. Circle and/or on the chart which of the different characteristics students noticed would be traits of seagrass, such as their height, how their roots grow, types of waters they grow in, and the shape or width of their leaves.” (Lesson 5, Teacher Guide) While this portion of the activity does prompt students to figure out parental influence, **students are identifying patterns of traits, not the inheritance of traits from parents.**
- Lesson 6, Explore, Step 2: “Reorganize students to share evidence. Display slide D. As students finish up their exploration, reorganize them into new groups, with one student to represent each seagrass type. Prompt students to share their findings with their peers and record the evidence and ideas in Part C of the Seagrass Observations handout. Finally, direct them to work with their original group to complete Part D on the handout, pressing them for evidence from their observations.” In the prompts (“What claims did you or your classmates make about how these seagrasses got to be different?”) and “Ideas to look and listen for...” (“Do seagrasses have parents?”, “Maybe they come from different seeds.”) there are suggestions for how to guide students to discuss the grasses might inherit traits from “parents”. (Lesson 6, Teacher Guide)

LS3.B Variation of Traits

Claimed Element: **LS3.B-E1: Different organisms vary in how they look and function because they have different inherited information. (LS3.B-E1)**

Claimed in Lessons 5, and 6 **Some** evidence was located in all claimed lessons, examples include:

- Lesson 5, Explore, Step 4: “Hand one card from the Seagrass Identification Cards to each student and have them sit with another student who has a different seagrass card. Point out to students that each card contains ‘zoomed in’ pictures of the seagrass to show more detail. Direct students to analyze their own identification card page, then compare and contrast their seagrass with their partner’s seagrass. Provide measurement tools such as rulers, metersticks, or other objects in the classroom to support students in comparing the sizes of the different seagrasses. Partners should record information about both of their seagrasses on the Seagrass Data Sheet handout as they discuss and look for patterns.” (Lesson 5, Teacher Guide) Although students notice and record variations in the appearance of seagrass plants, **they do not observe variations in functions, nor do they attribute the differences to inherited information.**
- Lesson 6, Synthesize, Step 4: “Why are we seeing these patterns of trait variations? Why do the turtle grass offspring look so similar to their parents? Why don’t they look like manatee grass? The offspring get their traits from their parents. The seeds came from those parents, so the offspring will look like those parents. Like the dog parents, the seagrass parents give information to the offspring about what they will grow up to look like.” (Lesson 6, Teacher Guide)

LS4.C: Adaptation

Claimed Element: **LS4.C-E1 For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. (3-LS4-3)**

Claimed in Lessons: 1, 2, and 4. Evidence was found in all claimed lessons, examples include:

- Lesson 1, Explore, Step 2: “Explore a map of where manatees and dolphins live. Display slide K. Point out to students that they have just noticed that manatees and dolphins both live in water. Using students’ noticing, share with students that manatees and dolphins often share the waters in and around Florida. Orient students to the map by helping them (1) locate where they are, (2) locate Florida, and (3) asking what represents water. Invite students to share what they notice about the map, expecting a range of responses. Guide students to realize it may be easier to see more if we zoom in on Florida. (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 2: “Tell students that over many years scientists have tracked observations of manatees and dolphins and kept this data of where they are found. Share that we will explore this data of where dolphins and manatees are found. Display slide C. Orient students to the map by pointing out the major continents and oceans. Give students time to notice and wonder about where bottlenose dolphins can be found.” (Lesson 2, Teacher Guide)
- Lesson 4, Explore, Step 2: “Distribute a copy of the Wildlife Data Sheet handout to each student. Remind students of the question we are investigating, What else lives in these waters that could help us explain the odd pod?” Wildlife Data Sheet scaffolds prompts such as: “Why does it live there? (right temperature, find food, protection, lay eggs or give birth, needs saltwater, needs freshwater)”, “If it lived indifferent waters, would it survive OK?” (Lesson 4, Teacher Guide)

LS4.D: Biodiversity and Humans

Claimed Element: **LS4.D-E1: Populations live in a variety of habitats, and change in those habitats affects the organisms living there.**

Claimed in Lessons 2, 4, 9, 10, 11, 12 and 13. Evidence was found in Lessons 2, 4, 9, 10, 11, 12 and 13; examples include

- Lesson 2:
 - Lesson 2, Connect, Step 4,”Add habitats to the word wall. Say, We have so much more data and information about the waters, the places, where manatees and dolphins live. These three places are water habitats. Habitats are natural environments where animals and plants live and grow. Invite students to make connections with other habitats that they know about. Students may share connections to Unit 2.3: What lives where? where they may have first defined habitat. Place habitat on the Word Wall.” (Lesson 2, Teacher guide) While students are discussing habitats, they are not discussing how changes in those habitats affect the organisms living there.
 - As noted in the 3.4 Ecosystem Change and Survival matrix, this lesson alone does not ask students to engage with the whole DCI: “The second half of this Disciplinary Core Ideas about a change in the habitat will be addressed in this unit’s second lesson set.”
- Lesson 4:
 - Explore, Step 3: “Be prepared to let them add aquatic animal and plant stickers to their model. Show students how to add picture cards to the class model by taping the first card to the model. Pass out 2 plant or animal picture cards to each student pair for their assigned organism. Give students time to add their picture cards to the model. While students are adding to the model, be available to offer guidance. When the students tape

their picture cards on the model, their classmates can also add stickers to their individual models” (Lesson 4, Teacher Guide)

- As noted in the 3.4 Ecosystem Change and Survival matrix, this lesson alone does not ask students to engage with the whole DCI: “The second half of this Disciplinary Core Idea about a change in the habitat will be addressed in this unit’s second lesson set.”
- Lesson 9:
 - Explore, Step 2: “After reading each paragraph, to emphasize how (cause) each type of habitat change threatens manatees (effect), stop and ask the following questions: What problem is introduced here that threatens manatees? (effect). What seems to be the cause of the problem? (cause). Record student responses under ‘Notice’ on the class chart. Follow a similar routine for each paragraph to record more noticings. After the final paragraph, elicit student questions and wonderings. If needed, go back to point out specific causes and effects for each problem.” (Lesson 9, Teacher Guide)
 - Lesson 9 Slide Deck Slide C: “Where are these problems happening? According to the article, in what type of marine habitats are manatees most affected by: Lack of warm water, Not enough seagrass, Boat strikes”
- Lesson 10:
 - Navigate, Step 1: “Ideas to look and listen for: They live near warm springs in the winter. Manatees move to the springs during winter because the coastal water gets cold, and the springs are warm all year. The coastal water does not stay warm all year. The manatees have to move to get to warmer water. The article we read last time said the manatees don’t have enough warm water or they can’t get to it. People are destroying the springs and building on top of them. Remind students that we wanted to focus today on this issue of manatees not having access to warm water. Point out that one of the suggestions students made for evidence we need is more information about the problem so we can work on solving it.” (Lesson 10, Teacher Guide)
 - Explore, Step 4: “Display slide G. Ask students What should we do to make sure manatees have access to warm water? Give students time to think and then respond to questions on the slide. Say something like, Let’s use our solution comparison tool to research three solutions for protecting Florida manatees from the loss of warm water. Pass out the Solution 1 Card to pairs of students (Fixing Springs). Tell students that we will explore Solution 1 as a whole group, and then they will investigate two additional solutions in partners.” (Lesson 10, Teacher Guide)
- Lesson 11, Connect, Step 2: “Using the Why Do Manatees Still Need Protection chart from Lesson 7, share with students that we are going to dig deeper into the seagrass and boat problems. When we hear from experts, we want to figure out more about why less seagrass and boats are a problem for manatees. Share that we will add new ideas to the problem, similar to what we did when we investigated the warm water problem in Lesson 10.” (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize, Step 2, “Define the problem (Step 2). Then read aloud the prompt for Step 2. Pause and give students a chance to identify the problem. Potential problems might include: Boats hitting manatees as they travel between warm water springs and seagrass. Not enough warm water springs or seagrass or these are not in safe places for manatees. Boats hitting manatees in the river or around the island. Give students time to jot down the problem in their own words.” (Lesson 12, Teacher Guide)
- Lesson 13, Student Assessment 1 Sea Turtle Task:
 - “Part 1: Identify the Problem. Most Loggerhead Sea Turtles emerge from their nests at night. They look for the brightest light to help find their way to the ocean. Now there are more buildings along beaches with bright lights on them. Scientists are noticing that more hatchlings are getting lost instead of going to the ocean.

Circle the location on the scaled picture graph where turtles are most likely to get lost. Why did you select that location? How has the sea turtles' habitat changed? What was it like before and what is it like now?" (Lesson 13, Student Assessment 1)

- "Part 3: Compare and Argue For Solutions. 6. Caleb claims that turtle friendly lights are the best solution because they do not create new problems for plants and animals. They do not create safety problems for people. Ava claims that turning off the lights is the best solution because it has a low cost. Turning off the lights can be started right away. Ms. Miller claims the city can block the light using plants. The plants will make habitat for other plants and animals. Who do you agree with most and why is this the best solution? Include evidence to support your idea." (Lesson 13, Student Assessment 1)

Criterion-Based Suggestions for Improvement: N/A

Rating for Criterion: CCC

EXTENSIVE

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

The reviewers found **extensive** evidence that the materials provide opportunities to develop and use specific elements of the CCCs. Students intentionally build the following crosscutting concepts: PAT: Patterns, CE: Cause and Effect, and SYS: Systems and System Models. Students have the opportunity to practice the following crosscutting concept: SC: Stability and Change. While students have opportunities to engage with the intentionally developed elements of Systems and System Models and Patterns, *they do not engage fully with the elements from Cause and Effect*

CE: Cause and Effect

Claimed Element: **CE-E1: Cause and effect relationships are routinely identified, tested, and used to explain change. (CE-E1)**

This CCC is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of CE-E1 in Lessons 1, 4, and 7-13. Though as noted in Lesson 4, Synthesize, Teaching Tip sidebar: "...students do not test cause and effect relationships in this unit (they do that in Units 3.1 and 3.2) "Some evidence was located in all claimed lessons, examples include:

- Lesson 1, Synthesize, Cause and Effect sidebar: "Push students to think about 'ifs' and 'thens' to help them brainstorm claims. For example 'if manatees and dolphins both live in the ocean, need the same kind of food, share the same habitat, need to live in groups with other animals, etc...then the odd pod might have formed *because* they were looking for food together, wanted to be in a group, or just happened to be in the same water at the same time, etc.). This kind of thinking leads students to consider different possible claims to make." (Lesson 1, Teacher Guide) While the sidebar suggests teachers guide students toward engaging with the element, *students are not explicitly identifying cause and effect relationships.*
- Lesson 7, Explore, Cause and Effect sidebar: "Cause and effect is a useful lens to support student thinking in this context. The behaviors animals engage with as a group (or on their own) leads to an outcome, or effect, for individuals and the group. As you circulate the room, use prompts like 'If the animal does this ____ (behavior in group/ on its own), then ____ (would happen to help them survive)?" (Lesson 7, Teacher Guide) While the sidebar suggests teachers guide students toward engaging with the element, *students are not explicitly identifying cause and effect.*

- Lesson 8, Synthesize, Step 4: “Claims chart visible and replay the Odd Pod video if needed (Meet the Dolphin) in case the class wants to revisit as they suggest new claims or revise their initial thinking. Encourage students to use cause-and-effect thinking, and listen for students to suggest ideas related to typical group behaviors.” (Lesson 8, Teacher Guide)
- Lesson 9:
 - Synthesize, Step 4: “Explain that in order to design effective solutions, it is helpful to think about the problem in terms of causes and effects. Have two blank pieces of chart paper ready to summarize the causes and effects already shared by students on the prior Notice and Wonder chart. Title this new chart, Why do manatees still need protection? As you refer to the noticings from the prior chart, point out any cause and effect language already developed by students, and use those to help develop this new chart into the causes and effects shown in the example chart here. Make cause and effect connections. To help students see the relationship between the causes and effects, draw a horizontal arrow from each cause to their corresponding effect. Before moving to the next slide, model how we can use this chart to summarize why manatees still need protection, by saying something like, There is a lack of warm water in freshwater areas due to fewer natural springs, and this leads to (arrow) manatees getting cold, sick, and sometimes dying. Explain that the arrow helps symbolize how each specific cause (lack of warm water) leads to a specific effect (manatees not surviving). Ask for student volunteers to summarize the other two relationships from the chart.” (Lesson 9, Teacher Guide)
 - As noted in the 3.4 Ecosystems and Survival Matrix: “Though students will not test relationships in this unit, they will develop tools (beginning in Lesson 8) to compare proposed solutions and evaluate them based on how they may meet specified criteria and constraints.”
- Lesson 10, Navigate, Cause and Effect sidebar: “The if...then statements support students to use cause and effect relationships in order to explain how the change in the environment affects manatees’ ability to meet their needs. Ask students to identify the ‘cause’ and the ‘effect’ components of their if...then statements as an opportunity for them to identify the causal relationships.” (Lesson 10, Teacher Guide)
- Lesson 11, Synthesize, Step 4: “Invite each corner’s speaker to share their group’s evidence and reasoning, and take questions from the class. Also ask the undecided group to share why it’s so hard to decide between solutions. During this sharing, listen closely to students’ claims and evidence and prompt students to fully describe how the solution disrupts the cause and effect on our Why Do Manatees Still Need Protection chart.” (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize, Step 2: “Use the map to orient students to the components in the system. Ask students what they notice and listen for: fishing spot, boat dock or parking, seagrass meadow, warm water springs, river, island, manatees, and boats. Share that these are all things in this system. Students might also notice possible interactions, such as saying something about manatees moving between warm water and the seagrass meadow. Point out that the different components interact in different ways, connecting back to your class discussion of interactions in Lesson 4. Tell them they will make additional observations as we learn more about the problem and design a solution to solve it.” (Lesson 12, Teacher Guide)
- Lesson 13, Explore, Cause and Effect sidebar: “In this phenomenon, there are two cause-and-effect relationships. The first centers on the problem: when the beach has a lot of artificial light (cause), the hatchlings are more likely to get lost on their way to the beach (effect). The second centers on the solution: when we design a solution to minimize the artificial light (cause), the hatchlings are less likely to get lost (effect). If students need additional support as they engage with this task, help them identify these causes and effects.” (Lesson 13, Teacher Guide)

Claimed Element: CE-E2: Events that occur together with regularity might or might not be a cause and effect relationship. (CE-E2)

This CCC is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of CE-E2 in Lesson 3. Evidence was located in the claimed lesson, examples include:

- Lesson 3, Synthesize, Step 6: “Prompts to use: What have we figured out about why manatees and dolphins move around? Ideas to look and listen for: Manatees need to move to stay warm. Manatees and dolphins move because they need food. Follow-up response: What is our evidence?” (Lesson 3, Teacher Guide.)

SYS: Systems and System Models**Claimed Element: SYS-E2: A system can be described in terms of its components and their interactions.**

This CCC is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of SYS-E2 in Lessons 2, 4, 5, 11, 12. Evidence was found in:

- Lesson 2, Synthesize, Step 5, Systems and System Models sidebar: “The Shared Waters system model is helpful for students to describe the components of the systems. They will use this model in subsequent lessons to add additional components and interactions.” (Lesson 2, Teacher Guide)
- Lesson 4, Synthesize, Step 4: “Name these habitats as systems. Point out that our model includes components (the waters and plants and animals that live in them) and interactions (how those components affect each other). Explain that scientists call these systems, and models like ours can help us figure out and explain how systems work. (Lesson 4, Teacher Guide)
- Lesson 5, Navigate, Step 1: “As the class reviews and adds to the DQB, make connections to the class consensus model and emphasize how students’ questions relate to components and interactions in the water systems.” (Lesson 5, Teacher Guide)
- Lesson 11, Navigate, Step 1: “Remember we have a system of living things that are interconnected, so how could less seagrass affect other living things?” (Lesson 11, Teacher Guide)
- Lesson 12:
 - Synthesize, Step 2: “Orient students to the new system. Display slide B. Tell students we will apply what we have figured out to solve a problem for manatees at a new location. Use the map to orient students to the components in the system. Ask students what they notice and listen for: fishing spot, boat dock or parking, seagrass meadow, warm water springs, river, island, manatees, and boats. Share that these are all things in this system. Students might also notice possible interactions, such as saying something about manatees moving between warm water and the seagrass meadow. Point out that the different components interact in different ways, connecting back to your class discussion of interactions in Lesson 4. Tell them they will make additional observations as we learn more about the problem and design a solution to solve it.”
 - Synthesize, Systems and System Models sidebar: “The map is a spatial representation of the system. The existing components of the system are labeled on the map, and students will need to infer and/or explicitly label interactions, such as manatees moving between warm water and seagrass, or boats moving between the boat parking and the fishing spot. As they decide where to place a solution, they will need to add the solution as a new component of the system and argue for how it affects interaction in the system. (Lesson 12, Teacher Guide)

SC: Stability and Change

Claimed Element: **SC-E1: Change is measured in terms of differences over time and may occur at different rates.**

This CCC is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of SC-E1 in Lesson 10. Evidence was found in:

- Lesson 10, Connect, Step 2: “Gather additional information from a video. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees? Play the Wildlife Nation: Endangered Underwater video. Have students turn and tell a partner what change has happened and how it’s affecting manatees. Invite 2-3 students to share and record the additional information on the Why do manatees still need protection? chart. You might write something like: Humans make barriers and the manatees cannot get to the warm water...Gather more information from a second video. Display slide D and remind students of our guiding questions: What change is happening in the habitat? How is it affecting manatees? Play the Causes of Warm Water Problems video. Then have students turn and tell a partner what changes have happened and how they are affecting manatees. Invite 2-3 students to share and record the additional information on the chart. You might write something like: Humans overuse the rivers and springs which causes rocks/dirt/sand to fall in. Then the water is too shallow for manatees to swim in. Power plants heat the water, but when they close, the water is too cold for manatees again.” (Lesson 10, Teacher Guide)

Claimed Element: **SC-E2: Some systems appear stable, but over long periods of time will eventually change.**

This CCC is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of SC-E2 in Lesson 11. Evidence was found in:

- Lesson 11, Connect, Step 2: “Watch two videos to gather more information about the seagrass problem. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees? Explain that this first video is made by a fishing guide who posts updates about seagrass in the Indian River Lagoon in Florida. He cares about seagrass because he has noticed that when there is less seagrass there are fewer fish...Play the video about boats. Share that we will do something similar for the boat problem. Display slide E and watch the Boats and Manatees video. Using the same prompts, facilitate a discussion about how the habitat is changing and how the change affects manatees. Be prepared to jot new notes on the Why Do Manatees Still Need Protection chart (see example below). You might also have students add boats to the class’ Class Consensus model to show how boats affect manatees in rivers and coastal ocean.” Stability and Change sidebar: “In this Connect, use the lens of stability and change to focus students on what is changing in the system to create a problem for manatees. Remind students that they have a model to show the habitats, but these habitats don’t always stay the same so we need to track changes that we are hearing about to help us understand the problem.” (Lesson 11, Teacher Guide)

SPQ: Scale, Proportion and Quantity (Note: this Practice is not mentioned in the Ecosystem Change and Survival unit front matter, but it is claimed in the Ecosystem Change and Survival matrix)

Claimed Element: **SPQ-E1: Natural objects and/or observable phenomena exist from the very small to the immensely large or from very short to very long time periods.**

This CCC is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of SPQ-E1 in Lesson 2. Evidence was found in Lesson 2, examples include

- Lesson 2, Explore, Step 2: “Orient students to the map by pointing out the major continents and oceans. Give students time to notice and wonder about where bottlenose dolphins can be found...Transition to the manatee map.

Share that the manatee map is different. We have to zoom closer to see where they live so we are changing scale. Display slide D. Orient students to this new map showing where the Florida (West Indian) manatees are found. Give students time to notice and wonder about where manatees are found...Motivate the need to zoom into Florida. Remind students that they are investigating where dolphins and manatees share waters around Florida. Tell students that it is a little hard to see where they are found around Florida. Ask, What could we do to just see where dolphins and manatees are found around Florida. Students will likely say to zoom in to Florida. Confirm with gestures and pointing to the map that Florida is a place students think they should zoom into. Ask, How could zooming in closer to Florida help us see what is happening there? Students may say that it would help so they could see where the dolphins and manatees are found around Tampa Bay or having more detail on the map if they could see the Florida area more closely.” (Lesson 2, Teacher Guide)

PAT: Patterns

NGSS Element: **PAT E1: Similarities and differences in patterns can be used to sort, classify, communicate and analyze simple rates of change for natural phenomena.**

Developer Claimed Element: **PAT-E1: Similarities and differences in patterns can be used to sort and classify natural phenomena.**

The developer has used a different version of the element for PAT-E1 that is not consistent with the language of Appendix G, though it is consistent with the foundation boxes from 3-LS3-1. Reviewers evaluate all instructional materials for alignment to the NGSS using Appendix G.

This CCC is identified as an opportunity to support the overall development of the practice in the Unit Front Matter. The Matrix claims the element of PAT-E1 in Lessons 2, 5, 6, 7, and 8. Evidence was found in Lessons 2, 5, 6, 7 and 8; examples include

- Lesson 2, Explore, Step 2: “Pass out one set of the paper dolphin map and manatee transparency map to each group. Tell students that these maps show where dolphins and manatees are found around Florida. They will use these maps to first figure out where they live and the waters they share and do not share. Follow these steps: Examine the paper dolphin map first to notice three different kinds of water. Have them share noticings with each other, about where dolphins live. Then share aloud. Add the manatee transparency. Help students line up the manatee map using the outline for Florida. Have them share noticings about where manatees live with each other, then share aloud. Encourage students to then notice the areas where dolphins and manatees are found together or found separately.” (Lesson 2, Teacher Guide)
- Lesson 5, Explore, Step 4: “Work with a partner to look for patterns. Recall with students that we just discussed what was in the identification cards and that now we will look at the data for the different types of seagrass. Hand one card from the Seagrass Identification Cards to each student and have them sit with another student who has a different seagrass card. Point out to students that each card contains ‘zoomed in’ pictures of the seagrass to show more detail. Direct students to analyze their own identification card page, then compare and contrast their seagrass with their partner’s seagrass. Provide measurement tools such as rulers, metersticks, or other objects in the classroom to support students in comparing the sizes of the different seagrasses. Partners should record information about both of their seagrasses on the Seagrass Data Sheet handout as they discuss and look for patterns.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Step 4: “Celebrate students’ use of data to answer their questions. Point out that students have shared patterns for different types of seagrass and also found patterns within the same types of seagrass using data. Suggest that we take a moment to capture this thinking and answer our questions about how seagrass gets to be different.” (Lesson 6, Teacher Guide)

- Lesson 7 Slide Deck slide I: “Do animals always live in groups? What is the most common reason they live in a group? What is the least common reason they live in a group? Why do the numbers in the group change? Why do we think some animals live mostly alone?” (Lesson 7, Slide Deck)
- Lesson 8, Synthesize, Step 4: “Bring the students back together to share data for typical dolphin and manatee groups. Facilitate a Consensus Discussion. Use slide G to orient students to the questions the class will share and discuss. Elicit ideas for manatees first. As a group shares, ask other groups if they found evidence of the same behaviors. Make check marks on the class chart. Repeat this process for dolphins. As you make checks on the class chart, encourage students to start noticing patterns between dolphins and manatees and other animals, but also patterns in what is similar and different about dolphins and manatees from each other.” (Lesson 8, Teacher Guide)

Claimed Element: **PAT-E3: Patterns can be used as evidence to support an explanation.**

This CCC is identified as intentionally developed in the Unit Front Matter. The Matrix claims the element of PAT-E3 in Lessons 1 and 3. Evidence was found in:

- Lesson 1, Synthesize, Patterns sidebar: “Students’ questions related to patterns (e.g., Where do manatees and dolphins usually live? In the same place all the time?) can provide insight into their thinking related to this crosscutting concept. In each of the other third grade units and in 3 out of 4 second grade units, students used patterns thinking to make sense of phenomena and used patterns as evidence to support their explanations. In this unit, students support their claims using patterns as evidence, and use patterns in data to make sense of how seagrasses get their differences in Lessons 5 and 6.” (Lesson 1, Teacher Guide)
- Lesson 3, Explore, Step 3: “Display slide G. Start with looking at one map together for Three Sisters Spring. This will help orient the students to analyzing these kinds of maps. Say, This is a map of where manatees are located at Three Sisters Springs during April-October (point to the months on the map), when it is late spring, summer, and early fall. This is not manatee season. Locate rivers, springs, and coastal ocean on the map using the map key and labels. Then, ask students to use estimation (rather than counting one-by-one) to figure out which water system manatees are mostly located in during this time of year (coastal ocean, rivers/springs, both) and where the tagged manatee is located.” Step 4: “Analyze and interpret patterns of manatee location through a Building Understanding Discussion. Display slide J. Gather students in a Scientists Circle around the Manatee Location Data Table for a Building Understandings discussion. Have the Manatee Location Maps nearby for reference. Invite pairs of students to share their observations of manatee locations...Use the prompts on the slide to ask students to analyze patterns about where manatees are located when it is not manatee season and when it is manatee season...What patterns do we notice about where manatees are located when it is not manatee season (April-October)?, What patterns do we notice about where manatees are located when it is manatee season (November-March)?, Did the tagged manatees move? How?, Are the patterns we notice true for every location.” (Lesson 3, Teacher Guide)

Criterion-Based Suggestions for Improvement:

- Ensure “[t]here is a close match between the SEP, CCC, and DCI elements that are claimed and evidence of their development and use in the materials” [Detailed Guidance, p. 10].
 - Consider including more opportunities for students to clearly engage with all pieces of the elements from Cause and Effect, specifically cause and effect relationships.

I.C. Integrating the Three Dimensions

EXTENSIVE

Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.

The reviewers found **extensive** evidence that student sense-making of phenomena requires student performances that integrate elements of the SEPs, CCCs, and DCIs. In the unit, students are expected to engage in many activities that require them to use grade-appropriate elements of the three dimensions simultaneously. The three dimensions are not used in isolation.

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

- Lesson 2 Lesson Learning Goal: **“Combine information across texts and media (information cards, maps, and videos) to develop a system model to describe the aquatic habitats where dolphins and manatees live.”** Students integrate the use of the elements in Synthesize, Step 5: “Say something like, ‘Now that we have gathered so much information, let’s describe what we know about these different waters. Pass out 1 copy of the Shared Waters Model handout to each student. Tell students to use the evidence they have to describe as much as they know about each type of water onto their individual handout. They will use their observation and evidence from their Explore Shared Waters handout to sketch or write some initial descriptions of each type of water on the model. Give students about 5 minutes to work quietly on describing each system.” (Lesson 2, Teacher Guide) **INFO-E2: Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. MOD-E4: Develop and/or use models to describe and/or predict phenomena. LS4D-E1: Populations live in a variety of habitats, and change in those habitats affects the organisms living there. SYS-E2: A system can be described in terms of its components and their interactions.**
- Lesson 4, Three-dimensional Learning Goals: **“Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.”** Students integrate the use of the elements in Synthesize, Step 6: “Ask students to share in a whole group, or with a partner, new ideas they may have for why the Odd Pod shared the same waters on that day. As students share, prompt them to say whether their thinking is similar or different from what they thought at the end of the previous lesson. Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain why their claim is most likely the best answer to their question. Construct an argument based on evidence. Display slide N. Show students the Odd Pod Claim and Evidence Cards for L3, L4, L8 from Lesson 3 with an additional evidence card: Wildlife in our Waters Website. Explain that students will use the cards to help them revise their claims and construct an argument.” (Lesson 4, Teacher Guide) **ARG-E4 Construct and/or support an argument with evidence, data, and/or a model. LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there. LS4.C-E1 For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. CE-E1 Cause and effect relationships are routinely identified, tested, and used to explain change.**
- Lesson 6 Lesson Learning Goal: **“Analyze and interpret data to provide evidence that plants (seagrass) have traits inherited from parents and that variation of these traits exists in a group of similar organisms.”**

Students integrate use of the elements in Explore, Step 2, Analyzing and Interpreting Data sidebar: “In this lesson, students analyze and interpret data sources (directly observing different seagrasses) to make sense of a phenomenon (that seagrasses are different) using logical reasoning (analysis of patterns to explain how parents and offspring have similar trait variations). This work builds on the students’ data analysis from videos and infographic cards in Lesson 5. Previously, in Unit 3.3, students represented trait variation data in graphs to reveal patterns that indicated the relationships between parents and offspring. If it would be helpful for students in this lesson, consider creating graphs of the seagrass trait data as well.” (Lesson 6, Teacher Guide) **DATA-E2: Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation. LS3.B-E1: Different organisms vary in how they look and function because they have different inherited information. PAT-E1: Similarities and differences in patterns can be used to sort and classify natural phenomena.**

- Lesson 9 Lesson Learning Goal: “**Design initial solutions to reduce the harmful effects of human caused environmental change(s) to manatee habitats.**” Students integrate the use of the elements in Synthesize, Step 5: “Have students create initial designs. Display slide I. Explain that students will create designs to protect manatees. Share that we discovered three causes for manatees being sick or dying (effects), and we also listed criteria that our solutions must meet to help protect manatees. Point out that it may be difficult to protect manatees from all three causes at the same time, so we can pick one cause to design a solution for. Share that students can use words, drawings, or both to explain how their design meets at least one of the criteria discussed. Pass out 1 copy of the Designs to Protect Manatees handout to each student. Look at the handout together. Explain that on page 1 they will design a solution to protect manatees from one of three problems - lack of warm water, not enough seagrass, or boat strikes.” (Lesson 9, Teacher Guide) **GEDS-E5: Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution. LS2C-E1: When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. LS4D-E1: Populations live in a variety of habitats, and change in those habitats affects the organisms living there. CE-E1: Cause and effect relationships are routinely identified, tested, and used to explain change.**
- Lesson 12 Lesson Learning Goal: “**Make a claim about the merit of a solution to protect manatees in a new system by citing relevant evidence about how it meets the criteria and constraints, and then improve designs based on feedback from peers.**” Students integrate use of the elements in Synthesize. Step 2: “Tell students that there are many possible options to consider - there is no ‘right’ answer to this problem. They will need to consider all the possible solutions and argue for the one they think might be the best overall solution to meet the criteria for protecting manatees. Encourage students to use the information they have on the Warm Water Solutions: Comparison Tool handout and the Seagrass and Boat Solutions: Comparison Tool handout as evidence. They may want to revisit their revised design ideas from Designs to Protect Manatees, too. This is a handout they used across Lessons 9, 10, and 11. Remind students that they need to: Circle the one solution they want to implement. Focus students on picking the best one (not all of them!) Draw the one solution they have chosen on the map where it needs to go. Then, write a claim to answer the questions and construct an argument to support their claim. Depending on which solution they choose, they will also need to consider constraints on that solution (e.g., if they choose to plant seagrass, one constraint might be time it takes to grow; if they choose to put in boater lanes, one constraint might be people not following the rules).” (Lesson 12, Teacher Guide) **ARG-E6: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there. SYS-E2: A system can be described in terms of its components and their interactions.**

Criterion-Based Suggestions for Improvement: N/A

I.D. Unit Coherence

EXTENSIVE

Lessons fit together to target a set of performance expectations.

- i. Each lesson builds on prior lessons by addressing questions raised in those lessons, cultivating new questions that build on what students figured out, or cultivating new questions from related phenomena, problems, and prior student experiences.
- ii. The lessons help students develop toward proficiency in a targeted set of performance expectations.

The reviewers found **extensive** evidence that the lessons fit together coherently to target a set of performance expectations because each lesson builds on prior lessons by acknowledging questions raised in those lessons, cultivating new questions that build on what students figured out, and/or cultivating new questions from related phenomena, problems, and/or prior student experiences. The lessons help students develop toward proficiency in a targeted set of performance expectations.

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

Questions from the Driving Questions Board (DQB) drive investigations throughout the unit. For example:

- Lesson 1, Synthesize, Step 5: “Invite students to bring their questions to the Scientists Circle. Refer to slide BB for the steps to sharing and organizing questions. As students share questions, organize them into clusters or categories of questions. Use students’ words to label a cluster with a ‘topic’ or ‘phrase’ so students can quickly reference them (e.g., ‘waters’ or ‘other animals’ or ‘animal needs’ or ‘animal groups’). For students who draw their question, have them explain it with words to the class (if needed, jot notes on a second sticky note and place both side-by-side on the DQB)” (Lesson 1, Teacher Guide)
- Lesson 2, Explore, Step 2: “Maybe we should add some of these questions to our Driving Question Board! (Use this opportunity to let any student add a question to the DQB)” (Lesson 2, Teacher Guide)
- Lesson 5, Navigate, Step 1: “Remind students that last time we figured out that both manatees and dolphins need seagrass. Ask the class what other questions they have about seagrass (and/or other plants) and invite them to write their questions on sticky notes. Add to the Driving Question Board (DQB). As students share their questions, organize them on the Driving Question Board into clusters of similar questions.” (Lesson 5, Teacher Guide)
- Lesson 9, Navigate, Step 6: “Ask questions about problems and solutions. Pass out 1-2 sticky notes and a dark marker to each student. Give students time to write 2 questions - 1 about the problems facing manatees and 1 about design ideas - with a partner. If students struggle to come up with questions, use slide M to provide useful question frames. Add to the Driving Question Board (DQB). As students share, organize the questions into clusters of similar questions. Once complete, explain to students that it is part of our mission to answer these new questions.” (Lesson 9, Teacher Guide)
- Lesson 11, Navigate, Step 1: “Revisit the questions we had about seagrass and boat problems. Remind students that at the end of the last class, they brainstormed questions about the seagrass and boat problems threatening manatees. Display slide A and facilitate a brief sharing of their questions. If not already posted to the DQB, post and organize these questions now. Recall what we already know. Share that these questions are useful to guide our investigations in this lesson. Display slide B. Facilitate a brief sharing of ideas for what we already know that we can use to help us try to answer our questions.” (Lesson 11, Teacher Guide)

Navigate sections begin and end every lesson, ensuring coherence and continuity. For example,

- Lesson 2, Navigate, Step 7: “Remind students that we figured out dolphins and manatees shared shallow coastal ocean water. But emphasize that we still have questions about the waters, including when the dolphins and manatees are in the waters and if they are there at the same time (e.g., do they share coastal ocean water all year? If not, when are they sharing this water). Display slide P. Turn and talk about our initial ideas about when dolphins and manatees are sharing waters. Let students share ideas about what they think and then tell them they will investigate when they are sharing waters next.” (Lesson 2, Teacher Guide)
- Lesson 3, Navigate, Step 1: “Point to the Class Consensus model and remind students that last time we generated new ideas based on evidence about the waters that manatees and dolphins share and don’t share. We also had initial ideas about when manatees and dolphins are sharing waters. Explain that, based on their ideas, you have this photo that might help us figure this out - it was taken at a place called Three Sisters Springs in Florida during something called manatee season.” (Lesson 3, Teacher Guide)
- Lesson 5, Navigate, Step 6: “Highlight students’ questions about the differences between seagrasses and how they can be so different and/or why they are different. Explain that to answer these scientific questions with a claim based on evidence, we will need more data. Suggest that we investigate real plants to use as evidence next time to figure this out together in Lesson 6.” (Lesson 5, Teacher Guide)
- Lesson 6, Navigate, Step 1: “Celebrate all these questions as important to gather more information about seagrass. Tell students that you used the ideas they generated, and you have some additional resources ready to help us explore seagrass more closely. If students specifically named looking at living seagrass as a source of evidence, leverage that to navigate to the next activity. Consider saying something like, It sounds like we need to figure out more about seagrass before we go any further.” (Lesson 6, Teacher Guide)
- Lesson 10, Navigate, Step 6: “Revisit our Driving Question Board to ask questions about other problems facing manatees. Display slide M. Ask 1-2 students to remind the class of the other problems affecting manatees (not enough seagrass and boat strikes). Remind students that researching more about the loss of warm water springs helped us improve our design solutions. Ask students to add questions to the DQB about the other problems that manatees face which they think figuring out will help us improve our design solutions for these other problems.” (Lesson 10, Teacher Guide)
- Lesson 11, Navigate, Step 1: “Recall what we already know. Share that these questions are useful to guide our investigations in this lesson. Display slide B. Facilitate a brief sharing of ideas for what we already know that we can use to help us try to answer our questions. Have the Class Consensus model and Our Growing Ideas chart prominently displayed for students to reference. The slide contains two prompts that can initiate the discussion with students first talking for a minute with a partner. After partner discussion, bring students back together to share with the whole group. Use the additional prompts below to broaden the discussion to fully elicit what we already know about the likely problems.” (Lesson 11, Teacher Guide)

The engineering design problem in Lesson Set 2 (Lessons 9-13) calls back to the anchor phenomenon from Lesson Set 1 (Lessons 1 - 8), and builds naturally from it.

- Lesson 9, Navigate, Step 1: “Revisit a conversation from Lesson 1. Display slide A. Remind students that we introduced dolphins and manatees as protected animals back in Lesson 1. Use the slide to help explain that both have been protected by government laws for more than fifty years, and that data collected by scientists tells us that efforts to protect dolphins appear to be successful so far. Regarding manatees, continued protection is still needed as their numbers have not increased as dramatically. Very briefly, ask a few students to share why they think manatees might still need protection. Thank students for sharing ideas about why manatees still need protection and build on any predictions they have about problems manatees might be experiencing to share that you have an article to help us explore several problems manatees are facing.” (Lesson 9, Teacher Guide)

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

The lessons help students develop toward proficiency in a targeted set of performance expectations. The target Performance Expectations are:

3-LS2-1. Construct an argument that some animals form groups that help members survive.

- Lesson 1, Synthesize, Step 3: “Display slide T and remind students that manatees and dolphins do not normally form groups together, but they did form a group in the Odd Pod. Direct students to the ‘Claim #2’ part of their handout and have them write and/or draw their answer to the question, Why did the manatee and dolphins form a group when they usually do not?” (Lesson 1, Teacher Guide)
- Lesson 4, Synthesize, Step 6: “Ask students to share in a whole group, or with a partner, new ideas they may have for why the Odd Pod shared the same waters on that day. As students share, prompt them to say whether their thinking is similar or different from what they thought at the end of the previous lesson. Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain why their claim is most likely the best answer to their question. Construct an argument based on evidence. Display slide N. Show students the Odd Pod Claim and Evidence Cards for L3, L4, L8 from Lesson 3 with an additional evidence card: Wildlife in our Waters Website. Explain that students will use the cards to help them revise their claims and construct an argument.” (Lesson 4, Teacher Guide)
- Lesson 7, Synthesize, Step 6: “Introduce the Springer assessment. Distribute the The Orca Named Springer assessment to each student. Display slide N and read the introduction of the assessment together. Introduce the new question, which is a slight variation on the lesson question: Does living in a group help an orca survive?” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Have students choose the argument format best suited to their needs. Display slide K. Pass out 1 copy of the Odd Pod New Argument assessment to each student with the side you chose for them (see the Materials Preparation section). Have a set of Odd Pod Claim and Evidence Cards for L3, L4, L8 with the new Lesson 8 evidence cards readily available for students to use. You can remove the two claim cards from Lessons 3 and 4, but keep the evidence cards. The set of evidence cards match the list of evidence under option 1 on students’ handout. Display slide L to review how they might use the evidence cards to pick out pieces of evidence to support their claims. Point to Our Growing Ideas chart, Animal Group Observation chart, and the Class Consensus Mode as additional resources they can use for their arguments.” The Odd Pod New Argument handout is a combination of short answer and multiple choice to help students think through the claims/arguments. (Lesson 8, Teacher Guide)

3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.

- Lesson 5, Synthesize, Step 5: “Name these different characteristics of seagrasses as traits. Emphasize that we have described the characteristics or features that seagrasses have, and a word that scientists use for this idea is trait. Point to examples you have added to the chart, emphasizing that each of these describes a trait - characteristics or features of a living thing that can vary. Add this word to the Word Wall. Circle and/or on the chart which of the different characteristics students noticed would be traits of seagrass, such as their height, how their roots grow, types of waters they grow in, and the shape or width of their leaves.” (Lesson 5, Teacher Guide)
- Lesson 6, Explore, Step 2: “Organize students into groups of three and designate which data source to work with, being sure every data source (seagrass type) has approximately the same number of groups (see the Living Seagrass

Investigation Guidance reference for more details). Distribute the Seagrass Observations handout, rulers, and hand lenses. Circulate as students explore the living seagrass and complete Part A of the handout, reminding them that they will be the experts on this seagrass in the next step.” Step 3: “Provide guidance for data analysis. Use slide F to show the Seagrass Data Tables handout and explain that every group will have two data tables that a scientist recorded from growing seagrass parents and offspring, in their lab. Using the graphic on the slide, invite students to recall and describe what they know from prior units about how plants reproduce: pollen is moved from one plant to another, and then seeds are produced. The seeds grow into new plants, which we are calling ‘offspring’ here. This is the same for seagrass, even though they live in water. Just like land plants, seagrass plants get pollinated by small animals carrying the pollen or through the pollen floating in water to the other plant.” (Lesson 6, Teacher Guide)

3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

- Lesson 1, Synthesize, Step 3: “Distribute the My Initial Claims handout to each student. Remind students that we know, from Michael, that manatees and dolphins often share the same waters in and around Florida. Direct students to the ‘Claim #1’ part of their handout and have them write and/or draw their answer to the question, Why do manatees and dolphins often share the same waters?” (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize, Step 6: “Ask students to share a claim (or answer) they might have that answers the lesson question and press them to use some evidence either the maps, the videos, the Scientists cards, or the Shared Waters model. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart. (Lesson 2, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Recall ideas already generated. Remind students that in the very first lesson and in the last class they have been coming up with ideas for why a manatee joined the dolphins in the odd pod. Display slide B. Revisit the Possible Claims chart and facilitate a brief sharing of ideas we added to prime our thinking for this class.” (Lesson 8, Teacher Guide)

3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.

- Lesson 4, Synthesize, Step 6: “Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain in writing why their claim is most likely the best answer to their question. Construct an argument based on evidence. Display slide N. Show students the Odd Pod Claim and Evidence Cards for L3, L4, L8 from Lesson 3 with an additional evidence card: Wildlife in our Waters Website. Explain that students will use the cards to help them revise their claims and construct an argument. Distribute only the cards labeled Lessons 3 & 4 or Lesson 4.” (Lesson 4, Teacher Guide)
- Lesson 6, Navigate, Step 6: “Distribute the Seagrass Data Tables handout to each student. Use slide G to walk through one example as a class. Start by orienting students to the columns and rows of the data table. Explain that scientists pollinated seagrass parent #2 with the pollen from seagrass parent #1. Then they grew the seeds from that flower, and one seed grew into offspring # 1, and one grew into offspring #2. After the offspring plants grew into adults, they measured the leaves. Ask a few guiding questions to check that students are able to interpret the data table accurately, such as, Can anyone tell us what the leaf width was for Turtle Grass parent #1? Ask about a few more data points to make sure all students can locate the information in the table.” (Lesson 6, Teacher Guide)

- Lesson 10, Explore, Step 4: “Individually, argue from evidence about which solution is best. Display slide I. Say something like, Now that we have researched different solutions for protecting Florida manatees, let’s use our evidence about how these solutions meet our criteria and constraints to pick one solution that we think is best. Invite students to spend time individually responding to the prompts on the slide and jotting down their idea on their Warm Water Solutions: Comparison Tool handout.” (Lesson 10, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

I.E. Multiple Science Domains

EXTENSIVE

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

- i. Disciplinary core ideas from different disciplines are used together to explain phenomena.
- ii. The usefulness of crosscutting concepts to make sense of phenomena or design solutions to problems across science domains is highlighted.

The reviewers found **extensive** evidence that links are made across the science domains when appropriate, because the unit allows students to make sense of the phenomena only using the life science domain.

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

The unit phenomena of species living in groups, and of habitat change affecting populations, can be adequately addressed within the Life Science domain. DCIs from Physical Science or Earth Science are not necessary for figuring out the phenomena. For example:

- Lesson 1:
 - Explore, Step 2: “Explore a map of where manatees and dolphins live. Display slide K. Point out to students that they have just noticed that manatees and dolphins both live in water. Using students’ noticing, share with students that manatees and dolphins often share the waters in and around Florida. Orient students to the map by helping them (1) locate where they are, (2) locate Florida, and (3) asking what represents water. Invite students to share what they notice about the map, expecting a range of responses. Guide students to realize it may be easier to see more if we zoom in on Florida. Starts to set up geographic location as a consideration for survival.” (Lesson 1, Teacher Guide) Here the students are using the DCI: **LS4.C-E1 For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.**
 - Synthesize, Step 3: “Remind students that we know, from Michael, that manatees and dolphins often share the same waters in and around Florida. Direct students to the ‘Claim #1’ part of their handout and have them write and/or draw their answer to the question, Why do manatees and dolphins often share the same waters? Display slide T and remind students that manatees and dolphins do not normally form groups together, but they did form a group in the Odd Pod. Direct students to the ‘Claim #2’ part of their handout and have them write and/or draw their answer to the question, Why did the manatee and dolphins form a group when they usually do not?” Re-written to facilitate the conversation rather than “tell” the students

what to do. (Lesson 1, Teacher Guide) Here the students are using the DCI: **LS2.D-E1 Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size.**

- Lesson 2:

- Explore, Step 2: “Tell students that over many years scientists have tracked observations of manatees and dolphins and kept this data of where they are found. Share that we will explore this data of where dolphins and manatees are found. Display slide C. Orient students to the map by pointing out the major continents and oceans. Give students time to notice and wonder about where bottlenose dolphins can be found.” (Lesson 2, Teacher Guide) Here the students are using the DCI: **LS4.C-E1 For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.**
- Connect, Step 4: “Discuss similarities and differences. Display slide K. After students read and discuss the [Scientist Data] cards, have them discuss with their small group the similarities and differences for the three types of water. Then share their noticings as a whole class.” (Lesson 1, Teacher Guide) Here the students are using the DCI: **LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there.**

- Lesson 4:

- Explore, Step 2: “Distribute a copy of the Wildlife Data Sheet handout to each student. Remind students of the question we are investigating, What else lives in these waters that could help us explain the odd pod?” Wildlife Data Sheet scaffolds prompts such as: “Why does it live there? (right temperature, find food, protection, lay eggs or give birth, needs saltwater, needs freshwater)”, “If it lived in different waters, would it survive OK?” (Lesson 4, Teacher Guide) Here the students are using the DCI: **LS4.C-E1 For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.**
- Synthesize, Step 4: “Update our definition of habitat. Point out that students have shared examples of many interactions between plants, animals, and waters in these places, and discussed why animals and plants survive well in those specific environments. Suggest that we add that idea to our definition of habitat; it is not only where plants and animals live, but it is the natural environment that helps plants and animals live, grow, and survive. Post this update to the Word Wall and summarize the ideas students shared about plants and animals not being able to survive as well or at all in different habitats than their own if their needs are not being met.” (Lesson 4, Teacher Guide) Here the students are using the DCI: **LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there. (3-LS4-4)**

- Lesson 6:

- Explore, Step 2: “Reorganize students to share evidence. Display slide D. As students finish up their exploration, reorganize them into new groups, with one student to represent each seagrass type. Prompt students to share their findings with their peers and record the evidence and ideas in Part C of the Seagrass Observations handout. Finally, direct them to work with their original group to complete Part D on the handout, pressing them for evidence from their observations.” In the prompts (“What claims did you or your classmates make about how these seagrasses got to be different?”) and “Ideas to look and listen for...” (“Do seagrasses have parents?”, “Maybe they come from different seeds.”) there are suggestions for how to guide students to discuss the grasses might inherit traits from “parents”. (Lesson 6, Teacher Guide) Here students are using the DCI: **LS3.A-E1: Many characteristics of organisms are inherited from their parents.**
- Synthesize, Step 4: “Point out that students have observed evidence that offspring plants have similar trait variations as their parents have, and we think that’s because information comes from the parents about those

variations. Scientists say that the plants inherit trait variations from their parents. Inherit means offspring get information about trait variations from their parents. Co-construct the meaning with students or use the suggested definition on the Word Wall card, then add this term to your Word Wall.” (Lesson 6, Teacher Guide) Here students are using the DCI: **LS3.B-E1: Different organisms vary in how they look and function because they have different inherited information.**

- Lesson 10, Connect, Step 2: “Gather more information from a second video. Display slide D and remind students of our guiding questions: What change is happening in the habitat? How is it affecting manatees? Play the Causes of Warm Water Problems video. Then have students turn and tell a partner what changes have happened and how they are affecting manatees. Invite 2-3 students to share and record the additional information on the chart. You might write something like: Humans overuse the rivers and springs which causes rocks/dirt/sand to fall in. Then the water is too shallow for manatees to swim in. Power plants heat the water, but when they close, the water is too cold for manatees again.” (Lesson 10, Teacher Guide) Here students are using the DCIs: **LS2.C-E1 When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.** And **LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there.**
- Lesson 11, Connect, Step 2: “Watch two videos to gather more information about the seagrass problem. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees? Explain that this first video is made by a fishing guide who posts updates about seagrass in the Indian River Lagoon in Florida. He cares about seagrass because he has noticed that when there is less seagrass there are fewer fish. Play Seagrass on the Indian River Lagoon video... Play the video about boats. Share that we will do something similar for the boat problem. Display slide E and watch the Boats and Manatees video. Using the same prompts, facilitate a discussion about how the habitat is changing and how the change affects manatees. Be prepared to jot new notes on the Why Do Manatees Still Need Protection chart (see example below). You might also have students add boats to the class’ Class Consensus model to show how boats affect manatees in rivers and coastal ocean.” (Lesson 11, Teacher Guide) Here students are using the DCIs: **LS2.C-E1 When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.** And **LS4.D-E1 Populations live in a variety of habitats, and change in those habitats affects the organisms living there.**

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

- Students use elements of the crosscutting concepts to make sense of phenomena related to the life science domain.

Criterion-Based Suggestions for Improvement: N/A

I.F. Math and ELA

EXTENSIVE

Provides grade-appropriate connection[s] to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.

The reviewers found extensive evidence that the materials provide grade-appropriate connections to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects because the materials explicitly state the mathematics and ELA standards used in the unit and support students to see the connections between content areas.

ELA

CCSS.ELA-LITERACY.RI.3.2 Determine the main idea of a text; recount the key details and explain how they support the main idea. Claimed in Lessons 3, 10, and 11. Evidence was located in all claimed lessons.

- Lesson 3, Connect, Step 5: “Gather information from a scientist on manatee and dolphin movement in Florida. Display slide L. Introduce the book *Meet the Expert: Eric Ramos* and read it as a class, pausing to discuss the prompts.” (Lesson 3, Teacher Guide)
- Lesson 10, Explore, Step 4: “Examine Problem 1: Fixing Springs as a whole group. As a class, investigate the solution of fixing warm water springs. Begin by reading problem 1, which tells the story of the problem with Warm Mineral Springs in Southwest Florida. You may choose to read the text aloud to students, or ask student volunteers to read one of the text boxes aloud for their peers. After reading problem one, invite students to turn and talk to partners about how the problem makes it hard for manatees to meet their needs.” (Lesson 10, Teacher Guide)
- Lesson 11, Explore, Step 3: “Prepare to compare solutions. Display slide G. Explain that you have additional information cards as students used when researching warm water solutions last time. Point out that because students have experience with this kind of work, they can be more independent this time, working with partners instead of small groups and choosing what problem to investigate solutions for.” (Lesson 11, Teacher Guide)

CCSS-ELA-LITERACY.RI.3.3 Describe the relationship between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text, using language that pertains to time, sequence, and cause/effect.

Claimed in Lessons 9 and 12. Evidence was located in all claimed lessons.

- Lesson 9, Explore, Step 2: “Uncover causes and effects. Read aloud the news article as a class. Stop after each paragraph to record noticings and wonderings from the class. Turn and talks may be helpful to intermix with the whole group as a way to allow more students to share their ideas aloud. Use them, as needed, to support student engagement.” (Lesson 9, Teacher Guide) While students are engaging with nonfiction text and the wording in the article is sequenced, students are not describing the relationship between what is happening in those sequential steps.
- Lesson 12, Connect, Step 3: “Introduce the book. Display slide D. Gather students together where they will all be able to see the *Engineers Give Feedback* book. Explain to students that giving and receiving feedback on engineering designs is an important part of the process. Feedback can lead to better designs. Tell students this book can help us understand how feedback works.” (Lesson 12, Teacher Guide) While this book does cover scientific concepts it does not give procedural steps and students are not asked to describe any relationships.

CCSS-ELA-LITERACY.RI.3.5 Use text features and search tools (e.g., key words, sidebars, hyperlinks) to locate information relevant to a given topic efficiently

Claimed in Lesson 5. Evidence was located in all claimed lessons.

- Lesson 5, Connect, Step 3: “Introduce identification cards. Display slide F. Explain that we have identification cards that contain information from patterns that a lot of other people have observed when they observe seagrass in nature. Identification cards use text features like images, captions, headings, and sentences to help people figure out which different kinds of plants they are observing. People often use identification cards to help them identify things in nature, like what kind of bird or tree they are looking at, so our identification cards and our other observations can help us figure out some general patterns about seagrass.” (Lesson 5, Teacher Guide)

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

Claimed in Lessons 1,4, and 9-11. Evidence was located in all claimed lessons.

- Lesson 1, Explore, Step 2: “Explore a map of where manatees and dolphins live. Display slide K. Point out to students that they have just noticed that manatees and dolphins both live in water. Using students’ noticing, share with students that manatees and dolphins often share the waters in and around Florida. Orient students to the map by helping them (1) locate where they are, (2) locate Florida, and (3) asking what represents water. Invite students to share what they notice about the map, expecting a range of responses.” (Lesson 1, Teacher Guide)
- Lesson 4, Explore, Step 2: “Help students get connected to the Wildlife in Our Waters Website and preview with students how the site is organized. Distribute a copy of the Wildlife Data Sheet handout to each student. Remind students of the question we are investigating, What else lives in these waters that could help us explain the odd pod? Ask them to consider strategies they can use to read the website.” (Lesson 4, Teacher Guide)
- Lesson 9, Explore, Step 2: “Uncover causes and effects. Read aloud the news article as a class. Stop after each paragraph to record noticing and wonderings from the class. Turn and talks may be helpful to intermix with the whole group as a way to allow more students to share their ideas aloud. Use them, as needed, to support student engagement.” (Lesson 9, Teacher Guide)
- Lesson 10, Explore, Step 4: “Obtaining information about solutions for protecting Florida manatees. Display slide G. Ask students What should we do to make sure manatees have access to warm water? Give students time to think and then respond to questions on the slide. Say something like, Let’s use our solution comparison tool to research three solutions for protecting Florida manatees from the loss of warm water. Pass out the Solution 1 Card to pairs of students (Fixing Springs). Tell students that we will explore Solution 1 as a whole group, and then they will investigate two additional solutions in partners.” (Lesson 10, Teacher Guide)
- Lesson 11, Explore, Step 3: “Research and compare. Display slide I. Pass out a set of Seagrass and Boat Solution Cards to each pair of students, and 1 copy of the Seagrass and Boat Solutions: Comparison Tool handout to each student. As students work to compare solutions, circulate to provide support.” (Lesson 11, Teacher Guide)

CCSS-ELA-LITERACY.RI.3.9 Compare and contrast the most important points and key details presented in two texts on the same topic.

Claimed in Lessons 2, 10, and 11. Evidence was located in all claimed lessons.

- Lesson 2, Connect, Step 4: “Read about scientists and the data they collect. Display slide J. Say, Now that we have connected these cards to what we want to figure out, let’s see what their data can tell us. Form groups of 3 and pass

out a set of Scientist Data Cards to each group. Students will take turns reading one scientist profile and sharing information about the water they study. As they share, all members should record information onto Step 3 of their handout. Discuss similarities and differences. Display slide K. After students read and discuss the cards, have them discuss with their small group the similarities and differences for the three types of water. Then share their noticings as a whole class.” (Lesson 2, Teacher Guide)

- Lesson 10, Explore, Step 4: “Examine Solutions 2 and 3 in partners. Display slide H. Pass out the Solution 2 and Solution 3 Research Cards to pairs of students. Invite students to work in partners to obtain information about additional solutions for protecting Florida manatees using similar strategies the class used for Solution 1. Students should record ideas on their individual copy of Warm Water Solutions: Comparison Tool.” (Lesson 10, Teacher Guide)
- Lesson 11, Explore, Step 3: “Choose solutions to research. Display slide H. Share that we have three solution cards for each problem - seagrass and boats - but students likely only have time to compare two solutions for each problem. So, explain that the first step to do with their partner is to scan the cards and choose the 2 they want to compare closely for each problem.” (Lesson 11, Teacher Guide)

CCSS-ELA-LITERACY.W.3.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly. Claimed in Lessons 7 and 8.

- Lesson 7 Student Assessment 1 The Orca Named Springer: “Our question is: Does living in a group help an orca survive? Which claim best answers the question? Circle one: Orcas survive best in a group. Orcas survive best alone. Support the claim you circled with the data and science ideas you figured out about animal groups. Write or draw your argument.” (Lesson 7, Student Assessment 1 The Orca Named Springer) Note that students engage in this standard if they choose the “write” option.
- Lesson 8, Synthesize, Step 6: “Give students time to write their arguments. Circulate around the room providing support and feedback as needed. If students get stumped on evidence, cue them to look through the evidence cards to identify at least 2 that helped them understand the odd pod better.” (Lesson 8, Teacher Guide)

CCSS-ELA-LITERACY.W.3.5 With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing. Claimed in Lesson 12.

- Lesson 12, Synthesize, Step 4, Assessment Opportunity sidebar: “Students’ use of slides E-G and the Design Peer Feedback handout provides an opportunity for them to review their partner’s claim with the purpose of providing feedback that supports their partner in improving their argument for a solution. Remind students that all solutions are possible, but it is important that the argument consider the criteria and constraints. Students will have an opportunity to use the feedback to revise their arguments. While students are providing feedback, circulate among the partners and provide teacher feedback on the quality of the feedback that is being provided. Support students with: How do you think we could make ____’s argument more clear? What piece of evidence do you think would help support the claim for this solution? Where did we see that evidence?” Synthesize step 4: “After the students have reviewed each other’s work, give students time to improve their designs and/or arguments before turning in this work for additional feedback from you. Consider your classroom routines for revising their work, such as using a different color, sticky notes, or on a new piece of paper.” (Lesson 12, Teacher Guide) Note that students engage in revising their work, but planning and editing are not called out as part of this lesson.

CSS-ELA-LITERACY.W.3.8 Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories. Claimed as embedded in each lesson so frequently that it is not called out.

- 3.4 Ecosystem Change and Survival Unit Front Matter: “How this standard is regularly built into lessons to support students’ science learning: Every lesson offers students the opportunity to recall and share information and experiences that happened previously in the lesson as the class completes the “Our Growing Ideas” chart. As students recall these experiences they are gathering more information to support their science learning.” Examples include
 - Lesson 3, Synthesize, 7: “Transition to updating the Our Growing Ideas chart by adding the lesson question: Do manatees and dolphins share the same waters all year? Ask students to return to the similar questions on the DQB they identified earlier. Move those questions to the Our Growing Ideas chart near the lesson question. Ask students to share a claim (or answer) they might have that answers the lesson question. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart. As students are sharing potential claims, also record the evidence that they name, too. Evidence might include maps, underwater videos, scientists cards, interview with a scientist, and the Class Consensus model.” (Lesson 3, Teacher Guide)
 - Lesson 5, Navigate, Step 6: “What should we write or draw on our model to show what we figured out about seagrasses? We just have clumps of seagrass shown on our model right now - what kind are they? We need to label the different kinds! Sometimes the seagrass is more spread out and sometimes it’s really close together. Different kinds of seagrass look different, so maybe we need to draw some other leaf shapes or sizes, and/or put roots and stems on the model?” (Lesson 5, Teacher Guide)
 - Lesson 11, Navigate, Step 6: “Record ideas we figured out. Bring the class together in a Scientists Circle. Display slide M. Remind students that we wanted to figure out how we could make sure manatees have access to warm water, seagrass, and protection from boats. Ask students to think for a minute on their own then to turn and talk with a partner about new ideas they figured out to answer this question. Then, have students either jot them down their thinking on a sticky note or share aloud. As students record or say their ideas, help them focus in on different parts of the question (warm water, boats, seagrass).” (Lesson 11, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacherled) with diverse partners on grade 3 topics and texts, building on others’ ideas and expressing their own clearly. Claimed as embedded in each lesson so frequently that it is not called out.

- 3.4 Ecosystem Change and Survival Unit Front Matter: “How this standard is regularly built into lessons to support students’ science learning: Students practice with this standard in every lesson during large group and small group (e.g., turn and talk) discussions. Collaborative discussions provide students exposure and practice with new vocabulary, concepts, and language in the context of science learning.” Examples include:
 - Lesson 2, Navigate, Step 7: “Turn and talk about our initial ideas about when dolphins and manatees are sharing waters. Let students share ideas about what they think and then tell them they will investigate when they are sharing waters next.” (Lesson 2, Teacher Guide)
 - Lesson 7, Explore, Step 3: “Use Hand Up, Pair Up to share our observations. When groups finish recording data from the book, use a Hand Up, Pair Up to facilitate sharing of students’ data with others. Display slide G and tell students they will raise their hand to locate another classmate who read about a different animal. They will meet up with that new person and exchange what they figured out about their assigned animal, jotting down check marks on their Animal Group Observations handout. Then they raise their hand again to

find another person who read about a different animal, and pair up with them to exchange information. After sharing, they raise their hands again and look for others who also have hands up.” (Lesson 7, Teacher Guide)

- Lesson 10, Explore, Step 4: “Form groups to share. Display slide J. Invite students to move to specific locations in the room for each of the three solutions. To keep groups small, you may want to form multiple groups for each solution. Students should get into a group with other classmates who chose the same solution as the best one. Invite students to take turns reading their argument. All students should jot down ways to improve their argument based on what they hear from classmates. One stay, one stray. Display slide K. After groups have had a chance to share, have one student in the group ‘stay’ while the other members ‘stray’ to make groups with mixed solution ideas. It is not important for students to visit every other peer group but rather to have the opportunity to hear multiple examples of arguments with different claims and supporting evidence.” (Lesson 10, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.1A Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion. Claimed as embedded in each lesson so frequently that it is not called out.

- 3.4 Ecosystem Change and Survival Unit Front Matter: “How this standard is regularly built into lessons to support students’ science learning: Students practice with this standard when they use previous experiences, notes, and other sources of evidence in discussions to support sensemaking.” Examples include:
 - Lesson 6, Synthesize, Step 4: “Display slide I and prompt groups to share their analysis of the data on the Seagrass Data Tables handout. As groups share their ideas, press them for their evidence from the different data sources in Lessons 5 and 6. Prompt them to use the sentence starters on the slide to support discussion, as they have practiced in previous lessons.” (Lesson 6, Teacher Guide)
 - Lesson 8, Synthesize, Step 6: “Display slide L to review how they might use the evidence cards to pick out pieces of evidence to support their claims. Point to Our Growing Ideas chart, Animal Group Observation chart, and the Class Consensus Mode as additional resources they can use for their arguments. Give students time to write their arguments. Circulate around the room providing support and feedback as needed. If students get stumped on evidence, cue them to look through the evidence cards to identify at least 2 that helped them understand the odd pod better.” (Lesson 8, Teacher Guide)
 - Lesson 12, Synthesize, Step 2: “Reorient students to slide C. Tell students that there are many possible options to consider - there is no ‘right’ answer to this problem. They will need to consider all the possible solutions and argue for the one they think might be the best overall solution to meet the criteria for protecting manatees. Encourage students to use the information they have on the Warm Water Solutions: Comparison Tool handout and the Seagrass and Boat Solutions: Comparison Tool handout as evidence. They may want to revisit their revised design ideas from Designs to Protect Manatees, too. This is a handout they used across Lessons 9, 10, and 11. Remind students that they need to: Circle the one solution they want to implement. Focus students on picking the best one (not all of them!) Draw the one solution they have chosen on the map where it needs to go. Then, write a claim to answer the questions and construct an argument to support their claim.” (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.SL.3.1B Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion). Claimed in Lessons 1, 8, 11 and 12.

- Lesson 1, Connect, Literacy Supports sidebar: “In Lesson 1, as we share our initial claims and voice our questions, it is helpful to check in on class agreements and encourage our community to follow the agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the

topics and texts under discussion). This will support students in practicing SL.3.1B as they follow agreed-upon rules for discussions and further cultivate a safe community for learning science together.” (Lesson 1, Teacher Guide)

- Lesson 8, Synthesize, Literacy Supports sidebar: “Before peer feedback, it may be a good time to revisit the Classroom Agreements to encourage students to provide positive and productive feedback to one another for the purpose of improving all of our ideas as a learning community, which supports SL.3.1B.” (Lesson 8, Teacher Guide)
- Lesson 11, Synthesize, Literacy Supports sidebar: “At the start of this activity, remind students of the classroom agreements that we look, listen, and respond to ideas (we value each other’s ideas), we share ideas when we’re uncertain, and we let our ideas change and grow. This work supports SL.3.1B and ensures that students follow their agreed-upon rules for discussion.” (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize, Literacy Supports sidebar: “Before peer feedback, it may be a good time to revisit the Classroom Agreements to encourage students to provide positive and productive feedback to one another for the purpose of improving all of our ideas as a learning community, which supports SL.3.1B.” (Lesson 12, Teacher Guide)

CCSS-ELA-LITERACY.L.3.5 Demonstrate understanding of word relationships and nuances in word meanings.

Claimed in Lessons 1, 2, 7, and 8. Evidence was found in the claimed lessons. Examples include:

- Lesson 1, Explore, Step 2, Literacy Supports sidebar: “We use the term ‘odd’ because it comes directly from the expert. Some students will remember this term from math and distinguishing “odd numbers” from “even numbers”. Help students understand that in this context, the term ‘odd’ means uncommon. It refers to the fact that manatees and dolphins do not usually form groups together. Point out that there’s nothing odd about any of the individual animals here. Instead, it is atypical for the animals to be together. Remind students that words can have multiple meanings that differ depending on when and how they are used. This work of explaining multiple meaning words and guiding students to understand word relationships and nuances in word meanings supports.” (Lesson 1, Teacher Guide)
- Lesson 2, Connect, Step 4: “Discuss similarities and differences. Display slide K. After students read and discuss the cards, have them discuss with their small group the similarities and differences for the three types of water. Then share their noticings as a whole class. Prompts to Use: Which waters are saltwater? Which are freshwater?... As students talk about saltwater and freshwater, pause and make sure all students have a shared understanding of saltwater and freshwater. Point students to the Scientists Data cards as needed. Connect the definition on the word wall cards to how students talked about saltwater and freshwater.” Literacy Supports sidebar: “Lead a discussion to ensure that students can distinguish between saltwater and freshwater. Ask students for examples of bodies of water that are saltwater (e.g., oceans, seas, estuaries) and freshwater (e.g., rivers, lakes, ponds). Ask students how these types of water are different to support their understanding of the meaning of both words. (L.3.5)” (Lesson 2, Teacher Guide)
- Lesson 7, Navigate, Step 1: “Clarify the meaning of ‘group’. Ask students what we mean when we say ‘group’. Listen for students to share ideas like ‘more than 1’ or ‘many’. Other ideas might include that they like to ‘stick together’ or ‘stay together’. Share that when we study living things in science, a group means more than one of the same kind of animal that lives together. Add this word to the class Word Wall.” Literacy Supports sidebar: “If time permits, you can extend the discussion of the word group to compare and contrast its meaning in science to other meanings of the word ‘group’. Consider explaining how some objects (i.e., nouns) in groups have specialized names also known as collective nouns. Provide some examples students may be familiar with like a sports team, musical band, or herd of cows in addition to broadening student’s knowledge to include less common collective nouns, like an orchestra or troupe. In science, groups are the same kinds of animal, which makes the Odd Pod an atypical, or rare, group (L.3.5).” (Lesson 7, Teacher Guide)

- Lesson 8, Connect, Step 5: “Ask students whether the way scientists argue seems similar or different from how they argue. Give them time to share their responses with the group. Pause to discuss the terms claim, evidence, and argument. Consider adding these words to your class Word Wall if not already present, and if you think it will support your students.” Literacy Supports sidebar: “Students may have everyday understandings of the word argument that do not align to how arguments are used in science. While reading the book, take a moment to discuss the nuances of the word argument when used in different contexts (L.3.5). You can also use the book to help students practice word relationships between claim, evidence, and argument.” (Lesson 8, Teacher Guide) This section is listed as “optional” in the teacher guide, **so if teachers skip this optional step, students will not be prompted to engage in this Common Core standard.**

CCSS-ELA-LITERACY.SL.3.2 Determine the main ideas and supporting details of a text read aloud or information presented in diverse media and formats, including visually, quantitatively, and orally.

Claimed in Lessons 10, 11. Evidence was found in the claimed lessons. Examples include:

- Lesson 10, Connect, Step 2: “Gather additional information from a video. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees? Play the Wildlife Nation: Endangered Underwater video. Have students turn and tell a partner what change has happened and how it’s affecting manatees. Invite 2-3 students to share and record the additional information on the Why do manatees still need protection? chart. You might write something like: Humans make barriers and the manatees cannot get to the warm water...Gather more information from a second video. Display slide D and remind students of our guiding questions: What change is happening in the habitat? How is it affecting manatees? Play the Causes of Warm Water Problems video. Then have students turn and tell a partner what changes have happened and how they are affecting manatees. Invite 2-3 students to share and record the additional information on the chart. You might write something like: Humans overuse the rivers and springs which causes rocks/dirt/sand to fall in. Then the water is too shallow for manatees to swim in. Power plants heat the water, but when they close, the water is too cold for manatees again.” (Lesson 10, Teacher Guide)
- Lesson 11, Connect, Literacy Supports sidebar: “As students view the videos looking for information about the problem, focus them on determining the main idea (SL.3.2). After watching the video, prompt students to talk with a partner to summarize the 1 or 2 main ideas. Ask them to then share aloud to the whole group. Look for the main idea to connect to the problem or change in the habitat, which can help you link students back to the Class Consensus model.” (Lesson 11, Teacher Guide)

CCSS-ELA-LITERACY.L.3.2 Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

Claimed in Lessons 12 and 13. Evidence was found in the claimed lessons. Examples include:

- Lesson 12, Synthesize, Literacy Supports sidebar: “Encourage students to use clear sentences, illustrations, and appropriate punctuation and capitalization to improve communication of their ideas. Use the peer review as an opportunity to strengthen their ideas through revising and editing their writing (L.3.2).” (Lesson 12, Teacher Guide)
- Lesson 13, Synthesize, Step 5: “Invite clarifying questions, then provide time for students to work independently to make decisions about the sea turtle solutions. Encourage students to write and/or draw clearly and use appropriate punctuation and capitalization like they do in other content areas, like ELA. Remind students how using punctuation and writing clearly ensures others, like the partners they will do peer feedback with in the next step, will be able to understand their thinking.” (Lesson 13, Teacher Guide)

Mathematics

CCSS-MATH-Practice.MP2 Reason abstractly and quantitatively.

Claimed in Lesson 2, 3, 5, 10, 11. Evidence was found in the claimed lessons. Examples include:

- Lesson 2, Connect, Step 4: “Discuss similarities and differences. Display slide K. After students read and discuss the cards, have them discuss with their small group the similarities and differences for the three types of water. Then share their noticings as a whole class. Prompts to Use...Which waters are deep? Which are shallow or not deep? Which waters change temperature during the year? Do any stay the same temperature?” Math Supports sidebar: “As students compare water temperatures between various bodies of water, have them use specific facts and data from the cards to justify their arguments and in critiquing the reasoning of others for which waters change temperature and which waters stay the same temperature during the year. (MP2 and MP3)” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “Examine summer data...Locate rivers, springs, and coastal ocean on the map using the map key and labels. Then, ask students to use estimation (rather than counting one-by-one) to figure out which water system manatees are mostly located in during this time of year (coastal ocean, rivers/springs, both) and where the tagged manatee is located. Listen for students to suggest that manatees are in both coastal ocean and rivers and springs, but the tagged manatee is located in coastal ocean. Record data. Give each student 1 copy of the Manatee Location Data Table handout. Locate the Manatee Location Data Table that matches the class data table. Record student observations on the class Manatee Location Data Table for Three Sisters Springs while students also individually record their observations on their handout.” Then class repeats for winter data. Math Supports sidebar: “Students will reason abstractly and quantitatively using estimation to make sense of the magnitude of the number of manatees in different locations, rather than count each manatee one-by-one so the focus stays on the science sensemaking. (MP2)” (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Math Supports sidebar: “Students are using a ruler to convert a physical characteristic, like the height of the seagrass, into numeric values to support sensemaking. To help them reason abstractly and quantitatively (MP2), provide measurement tools such as rulers, yardsticks, or other objects in the classroom so they can understand and compare the sizes of different seagrasses. Remind students that the illustrations on the seagrass cards are zoomed in to show more detail.” (Lesson 5, Teacher Guide)
- Lesson 10, Warm Water Comparison Tool: “Constraints, Limitations on our design or solution. Money, Time, Effect on other living things”. Students are asked to circle 1-2 for each of 3 solutions. The Money is represented by “\$, \$\$, \$\$\$”, Time is “Months, 1 year, 2 or more years” and Effect on other living things is harmed/not harmed with accompanying symbols.” (Lesson 10, Warm Water Comparison Tool)
- Lesson 11, Explore, Math Supports sidebar: “Similar to Lesson 10, students will use the Solution Research Cards and symbols to reason both abstractly and quantitatively to develop a sense of the relative magnitude of money and time needed for each solution (MP2).” (Lesson 11, Teacher Guide)

CCSS-MATH-Practice.MP3 Construct viable arguments and critique the reasoning of others.

Claimed in Lesson 2. Evidence was found in the claimed lessons. Examples include:

- Lesson 2, Connect, Math Support sidebar: “As students compare water temperatures between various bodies of water, have them use specific facts and data from the cards to justify their arguments and in critiquing the reasoning of others for which waters change temperature and which waters stay the same temperature during the year. (MP2 and MP3)” (Lesson 2, Teacher Guide)

CCSS-MATH-Practice.MP8 Look for and express regularity in repeated reasoning.

Claimed in Lessons 5 and 6. Evidence was found in the claimed lessons. Examples include:

- Lesson 5, Synthesize, Step 5: “Facilitate a Building Understandings Discussion about patterns we can identify in seagrasses. Display slide J. Invite students to share their noticings of similarities and differences between their pairs of seagrasses. Record their responses, such as larger or smaller size, or branching or straight-down roots, on the Seagrass Patterns chart...Name these different characteristics of seagrasses as traits. Emphasize that we have described the characteristics or features that seagrasses have, and a word that scientists use for this idea is trait. Point to examples you have added to the chart, emphasizing that each of these describes a trait - characteristics or features of a living thing that can vary. Add this word to the Word Wall. Circle and/or on the chart which of the different characteristics students noticed would be traits of seagrass, such as their height, how their roots grow, types of waters they grow in, and the shape or width of their leaves.” Math Supports sidebar: “Students look for repeated patterns across their observations of individual seagrass types to make generalizations about the traits of seagrasses using inductive logic. Have students support their claims with specific evidence from their investigation. (MP8)” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Math Supports sidebar: “When asking students to identify patterns in the data table, encourage them to recognize relationships within and between each seagrass type and support their claims with specific evidence from the table. (MP8)” Step 5: “Individually record what we have figured out about differences in seagrass. Display slide J, and distribute the Exit Ticket. Encourage students to use data from their Seagrass Observations and Seagrass Data Tables handouts as they work. Give students a few minutes to record their ideas individually.” (Lesson 6, Teacher Guide)

CCSS-MATH-3.NBT.A.3 Multiply one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80 , 5×60) using strategies based on place value and properties of operations.

Claimed in Lesson 13. Evidence was found in the claimed lessons. Examples include:

- Lesson 13, Student Assessment Sea Turtle Task: Students analyze how Light Brightness affects confusion in sea turtle hatchlings. They compare 3 locations in a pictogram. Each turtle icon = 10 turtles. Nine icons are listed on “Location 1: very bright light”. They have to circle the location “where turtles are most likely to get lost.” They must figure out that increase in bright light from nearby buildings is causing more confusion when turtles are trying to find the ocean. (Lesson 13, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

CATEGORY II

NGSS Instructional Supports

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II.A. Relevance and Authenticity

EXTENSIVE

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

- i. Students experience phenomena or design problems as directly as possible (firsthand or through media representations).
- ii. Includes suggestions for how to connect instruction to the students' home, neighborhood, community and/or culture as appropriate.
- iii. Provides opportunities for students to connect their explanation of a phenomenon and/or their design solution to a problem to questions from their own experience.

The reviewers found **extensive** evidence that the materials engage students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world. Throughout the unit, students experience phenomena or design problems as directly as possible. The materials include suggestions for connecting instruction to students' homes, neighborhoods, communities, and/or cultures, where appropriate. The materials do provide opportunities for students to connect their explanation of a phenomenon and/or their design solution to questions from their own experiences.

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

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

- Lesson 1, Connect, Step 1: "Observe dolphins and manatees videos. Display slide C. Distribute 1 copy of the Comparing Dolphins and Manatees handout to each student and share that we have videos to watch to help us notice more about manatees and dolphins. Display slide D. Repeat the same steps above with the Meet the Manatee video, giving students a chance to observe and record what they notice about manatees and their surroundings." (Lesson 1, Teacher Guide)
- Lesson 3, Navigate, Step 2: "Explain that you have two videos to help us see how scientists collect data about where manatees and animals like them are living. Play the Manatee Tracking video from slide E and the How do Researchers ID Manatees? video from slide F. Read aloud the text as it appears on the screen, and pause to discuss the meanings of any words as needed (e.g. researchers, travel routes, collisions). Invite students to share comments and questions after viewing." (Lesson 3, Teacher Guide)
- Lesson 5, Explore, Step 2: "Observe seagrass in nature. Display slide C. Explain that this video includes clips of seagrass in various places. Watch the Underwater with Seagrasses video. Pause the video a few times to have kids turn and talk about their noticing and wonderings as they watch." (Lesson 5, Teacher Guide)
- Lesson 7, Explore, Step 2: "Examine pictures and words together as a class. Display slide E and read aloud pages 1-6 of the Better Together: Animals in Groups book. As students start to see evidence from the photos and words for why Meerkats live in groups, place checkmarks in the appropriate columns of the data table on the Animal Group Observation chart. You might choose to add "communicate" to the left-side column of your chart since Meerkats use sounds to warn each other of danger. A sample chart is shown here for reference." (Lesson 7, Teacher Guide)
- Lesson 9, Explore, Step 2: "Introduce the problems that manatees face. Display slide B. Motivate this reading, Seeking Solutions for Manatees by reminding students that manatees are still in need of protection and this news article may

help explain why. Have a piece of chart paper and markers ready to record noticings and wonderings from students.” (Lesson 9, Teacher Guide)

- Lesson 11, Connect, Step 2: “Watch two videos to gather more information about the seagrass problem. Display slide C and point out the two questions that will guide our thinking as we gather information from these videos: What change is happening in the habitat? How is it affecting manatees?” (Lesson 11, Teacher Guide)

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

- Lesson 2, Connect, Step 4: “Add habitats to the word wall. Say, We have so much more data and information about the waters, the places, where manatees and dolphins live. These three places are water habitats. Habitats are natural environments where animals and plants live and grow. Invite students to make connections with other habitats that they know about.” (Lesson 4, Teacher Guide)
- Lesson 4, Synthesize, Step 4: “Display slide I and encourage students to think back to animals they mentioned on the Sharing Community Examples page from Lesson 1. Invite students to turn and talk with a partner to share other examples of how interactions with their habitats might help plants and/or animals survive. Then invite a few students to share their ideas with the class.” (Lesson 4, Teacher Guide)
- Lesson 9, Connect, Step 3: “Share personal connections. Point out that there are some clear problems that manatees face, and that they may need our help. Display slide E. Revisit student ideas on the Protected Animals chart. Ask students if they have heard of or experienced something similar - other living things (plant or animal) that needed help from people. Give students a few minutes to turn and talk about their experiences before going public as a whole group.” (Lesson 9, Teacher Guide)
- Other opportunities to connect instruction to students’ own communities are included as extensions, **but not included in the regular lessons:**
 - Lesson 4, Synthesize, Community Connection sidebar: “Extension opportunity: To help students maximize transfer and generalization of the concept of interactions, provide students with an extension opportunity to document interactions in their community. Encourage students to plan a wandering walk with a trusted adult to create a drawing or take informal jottings about some interactions they might see in their neighborhoods or communities.” (Lesson 4, Teacher Guide) **Because this is labeled as an extension, students may not have the opportunity to engage with this connection to their community.**
 - Lesson 11, Navigate, Community Connection sidebar: “Students may want to investigate habitat changes for other animals or for other places. Extension ideas to broaden to related phenomena in your local community or ones that may interest students are provided in Extension: Broadening to Other Habitats.” (Lesson 11, Teacher Guide) **Because this is labeled as an extension, students may not have the opportunity to engage with this connection to their community.**

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.

- Although the phenomenon will be of local relevance only to students who live in Florida, USA, developers mention in the 3.4 Ecosystem Change and Survival Unit Front Matter that the phenomenon was chosen based on student interest: “When we surveyed elementary students about four possible phenomena, phenomena related to ocean animal survival had the highest interest levels. This was especially true for female students. When prompted to pick the phenomenon of highest interest to them, 64% of students in our sample selected the ocean phenomenon.” (3.4 Ecosystem Change and Survival Unit Front Matter)

- Lesson 1, Connect, Step 1: “Brainstorm other animals that may need protection. Display slide H and start the Protected Animals chart. The question on the slide may elicit personal connections for some students, so accept all responses. If students share a traumatic story about animals, follow these three steps: Be Curious, Validate, and Thank the Student. Additional guidance is provided in the Incorporating Trauma-Informed Approaches section of the Teacher Handbook.” (Lesson 1, Teacher Guide)
- Lesson 1, Connect, Step 4: “Introduce the Community Connection page. Display slide V. Remind students that when scientists are puzzled by a phenomenon they often look for other examples that may help them understand how or why something happens. Suggest that it might help us to look for examples of other animals that share spaces or form groups. Distribute and read through the Sharing Community Examples Community Connection page. If this is a good time to pause the lesson for today, explain how students can use this page to document stories and/or observations from their communities and experiences, including talking with siblings, friends, and/or trusted adults outside the classroom. Send students home with this page and look forward to sharing ideas the next time we have science class.” Connect step 4: “Ask students to share examples using words and/or gestures of other animals that form groups and record them, using words and/or pictures, on the chart. Then remind students that we know manatees and dolphins often (not always) share the same waters. Ask students to share examples using words and/or gestures of other plants and animals that share spaces and record them, using words and/or pictures, on the chart. Accept all responses and remind students that we will return to these ideas to help us figure out about the Odd Pod, and figuring out about the Odd Pod could help us explain why these animals form groups and share spaces, too.” (Lesson 1, Teacher Guide) Although students are told they will use Odd Pod ideas to explain their own animal experiences, **students do not have the opportunity to do this during the unit.**
- Lesson 2, Navigate, Step 1: “Revisit what we know about manatees and dolphins. Display slide A. Invite students to turn and talk about what we were curious about last time that led us to ask so many questions and have these ideas. Use the Driving Question Board and Evidence We Need chart, as needed.” Community Connections Callout: “It is important to cultivate a sense of a shared mission to investigate our ideas and questions together. Individuals will contribute their ideas and questions throughout the unit. At times, you may want to elevate those individual contributions by asking specific students to share and lead our work. However, fostering collaboration and community are essential. To do this well, focus on cultivating a class community that takes up an individual’s idea and/or question as necessary for our community to build knowledge together where the teacher is a collaborator alongside the students, not just the authority figure.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “Make observations of manatee locations at Three Sisters Springs. Share that scientists often put their data onto maps. If time allows, you could ask students to share other ways they have used maps before. Then say something like, Let’s look at some maps of where manatees are during the year that show data from scientists counting manatees or GPS tracking to try and figure out when they are there. Examine summer data.” (Lesson 3, Teacher Guide)
- Lesson 4, Navigation, Step 1: “Consider where to go next. Display slide C. Acknowledge how students’ lived experiences and personal connections to the waters provide a great place to start. Point out also that we have some disagreement or uncertainty. This is a clue for us as scientists to find out more information. Ask students to suggest ways we might find out more information about what dolphins and manatees eat, what might eat them, and what other things may live in the shared waters. Encourage students to post new questions to the DQB throughout this discussion as they come up.” Community Connections Callout: “If helpful, redistribute the Sharing Community Examples page from Lesson 1 so students can recall which animals they have observed outside or shared stories and experiences about. Connecting with animals other than dolphins and manatees will help students generalize what they figure out in this lesson to other more local and/or non-aquatic habitats.” (Lesson 4, Teacher Guide)

- Lesson 8, Synthesize, Broadening Access sidebar: “When brainstorming new ideas for the odd pod, consider replaying the anchoring phenomenon video (The Odd Pod). This will be beneficial for students who want to make observations again now that they know more about manatees and dolphins and provide with time to internalize how their ideas and thinking has changed over time” (Lesson 8, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

II.B. Student Ideas

EXTENSIVE

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

The reviewers found **extensive** evidence that the learning experiences in the materials provide students with opportunities to negotiate new understandings by clarifying their own ideas and comparing them to those of their peers. The materials offer opportunities for students to justify or build upon their ideas and support students in reflecting on others’ ideas, as well as helping students change or reconsider their own ideas.

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

- Lesson 2, Synthesize, Step 6: “Ask students to share a claim (or answer) they might have that answers the lesson question and press them to use some evidence either the maps, the videos, the Scientists cards, or the Class Consensus model. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart.” (Lesson 2, Teacher Guide)
- Lesson 3, Synthesize, Step 8: “Introduce odd pod claim and evidence cards. Share that we have gathered a lot of new evidence in the previous classes so it’s helpful to examine the evidence we have and what claims the evidence might support. Share with students that you have a deck of evidence cards and each deck of Odd Pod Claim and Evidence Cards for L3, L4, L8 has two cards with two possible claims and 5 evidence cards. Read the claims on the cards and work with students to compare and contrast them with the claims we made in Lesson 1, pointing out if and how they are similar or different, without identifying which one is better supported by our evidence (that is the next step).” (Lesson 3, Teacher Guide)
- Lesson 7, Synthesize, Step 4: “Ask students to share their ideas; welcome all ideas, but work toward making a claim that summarizes ideas across the animal groups, such as Being part of a group helps some animals meet their needs for survival and reproduction. Ask students what pieces of evidence help them support the claims. Record evidence students agree upon. A sample updated chart is shown here; bear in mind that your class may have expressed their ideas differently.” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Display slide L to review how they might use the evidence cards to pick out pieces of evidence to support their claims. Point to Our Growing Ideas chart, Animal Group Observation chart, and the Class Consensus Mode as additional resources they can use for their argument.” (Lesson 8, Teacher Guide)

- Lesson 10, Explore, Step 4: “One stay, one stray. Display slide K. After groups have had a chance to share, have one student in the group ‘stay’ while the other members ‘stray’ to make groups with mixed solution ideas. It is not important for students to visit every other peer group but rather to have the opportunity to hear multiple examples of arguments with different claims and supporting evidence.” (Lesson 10, Teacher Guide)

The Growing Ideas Chart is an artifact that is used to track whole class reasoning and changes in their thinking over time. It is used a few times throughout the unit. For example:

- Lesson 3, Synthesize, Step 7: “Ask students to share a claim (or answer) they might have that answers the lesson question. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart. As students are sharing potential claims, also record the evidence that they name, too. Evidence might include maps, underwater videos, scientists cards, interview with a scientist, and the Class Consensus model.” (Lesson 3, Teacher Guide)
- Lesson 6, Navigate, Step 6: “Update Our Growing Ideas chart. Display slide K and add the lesson question to Our Growing Ideas chart: How does the seagrass get to be different? Ask students if they have questions similar to this one on the DQB. If so, move those sticky note questions over to the Our Growing Ideas chart near the lesson question.” (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize, Step 4: “Return to the lesson question to update Our Growing Ideas chart. Display slide J. Remind students that we’ve been working toward answering the question, Why do some animals live in groups? Jot this question onto Our Growing Ideas chart. Move any similar questions from the DQB near the lesson question.” (Lesson 7, Teacher Guide)
- Lesson 12, Navigate, Step 1: “Revisit Our Growing Ideas Chart. Display the Our Growing Ideas chart. Say something like, Last time, you all shared ideas that should be added to Our Growing Ideas chart. I tried to capture our thinking. Let’s take a moment to read through what we have - is there anything you want to add or update? Give students a moment to read what you recorded. Let students share anything they would like to update or add from the last lesson.” (Lesson 12, Teacher Guide)

Students expand and revise ideas on Student Handout Designs to Protect Manatees throughout Lesson Set 2 (Lessons 7 -11).

- Lesson 9, Synthesize, Step 5: “Explain that students will create designs to protect manatees. Share that we discovered three causes for manatees being sick or dying (effects), and we also listed criteria that our solutions must meet to help protect manatees. Point out that it may be difficult to protect manatees from all three causes at the same time, so we can pick one cause to design a solution for. Share that students can use words, drawings, or both to explain how their design meets at least one of the criteria discussed. Pass out 1 copy of the Designs to Protect Manatees handout to each student. Look at the handout together. Explain that on page 1 they will design a solution to protect manatees from one of three problems - lack of warm water, not enough seagrass, or boat strikes.” (Lesson 9, Teacher Guide)
- Lesson 10, Synthesize, Step 5: “Revise our design solutions to protect manatees based on additional evidence. Display slide L. Pass back or have students locate their Designs to Protect Manatees handout from Lesson 9. Invite them to review their initial design solutions and then give them time to revise their idea or generate a new idea based on the additional research. Students can record their ideas on the second page of the handout. As students are revising their design ideas encourage them to represent their thinking using both words and pictures and be specific about how their designs better meet our criteria and constraints.” (Lesson 10, Teacher Guide)
- Lesson 11, Synthesize, Step 5: “Revise or redesign our solutions. Ask students to locate their Designs to Protect Manatees from the previous lessons and find the last page. Display slide K. Refer to the classroom agreements. Ask students which classroom agreement have we used the most while researching and comparing solutions. Students

will likely say that we let our ideas grow and change. Acknowledge that our ideas have changed a lot and now that we have more information they may want to either refine their original idea from Lesson 9 or generate a new design idea. Give students time to individually work on the final page of the Designs to Protect Manatees handout. Cue them to use words and/or pictures to argue for a solution they think best meets the criteria and constraints.” (Lesson 11, Teacher Guide)

- Lesson 12, Synthesize, Step 2: “Tell students that there are many possible options to consider - there is no ‘right’ answer to this problem. They will need to consider all the possible solutions and argue for the one they think might be the best overall solution to meet the criteria for protecting manatees. Encourage students to use the information they have on the Warm Water Solutions: Comparison Tool handout and the Seagrass and Boat Solutions: Comparison Tool handout as evidence. They may want to revisit their revised design ideas from Designs to Protect Manatees, too. This is a handout they used across Lessons 9, 10, and 11.” (Lesson 12, Teacher Guide)

The Following Student Sensemaking Tool for Lessons 2-4, 7-8, and 10-12 is provided for teachers to track each students’ thinking over time. For example:

- Lesson 4, Explore, Step 2: “While students are working in their research pairs, circulate to groups to listen to their discussions. Keep Following Student Sensemaking (Lessons 2-4) on a clipboard to jot down evidence of student understanding. You can cue students to share 1-on-1 what they figured out about manatees and dolphins and how they are using those ideas to help them with this new animal.” (Lesson 4, Teacher Guide)
- Lesson 7, Synthesize, Step 6: “ Use the Following Student Sensemaking (Lessons 7-8) to gather and analyze student progress. Providing written or verbal feedback to students on The Orca Named Springer can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect.” (Lesson 7, Teacher Guide)
- Lesson 11, Explore, Step 3: “Gather evidence using Following Student Sensemaking (Lessons 10-12) as you listen to partner discussions while students use Seagrass and Boat Solutions: Comparison Tool.” (Lesson 11, Teacher Guide)

Students receive constructive feedback from both the teacher and peers. For example,

- Lesson 1, Synthesize, Broadening Access sidebar: “Sitting in a circle where they can face one another can help support students’ engagement and build a sense of shared mission and community, as well as ensure that students can see and hear all of their classmates, including gestures they might use and how they might point to a map or a chart. The Scientists Circle is also an important tool for developing students’ agency in their learning as they take stock of what they have figured out and decide where they need to go next. Share with students that professional scientists also collaborate with one another to brainstorm, discuss, and review their work.” (Lesson 1, Teacher Guide)
- Lesson 5, Synthesize, Teaching Tip sidebar: “A Building Understandings Discussion is a useful kind of discussion following an investigation because the purpose is to focus students on drawing conclusions based on evidence. Your role during the discussion is to invite students to share conclusions and claims and to push them to support their conclusions and claims with evidence. Students can disagree with each other, and the class does not need to reach consensus on all ideas shared; areas of disagreement can motivate future investigations.” (Lesson 5, Teacher Guide)
- Lesson 6, Explore, Broadening Access sidebar: “The jigsaw activity structure that is used in this lesson step fosters collaboration and community by shifting the classroom environment from a competitive one to a collaborative one. Students depend on each other to learn by having to be experts on a portion of the data source and teach it to others in groups, where every student has an equal responsibility and role.” (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize, Step 6: “Introduce the Springer assessment. Distribute the The Orca Named Springer assessment to each student. Display slide N and read the introduction of the assessment together. Introduce the new

question, which is a slight variation on the lesson question: Does living in a group help an orca survive? Provide time for students to complete the assessment independently. Circulate the room as students work and assist as needed, such as by explaining unknown words or prompting students to use evidence from the book and/or Animal Group Observations chart. When students complete their assessments, be sure to review them and offer written and/or oral feedback before the end of Lesson 8 so students have a chance to respond to that feedback before the end of this lesson set.” (Lesson 7, Teacher Guide)

- Lesson 9, Synthesize, Step 5: “Share and evaluate designs. Once students complete their designs, have them share using a protocol like the Hand Up, Pair Up on slide J. As well as an opportunity to communicate and hear other ideas, this activity gives students an opportunity to provide and receive peer feedback on how well each design addresses one cause and meets at least one of the agreed upon criteria. Have students share with at least two classmates. If students find out that their initial design does not address at least one cause or does not meet at least one criteria, give students time to revise their idea.” (Lesson 9, Teacher Guide)

The Assessment Guide document calls out lessons 8,12, and 13 as formal opportunities for peer feedback and lessons 3,4,10 and 11 for informal peer feedback to occur. For example,

- Lesson 3, Synthesize, Step 8: “Use the claim and evidence cards to start an argument. Display slide R. Ask students to work with a partner to pick one claim that they think best answers our question and select the evidence cards that they think help support their claim. Partners can lay their deck out on a table and move the evidence cards under the claim that they have selected. The evidence cards include a sentence starter to support students in describing what we observed in the evidence that supports their claim. As students are working with partners, circulate the room and use the Following Student Sensemaking (Lessons 2-4) to document student’s individual sense making. During this lesson, students have the opportunity to expand their thinking of how to connect evidence to claims, and they start to verbally construct an argument with a peer.” (Lesson 3, Teacher Guide)
- Lesson 4, Synthesize, Teaching Tip sidebar: “Suggest that partners sit near each other so they can talk as necessary to support updating the class model. If students are struggling to come up with ideas, you can suggest students turn and talk to check in with their partners. This will allow them to practice articulating their thinking to a small audience which may boost their confidence to share to the class. Additionally, this may allow students time to process the question with a partner and clarify their thinking before sharing with the class.” (Lesson 4, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Provide peer review and feedback. Display slide M. When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Encourage partners to ask questions about each other’s claims and arguments. After both partners have shared, have them trade handouts and read one another’s ideas, using the Argument Peer Feedback handout ask students to write down their 1-2 feedback ideas for their partner. Remind students of the purpose of giving feedback by emphasizing things to look for (see slide N). Use slide O to support students to receive feedback.” (Lesson 8, Teacher Guide)
- Lesson 10, Explore, Step 4: “Examine Problem 1: Fixing Springs as a whole group. As a class, investigate the solution of fixing warm water springs. Begin by reading problem 1, which tells the story of the problem with Warm Mineral Springs in Southwest Florida. You may choose to read the text aloud to students, or ask student volunteers to read one of the text boxes aloud for their peers. After reading problem one, invite students to turn and talk to partners about how the problem makes it hard for manatees to meet their needs. Students should individually record their ideas in the ‘additional notes’ section of their Warm Water Solutions: Comparison Tool. Invite 2-3 students to share what their partner said.” (Lesson 10, Teacher Guide)
- Lesson 12, Synthesize, Step 4: “Provide peer review and feedback. Display slide E. When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Ask each student to show on their map where their design solutions would work best. Encourage partners to ask questions

about each other's claims and arguments. After both partners have shared, have them trade handouts and read one another's ideas, examining the map Step 4 and the argument in Step 5. Using Design Peer Feedback ask students to write down their 1-2 feedback ideas to their partner. Remind students of the purpose of giving feedback by emphasizing things to look for (see slide F)." (Lesson 12, Teacher Guide)

- Lesson 13, Synthesize, Step 5: "Give and receive feedback. When students have completed Part 3, display slide N and distribute the Giving and Receiving Feedback handout and pair them up to give and receive feedback about their claims and evidence. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints." (Lesson 13, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

II.C. Building Progressions

ADEQUATE

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

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

The reviewers found **adequate** evidence that the materials identify and build upon students' prior learning in all three dimensions. The materials do explicitly identify prior learning expected for all three dimensions for **some** of the elements. **One** reference to students' alternate conceptions and/or misconceptions was found.

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

The 3.4 Ecosystem Change & Survival Unit Front Matter document features a section titled, "What ideas and experiences will my students bring that can help them in this unit". It contains **some** of the expected learning students will come to third grade with for six DCI concepts (Ecosystem Dynamics, Functioning and Resilience, Inheritance of Traits, Variation of Traits, Social Interactions and Group Behavior, Biodiversity and Humans, Adaptation, Developing Possible Solutions), three SEPs (Analyzing and Interpreting Data (DATA-E1, DATA-E4), Engaging in Argument from Evidence (ARG-E4, ARG-E6), Obtaining, Evaluating and Communicating Information (INFO-E2), and three CCCs (Patterns (PAT-E1, PAT-E3), Cause and Effect (CE-E1), Systems and System Models (SYS-E2). There is **some** guidance about what a teacher should expect the students to be upon arrival, and of how to move students further in their use of the SEPs, CCCs, and DCIs.

The Unit Front Matter **does not** include expected prior student learning or experiences related to:

- The intentionally developed SEPs of Analyzing and Interpreting Data (DATA-E2), Engaging in Argument from Evidence (ARG-E1, ARG-E3) and Obtaining, Evaluating and Communicating Information (INFO-E1). The intentionally developed CCC of Cause and Effect (CE-E2).
- The opportunity to practice the following SEPs: Asking Questions and Defining Problems (AQDP-E2, AQDP-E3), Developing and Using Models (MOD-E1, MOD-E4), and Constructing Explanations and Designing Solutions (CEDS-E5). The opportunity to practice the following CCCs: Scale, Proportion and Quantity (SPQ-E1) and Stability and Change (SC-E1, SC-E2).

Disciplinary Core Ideas:

The 3.4 Ecosystem Change & Survival Unit Front Matter description includes the expected prior learning/experiences students will have with: Ecosystem Dynamics, Functioning and Resilience (LS2.C), Inheritance of Traits (LS3.A), Variation of Traits (LS3.B), Social Interactions and Group Behavior (LS2.D), Biodiversity and Humans (LS4.D), Adaptation (LS4.C), and Developing Possible Solutions (ETS1.B).

3.4 Ecosystem Change & Survival Unit Front Matter: “What ideas and experiences will my students bring that can help them in this unit?”

- Ecosystem Dynamics, Functioning and Resilience (LS2.C): “Survival is an important idea that surfaces throughout the unit and is defined explicitly in Lesson 3. Students will have prior experiences and ideas that survival happens when a plant or animal meets its needs. In science class, students learn about plants and animals meeting their needs for food and water (and light for plants) during kindergarten (K-LS1-1). In the OpenSciEd program, this learning experience occurs in K.4 Ecosystems: Plants, Animals, & Their Environment and again in 3.3 Traits and Variation. In addition to school learning, students may also have experiences and knowledge developed by taking care of plants and animals outside of school (e.g., watering house plants, tending a garden, raising sheep, feeding a pet). All of this prior knowledge and experience is helpful as students make sense of why animals need certain conditions in their environment to survive well, and how changes to habitats can affect their survival.” (3.4 Ecosystem Change & Survival Unit Front Matter)
- Inheritance of Traits (LS3.A) and Variation of Traits (LS3.B): “In the recommended scope and sequence, students will have experienced Unit 3.3: Why do animals look and act the way they do? prior to this unit, so they will bring in ideas they figured out about animal trait variations and inheritance. Students also learned about traits in Unit 1.4: How do the ways plants and animals look and act help them live and grow? as they investigated why young plants and animals are very much alike, but not exactly the same, as their parents. In first grade, students only make noticings of the traits and compare them between parents and offspring but they do not explain why there are some similarities and differences. In Unit 3.3 students figure out that information for animals’ trait variations is inherited from parents, and in this unit they will figure out that the same is true for plants.” (3.4 Ecosystem Change & Survival Unit Front Matter)
- Social Interactions and Group Behavior (LS2.D): “Students will not have formally investigated group behaviors in science class prior to third grade, but since humans are social creatures, students will likely be able to leverage connections to how other humans help them find food, stay safe, cope with changes, and communicate. See the “What unit-specific strategies are important for supporting equitable science learning in this unit?” section of this overview for guidance if students share about negative human group behaviors.” (3.4 Ecosystem Change & Survival Unit Front Matter)
- Biodiversity and Humans (LS4.D): “Depending on where students live and how much they travel, read, and watch other media, they will bring a diversity of experiences with different habitats and ecosystems. Some students may have more knowledge and experience of the ocean and plants and animals that live there, while others have experiences of the forest or grasslands and living things found in these ecosystems. Even if students have not traveled to these places directly, through books and other media and visits to aquariums, they have likely encountered images of these kinds of places and the plants and animals living there or experiences outside of school. During second grade they will learn more about the many different kinds of living things that exist in places on land and in water (2-LS4-1). These prior experiences and ideas will be helpful to leverage throughout this unit.” (3.4 Ecosystem Change & Survival Unit Front Matter)
- Adaptation (LS4.C): “Students will not have formal school experiences with ideas about environmental changes and organisms’ resilience before third grade. However, students may have prior knowledge about animals migrating when the seasons change or moving into transformed environments (coyotes in suburban areas, for example) from media or their own experiences. Some students may bring in ideas about pollution harming wildlife (generally or in specific

events like oil spills) and inferences or direct examples about organisms not being able to survive in a place that is no longer able to meet their needs (such as plants dying in a cold snap). In the recommended scope and sequence, students will have experienced Unit 3.3: Why do animals look and act the way they do? prior to this unit, so they will bring in ideas they figured out about life cycles and extinction; they have examined fossil evidence to explain that if plants and animals are not able to survive and reproduce in their environment, they will die.” (3.4 Ecosystem Change & Survival Unit Front Matter)

- Developing Possible Solutions (ETS1.B): ”Students will have engaged in engineering design tasks before they begin third grade. Likewise, the first unit for 3rd grade in the scope and sequence (Unit 3.1: How can we design objects to balance and move in different ways?) also emphasizes engineering design. In addition, the second unit for 3rd grade, (Unit 3.2: Why do plants only grow well in certain places, and how can we protect them?), emphasizes engineering design. Students will have experiences defining a problem before they engage in creating solutions. They also will likely have experience sketching designs for solutions, creating physical models, and testing a variety of design options to see what solution works best. From these prior units, they will have an understanding of the terms criteria and constraints. Use these experiences to reinforce defining problems and defining shared criteria and constraints. Add to this the importance of conducting research and working with peers to improve design ideas.“ (3.4 Ecosystem Change & Survival Unit Front Matter)

Science and Engineering Practices:

The 3.4 Ecosystem Change & Survival Unit Front Matter description includes the expected prior learning/experiences students will have with *some* of the SEPs: Analyzing and Interpreting Data (DATA-E1, DATA-E4), Engaging in Argument from Evidence (ARG-E4, ARG-E6), Obtaining, Evaluating and Communicating Information (INFO-E2).

3.4 Ecosystem Change & Survival Unit Front Matter: “What ideas and experiences will my students bring that can help them in this unit?”

- **Analyzing and Interpreting Data**

- DATA-E1: Represent data in tables and/or various graphical displays (bar graphs, pictographs, and/or pie charts) to reveal patterns that indicate relationships. “Students engage with the practice of analyzing and interpreting data in Unit 3.3 when they represent data in tables and graphical displays to reveal patterns that help them make sense of the phenomenon of canines looking pretty similar as newborns but very different as adults. Students also engage with this practice in Unit 3.2 when they represent data on maps and graphs to reveal weather and climate patterns that help them make sense of why we can have certain fruits available year-round.”
- Evidence of expected prior learning DATA-E2 is not provided.
- Data-E4: Analyze data to refine a problem statement or the design of a proposed object, tool, or process “If they have not experienced Unit 3.2 prior to this unit, they may need additional support with analyzing and interpreting data to make sense of phenomena using logical reasoning or to refine the design of a proposed tool or process.”

- **Engaging in Argument from Evidence**

- ARG-E4: Construct and/or support an argument with evidence, data, and/or a model. “In grades K-2, students will have made claims and supported claims with evidence. They may know that a claim answers a scientific question and that it needs to account for and be supported by evidence. Students may also have prior experiences distinguishing between their opinions versus an evidence-based explanation.”

- ARG-E6: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem. “In grades K-2, students will have made claims and supported claims with evidence. They may know that a claim answers a scientific question and that it needs to account for and be supported by evidence. Students may also have prior experiences distinguishing between their opinions versus an evidence-based explanation.”
- Evidence of expected prior learning of ARG-E1 and ARG-E3 is not provided.
- **Obtaining, Evaluating and Communicating Information**
 - INFO-E2: Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. “Students engage with the practice of obtaining, evaluating, and communicating information in each of the other grade 3 units, combining information from books and other reliable media to support their engagement in other SEPs and help them make sense of phenomena and design solutions.”
 - Evidence of expected prior learning of INFO-E1 is not provided.
- **Asking Questions and Defining Problems**
 - Evidence of expected prior learning of AQDP-E2 and AQDP-E3 is not provided.
- **Developing and Using Models**
 - Evidence of expected prior learning of MOD-E1 and MOD-E4 is not provided.
- **Constructing Explanations and Designing Solutions**
 - Evidence of expected prior learning of CEDS-E5 is not provided.

Crosscutting Concepts:

The 3.4 Ecosystem Change & Survival Unit Front Matter description includes the expected prior learning/experiences students will have with **some** of the CCCs: Patterns (PAT-E1, PAT-E3), Cause and Effect (CE-E1), Systems and System Models (SYS-E2).

3.4 Ecosystem Change & Survival Unit Front Matter: “What ideas and experiences will my students bring that can help them in this unit?”

- **Patterns**
 - PAT-E1: Similarities and differences in patterns can be used to sort and classify natural phenomena. “Students use the crosscutting concept of Patterns in each of the other grade 3 units, so if they have had any units prior to this one, they will be able to leverage patterns thinking to sort and classify natural phenomena and use patterns as evidence to support their explanations (or claims, in this unit).”
 - PAT-E3: Patterns can be used as evidence to support an explanation. “Students use the crosscutting concept of Patterns in each of the other grade 3 units, so if they have had any units prior to this one, they will be able to leverage patterns thinking to sort and classify natural phenomena and use patterns as evidence to support their explanations (or claims, in this unit).”
- **Cause and Effect**
 - CE-E1: Cause and effect relationships are routinely identified, tested, and used to explain change. “Students use the crosscutting concept of Cause and Effect in each of the other grade 3 units, so if they have had any units prior to this one, they will be able to identify and test cause and effect relationships and use them to explain change.”

- Evidence of expected prior learning of CE-E2 is not provided.
- **Systems and System Models**
 - SYS-E2: A system can be described in terms of its components and their interactions “In second grade, students defined a system as parts that work together for the whole. If students have already experienced Unit 3.1: How can we design objects to balance and move in different ways? and or Unit 3.2: Why do plants only grow well in certain places, and how can we protect them?, they will likely know that systems are made of parts (components), but this unit will add the idea of interaction between those components.”
- **Scale, Proportion and Quantity**
 - Evidence of expected prior learning of SPQ-E1 is not provided.
- **Stability and Change**
 - Evidence of expected prior learning of SC-E1 and SC-E2 is not provided.

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

Additional information is located in the 3.3.4 Ecosystem Change & Survival About the Science document, some of this information is also found in the 1.3.4 Ecosystem Change & Survival Unit Front Matter document. For example,

Disciplinary Core Ideas:

- **Adaptation (LS4.C):** “In the first lesson set, students explore how organisms meet their survival needs in river and spring habitats compared to coastal and deep ocean habitats. Manatees and dolphins serve as key examples: manatees must move between habitats to access food, freshwater, and warm water, while dolphins meet all needs within either coastal or deep ocean habitats. Students figure out that manatees cannot survive solely in coastal ocean habitats and need freshwater, just as dolphins cannot survive in rivers and springs. Building on K-2 foundations about basic organism needs (food, water, air, and for plants, sunlight), this unit adds why some kinds of plants and animals thrive in specific habitats or must move to meet their needs. If you have taught Unit 3.2: Why do plants only grow well in certain places, and how can we protect them?, students may also bring ideas about fruit plant needs and how different climates provide the amount of precipitation and seasonal temperatures that are well-matched to those needs. Some plants survive and grow well in particular environments whereas they would not survive or grow well in environments that do not meet their needs. Leverage these ideas about plants to more explicitly develop ideas about survival in this unit. The second half of the unit explores how habitat changes affect survival focusing on struggling manatees in altered river, spring, and coastal habitats, while other kinds of organisms either thrive in the altered habitat (e.g. algae) or move to new habitats (e.g. dolphins).”
- **Biodiversity and Humans (LS4.D):** “In the first lesson set, students explore aquatic plants and animals in river and spring, coastal ocean, and deep ocean habitats, building on second-grade knowledge of habitat diversity. Students examine habitat characteristics (salinity, temperature, depth) and plants and animals found in three kinds of habitats, while also learning that some organisms thrive in single habitats while others move between them. Through the anchoring phenomenon, students investigate how seasonal temperature changes drive manatee migration between warm springs (winter) and coastal waters (summer). This understanding of interconnected aquatic habitats and movement patterns provides context for the second lesson set’s investigation of habitat changes affecting marine life. The relationship between habitat types and dolphin and manatee movement patterns supports revision to claims about the Odd Pod phenomenon, because students uncover new evidence that these two kinds of animals share coastal waters during summer months due to their movement patterns and shared need for seagrass habitats.”
- **Social Interactions and Group Behavior (LS2.D):** “In the first lesson set, students explore why some animals rely on a social group for survival while others are more solitary. Students figure out that dolphins depend on groups for

multiple survival needs: hunting, predator defense, and social learning. In contrast, manatees primarily gather in groups around shared resources, meeting most needs independently or in small family groups for social learning. This understanding of typical group behaviors provides evidence for analyzing the Odd Pod phenomenon again and hypothesizing why the manatee temporarily joined the dolphin pod (though scientists don't know for certain why this rare group formed)."

- Biodiversity and Humans (LS4.D): "In the second lesson set, students examine how environmental changes affect habitats and the organisms living there. They explore how access to warm water springs impacts manatees and that pollution alters water quality - promoting algae growth but killing seagrass and other plants. Students also research how boat traffic affects manatees in rivers, springs, and coastal waters. These human-induced habitat changes threaten manatee survival because manatees have specific needs in their habitats. Students also figure out people have the capacity to minimize changes to habitats so that living things in those habitats survive and thrive."
- Inheritance of Traits (LS3.A) and Variation of Traits (LS3.B): "Traits are characteristics we can see or observe about a living thing. In first grade students make observations between parent plants and animals and their offspring to conclude that they look very similar but not identical. While students are observing 'traits' to draw conclusions in first grade, they do not use this terminology. You will introduce this term to students in Lesson 5 as a scientific word to describe things they have already been observing about living things (and, if students already experienced Unit 3.3: Why do animals look and act the way they do?, connect to their knowledge of the term from that unit."
- Inheritance of Traits (LS3.A) and Variation of Traits (LS3.B): "In Lessons 5 and 6, students further investigate seagrass, due to the important role it plays for the dolphins and manatees. In first grade, students observe similarities and differences between parents and offspring but do not explain how or why offspring look similar to parents, and also slightly different. They do lay foundational ideas for 'kinship' that related plants and animals look similar to each other. How and why this occurs is new for 3rd grade. In 3rd grade students develop an understanding of 'inherited information' passing from parents to offspring that influences how offspring look and function."
- Inheritance of Traits (LS3.A) and Variation of Traits (LS3.B): "Students will notice variation in traits right at the beginning of Lesson 5 as they investigate patterns in the Seagrass Identification cards. While they do not label them as traits until later in the lesson (and name variations in Lesson 6), their work on sorting and classifying is their entry point into thinking about variation. Similar to inheritance, students will learn in first grade that individuals of the same kind of plants or animals share similarities but also vary in different ways. In first grade, students don't explain how or why there is variation, whereas in 3rd grade students start to lay foundational ideas about how this works. In particular, they analyze data in Lesson 5 to use as evidence that two parents pass along information to their offspring, resulting in different combinations of that information for the offspring, leading to varied observable traits. A key idea students develop is that different animals, even within the same family (parents, sibling offspring) vary in how they look and behave because of this slight difference in their inherited information. The animals within the same family are still more similar to each other and to others in the same plant type (species) compared to other kinds of seagrass plants."
- Developing Possible Solutions (ETS1.B): "This unit approaches engineering differently than in Unit 3.1: How can we design objects to balance and move in different ways? and Unit 3.2: Why do plants only grow well in certain places, and how can we protect them?. Instead of building and testing prototypes, students focus on idea generation, concept design, and research into existing solutions. The emphasis shifts from building to evaluating possible solutions through research, peer feedback, and refining design ideas. In Lesson 12, students use these skills to construct arguments for implementing specific solutions in particular locations. The unit frames science and engineering as tools that work together for habitat and organism protection, distinct from other actions that people take, such as legislation." This is not a focal DCI; however, it is included.

Science and Engineering Practices:

- Developing and Using Models (MOD-E4): “This unit uses different ways to represent system models for students to track components and interactions. Students who experienced Unit 2.3: What lives where? will have some foundational understandings about maps as models. One of the representations that students engage with in this unit is using maps of the different systems to show where manatees and dolphins are found. Third-grade students are developing spatial thinking skills, but may not have secure ideas about quantitative distances, cardinal directions, grid system references, quantitative scales, and other spatial references that are commonly associated with map interpretation. These are often developed in upper elementary and middle grades. Students might interpret a map symbol as representing a single manatee rather than understanding the map key information that it represents many. They may find it difficult to interpret an abstract symbol, such as the color on a map representing the entire area in which dolphins can be found. Thus, students may need additional support talking about where things are on the map and where they move, including what symbols might mean, what lines on the map might indicate, etc. They may say ‘They move that way’ or ‘The manatee is located in this spot (point to a symbol)’. These are typical spatial ideas for this age group. You can support them by probing their ideas and having them trace their thinking on the map or explain how they are interpreting a color or symbol.”

Some support for teachers pertaining to alternate conceptions are included. For example,

- 3.4 Ecosystem Changes and Survival Front Matter “What ideas and experiences will students bring that can help them in this unit?” also describes science ideas that students may already know, **but does not include information about alternate conceptions that students may have.**
- The About The Science document describes **one alternate conception students may have about map keys:** “Using Maps as Models: ...Students might interpret a map symbol as representing a single manatee rather than understanding the map key information that it represents many. They may find it difficult to interpret an abstract symbol, such as the color on a map representing the entire area in which dolphins can be found. Thus, students may need additional support talking about where things are on the map and where they move, including what symbols might mean, what lines on the map might indicate, etc. They may say “They move that way” or “The manatee is located in this spot (point to a symbol).” These are typical spatial ideas for this age group. You can support them by probing their ideas and having them trace their thinking on the map or explain how they are interpreting a color or symbol.”

Criterion-Based Suggestions for Improvement:

- Ensure “explicit support is provided to teachers to clarify adult understanding or the potential alternative conceptions that they, or their students, may have while building towards students’ three-dimensional learning, along with guidance for how to help students negotiate their understandings [vs. Telling students they are wrong]. [Detailed Guidance, p. 25].
- Consider “explicit support to teachers for identifying individual students’ prior learning and accommodating different entry points.” [Detailed Guidance, p.25]

II.D. Scientific Accuracy

EXTENSIVE

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

The reviewers found **extensive** evidence that students use scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning. Teachers are supported in guiding students to authentically develop scientifically accurate language and are provided with a document outlining the boundaries of the unit's science ideas.

There is a 3.4 Ecosystem Change & Survival About the Science document that includes "What Are The Boundaries Of The Science Ideas For Students In This Unit?" For example,

- "Manatee species. The manatee around Florida is the Florida Manatee, a subspecies of the West Indian Manatee. Much of the data we used is for the West Indian Manatee that lives around Florida and throughout the Caribbean and South and Central America, therefore, not always specific to the Florida manatee subspecies. Students do not need to know about specific species and subspecies, but if you want to learn more yourself, see the adult-level resources that follow."
- "Dolphin species. This unit focuses on the Common Bottlenose Dolphin, which lives in temperate and tropical coastal and deep ocean waters around the world. About 40 dolphin species exist, and some of these live exclusively in freshwaters such as rivers. Students do not need to know about specific species of dolphins, but if you want to learn more yourself, see the adult-level resources that follow."
- "Seagrass species and trait variations. Globally, there are approximately 72 different seagrass species. In this unit, when referring to different species, students will use the word type and students will only be observing several species local to the Florida area. Seagrasses are unique plants that have evolved to live in seawater. Seagrasses are a functional group, not a taxonomic group, of angiosperms (flowering plants), which means various seagrass families are not necessarily closely related. Furthermore, in Lesson 5, students will be looking for patterns across species ('types' or 'kinds' to students), so scientifically speaking, we are not calling the differences trait variations. In Lesson 6, students will name the differences within a species (type of seagrass), such as leaf height and width, as trait variations. This distinction is not essential to student understanding at this gradeband; the key idea for third graders is that parents and their offspring are more similar than non-related offspring, even within the same type of plant."
- "Algae. This unit does not spend time discerning seagrass or other aquatic plants from algae. However, seagrass is a true flowering plant with roots, stems, leaves, and seeds, while algae (which some people consider 'seaweed' together with any aquatic plants) is a simpler organism that lacks plant structures and uses a holdfast for attachment instead of roots. The key differences lie in their evolutionary history, structure, and reproductive methods: seagrasses have a complex internal transport system, whereas algae absorb nutrients directly through their surfaces by diffusion. Students are not expected to figure out how algae is different from plants; they only need to figure out that too much algae growing in a habitat prevents seagrasses and other plants from getting the sunlight they need to survive."
- "Seagrass reproduction. Seagrasses reproduce both sexually and asexually, similar to many land plants. Sexual reproduction involves underwater pollination, leading to flowers, fruits, and seeds that can float to new locations before germinating. Asexual reproduction involves vegetative growth through a horizontal stem called a rhizome, which sends up new shoots to form a connected network. Note that in this 3rd-grade unit, we will only be referring to the sexual reproduction of seagrass (although that term is not used until middle school). This unit does not address life cycles of plants or how reproduction is essential to the continued existence of plants, as these ideas are investigated in Unit 3.2: Why do plants only grow well in certain places, and how can we protect them?."

- “Inheritance of traits as explained by genes and DNA. The focus of LS3.A is to help students understand the relationship between genes and traits. Yet, using ideas about genes, alleles, and DNA are well above 3rd grade level. At 3rd grade, students can develop the idea that parents ‘pass on information’ to offspring, but genetic mechanisms for inheritance and prediction of traits is not appropriate for 3rd grade. Students should not investigate alleles from parents and how dominant and recessive alleles make up the genetic information an offspring inherits, nor should they investigate how particular combinations of those alleles result in the trait that is expressed. That level of understanding is reserved for middle and high school. Therefore, no Punnett Square or similar kinds of activities should occur in 3rd grade. Third grade should focus on helping students build foundational ideas about kinship similarities and environmental effects without developing the mechanisms that underlie them, which happens in middle school (Shea & Duncan, 2017, p.156). This should occur with non-human examples. This unit only focuses on plant inheritance since students figure out in Unit 3.3: Why do animals look and act the way they do? that many characteristics of animals are inherited from their parents.”
- “Animal reproduction/mating. This unit addresses animal social grouping and minimally touches upon mating as one reason for group formation. The unit only minimally connects to reproduction as part of life cycles, which are addressed for plants in Unit 3.2: Why do plants only grow well in certain places, and how can we protect them? and animals in Unit 3.3: Why do animals look and act the way they do?. Students figure out in this unit that animals may not be able to reproduce (have and raise babies) if they are not getting what they need in their environments. Human reproduction should not be discussed in this unit.”
- “Food chains and food webs. When students explore the biodiversity of aquatic habitats in Lesson 4, you may be tempted to include more food chain- or web-like interactions between plants and animals in those systems. However, the purpose of Lesson 4 is to broaden students’ understandings of how plants and animals beyond dolphins and manatees meet their needs in those habitats. Including some important interactions with manatees and dolphins is essential for investigating the anchoring phenomenon; however, students do not need to understand predator-prey relationships, which are ideas developed in middle school.”

Teacher Guides point out places where language or concepts may be ambiguous or above grade level, and offer tips to help clarify for students. For example:

- Lesson 1, Explore, Literacy Support sidebar: “We use the term ‘odd’ because it comes directly from the expert. Some students will remember this term from math and distinguishing ‘odd numbers’ from ‘even numbers’. Help students understand that in this context, the term ‘odd’ means uncommon. It refers to the fact that manatees and dolphins do not usually form groups together. Point out that there’s nothing odd about any of the individual animals here. Instead, it is atypical for the animals to be together. Remind students that words can have multiple meanings that differ depending on when and how they are used.” (Lesson 1, Teacher Guide)
- Lesson 6, Explore, Step 3: “Important lesson guidance: Seagrass reproduces both sexually and asexually, similar to many land plants. Sexual reproduction involves underwater pollination, leading to flowers, fruits, and seeds that can float to new locations before germinating. Asexual reproduction involves vegetative growth through a horizontal stem called a rhizome, which sends up new shoots to form a connected network. Note that in this 3rd-grade unit, we will only be investigating sexual reproduction in seagrasses. More information is available in the About the Science unit document.” (Lesson 6, Teacher Guide)
- Lesson 7, Navigate, Broadening Access sidebar: “As part of this lesson, students will investigate animal groups. Avoid using terms about ‘size’, such as big/large or small, in this context. Size can be interpreted in a lot of ways. Instead, focus on the number of members in the group (i.e., quantity).” (Lesson 7, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

II.E. Differentiated Instruction

EXTENSIVE

Provides guidance for teachers to support differentiated instruction by including:

- i. Supportive ways to access instruction, including appropriate linguistic, visual, and kinesthetic engagement opportunities that are essential for effective science and engineering learning and particularly beneficial for multilingual learners and students with disabilities.
- ii. Extra support (e.g., phenomena, representations, tasks) for students who are struggling to meet the targeted expectations.
- iii. Extensions for students with high interest or who have already met the performance expectations to develop deeper understanding of the practices, disciplinary core ideas, and crosscutting concepts.

The reviewers found **extensive** evidence of support for differentiated instruction. The materials provided guidance for teachers to support multiple modality expressions and multiple means of engagement. The materials also provided strategies for teachers to support multilingual learners and support for students who have met the performance expectations.

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

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

- The 1 3.4 Ecosystem Change & Survival Unit Front Matter document contains a section titled, “What unit-specific strategies are important for supporting equitable science learning in this unit?” that explains the design of the OpenSciEd Units and the use of the Universal Design for Learning.
- The Teacher Handbook document also contains UDL and differentiation supports including: “Building an equitable classroom culture for science, Integrating literacy (has support for readers and writers and word development), Using math to support science sensemaking, Incorporating trauma-informed approaches, University Design for Learning (UDL), and Supporting multilingual students.”
- The Additional Accessibility Resources document contains additional strategies and resources for teachers to access if needed. One strategy included states: “Utilize Descriptive Transcripts, Alt Text, and Closed Captioning. All OpenSciEd elementary materials (except field test version) have descriptive transcripts, alt text, and closed captioning for video and image files. This is a good resource to provide alternate options for students to engage in learning from a video or image. If utilizing a screen reader technology, it should read aloud the alt text of an image in line with the text on the page. When viewing a video, you may need to enable closed captioning. Finally, descriptive transcripts are provided for each video, which gives both a narrative account from the video, with visual and auditory descriptions of what is happening during the video.”
- Kinesthetic learning opportunities are found in several lessons in the Broadening Access sidebars. For example, Lesson 2, Synthesize Section, Broadening Access sidebar: “To support students in noticing all of the rich ways that their peers might share ideas during a discussion (e.g., using gestures, pointing to a map, talking across different languages, etc.) it is important that students be seated in a way that helps them see and hear all of their classmates. This is why the Scientist Circle seating arrangement is particularly helpful when you update Our Growing Ideas chart, as it allows students to orient to all their peers and the ways their peers might communicate their thinking.” (Lesson 2, Teacher Guide)

- Teachers are reminded of the different modes students might use to express themselves, in the “Following Student Sensemaking” documents for lessons 2-4, 7-8, and 10-12 All documents include a column for the teacher to record “Notes about what students say, write, draw, gesture, do”, as well as a “Possible Evidence of Student Sensemaking” section which reminds teachers: “Remember students are often using multiple means of communication to express their sensemaking. Recall that what you aim to identify here is the extent to which students are figuring out and demonstrating an understanding of the focal performance assessment across lessons. In this space, it is important that you identify evidence of this understanding, regardless of how students express their ideas. Use the following ideas below as evidence that students have a secure grasp of the assessment statement... Students might say... Students might gesture/manipulate...”

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

- Lesson 1, Connect, Broadening Access sidebar: “It is important to organize activities in ways that create opportunities to support student engagement by emphasizing socially safe activity structures and interactions (e.g., small-group or partner work before a whole-class discussion). This is especially beneficial to multilingual students. For this reason, partner talk or small-group talk should precede whole-group discussion whenever possible to give students an opportunity to share their ideas with peers and self-assess before going public with the whole class.” (Lesson 1, Teacher Guide)
- Lesson 2, Connect, Broadening Access sidebar: “Provide options for comprehension by clarifying less common vocabulary (such as ‘shallow’) for multilingual learners in order to promote understanding across languages. Invite multilingual students to add their own word/definition to the class model or their own models in their home or everyday language or include a simplified definition such as ‘not deep’.” (Lesson 2, Teacher Guide)
- Lesson 5, Explore, Broadening Access sidebar: “Accept and record all ways of describing what students observed; capture not only students’ ideas, but also the rich ways that students express their ideas, such as with drawings or gestures, inviting both familiar and scientific language. This is especially important for multilingual students because their language resources are not always noticed or valued in school spaces. If a student shares an idea using words in a language other than English (e.g., in Spanish, Arabic, Mandarin, etc.), record their idea exactly as they shared it and then add a translation in English next to it. If possible, have students record ideas onto the chart themselves.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Broadening Access sidebar: “Encourage multilingual students to share what a similar word might be in their preferred language. If applicable, you might encourage your multilingual students to add vocabulary words across named languages (e.g., Spanish, Mandarin, Arabic) to the Word Wall if it would support their sense-making throughout the unit.” (Lesson 6, Teacher Guide)
- Lesson 7, Navigate, Broadening Access Callout: “As part of this lesson, students will investigate animal groups. Avoid using terms about ‘size’, such as big/large or small, in this context. Size can be interpreted in a lot of ways. Instead, focus on the number of members in the group (i.e., quantity). This will be especially beneficial for multilingual learners.” Explore, Step 2, Broadening Access: “Support students, especially multilingual students, by encouraging them to label or annotate the rows with translated words for some/all of the reasons (e.g. ‘comida’ for ‘food’ in Spanish).” (Lesson 7, Teacher Guide)
- Lesson 8, Explore, Step 3: “Motivate examining images and text. Share that when looking closely at evidence, we can often find more information. Share that students can use these to look for additional clues. Pass out or link to a copy of the Better Together: Animals in Groups book for each pair of students...If possible, providing students with digital access to the book could provide automatic translations to benefit multilingual learners.” (Lesson 8, Teacher Guide)

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

- Lesson 2, Explore, Broadening Access sidebar: “To provide multiple means of representation and perception and help all students including those with color impairments access details of the map, have students notice that the water on the map is where the darker shade or contrast of color with the land is located while also providing a label.” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Broadening Access sidebar: “To make this map investigation accessible to students with visual impairments, offer vision heightening options to help students make observations. If possible, offer magnifying glasses for all students to use as needed or provide access to technology with text-to-speech options for students who might need an option to listen to a description of what the map is displaying. Work closely with students to ask what they need to be successful and/or examine their accommodations for specific needs.” (Lesson 3, Teacher Guide)
- Lesson 8, Explore, Broadening Access sidebar: “One important group behavior between animals is communication. Throughout this lesson, remind students that people communicate in many ways through talking, gestures, writing, and drawing. Similarly, they might notice different ways that animals communicate through sight, sound, gesture, and body movements. If you have students with a visual impairment, consider adding audio clips of dolphin and manatee noises to the experience such as Dolphin audible sounds and Manatees audible sounds.” (Lesson 8, Teacher Guide)
- Lesson 11, Explore, Broadening Access sidebar: “Some students may prefer to quietly read on their own before discussing with a partner. Other students could benefit from partner reading. Students with visual impairment will need a partner comfortable with reading the card aloud. Allow students to decide how to approach the activity, but strategically partner students to support their social preferences and multilingual communication.” (Lesson 11, Teacher Guide)

Learners reading below grade level

- Lesson 3, Connect, Literacy Supports sidebar: “Pausing to ask and answer prompts while reading supports students’ engagement and understanding of key details in a text. Answering the prompts to use while reading Meet the Expert: Eric Ramos helps students identify key details that explain why dolphins and manatees move in different Florida water systems (RI.3.2).” (Lesson 3, Teacher Guide)
- Lesson 4, Explore, Broadening Access sidebar: “You may choose to have students work in partners or 3-4 person groups. Partners would likely allow for more diversity in the information gathered. Yet, some students may find working in pairs difficult to navigate socially and academically. Consider having private conversations with students who may benefit from a specific group size to gather their input and prepare them in advance. If some groups finish their research faster than other groups, have additional organisms for them to explore.” (Lesson 4, Teacher Guide)
- Lesson 10, Explore, Broadening Access sidebar: “In order to increase access to the informational text on the Solution Research Cards, you may choose to encourage student partners to take turns reading different parts of the cards aloud to each other. Alternatively, you may choose to read multiple cards aloud to the whole class and provide partners subsequent time to discuss and complete their solution comparison tool.” (Lesson 10, Teacher Guide)
- Lesson 11, Explore, Broadening Access sidebar: “Some students may prefer to quietly read on their own before discussing with a partner. Other students could benefit from partner reading. Students with visual impairment will need a partner comfortable with reading the card aloud. Allow students to decide how to approach the activity, but strategically partner students to support their social preferences and multilingual communication.” (Lesson 11, Teacher Guide)

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

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

- Lesson 4, Teacher Assessment Tool Instructional Guidance 4: "If you notice students are not connecting the evidence from our lessons to their claim about what manatees and dolphins sometimes share the same waters. Gather the students in a small group with you and/or circulate to each student who is struggling to talk one-on-one. Focus them on interpreting the evidence first. Cause and effect may be helpful for doing this." (Lesson 4, Teacher Assessment Tool Instructional Guidance 4)
- Lesson 6, Teacher Assessment Tool Instructional Guidance 6: "If you notice students struggle to see patterns related to seagrass trait variations. Provide an opportunity to look at other plants that are similar and look for patterns with their traits. For example, take the class outside and look at the grass growing near the school, especially if it's growing in places that aren't mown frequently (such as in sidewalk cracks). Ask: How are the grasses we see on land similar to each other? Different from each other?" (Lesson 6, Teacher Assessment Tool Instructional Guidance 6)
- Lesson 7, Teacher Assessment Tool Instructional Guidance 7: "If you notice students could improve their use of evidence in their arguments. Provide feedback to students on this assessment. Feedback can be written or oral. Focus on helping students strengthen their arguments by incorporating more evidence into their written arguments or drawings. One way to do this is to have them revisit the evidence we have for Springer. Ask the student to point to one piece of evidence that supports their claim. Consider having students then edit or revise their argument to include that one piece of evidence." (Lesson 7, Teacher Assessment Tool Instructional Guidance 7)
- Lesson 12, Teacher Assessment Tool Instructional Guidance 12: "If you notice Students have ideas for solutions, but are struggling to figure out where to place them on the map. It may be helpful to have a student trace on the map, using a finger or a pencil, where manatees would move around in the system. Use these 'paths' to identify possible locations for problems to happen (e.g. where they might be most likely to interact with a boat) or where a solution would provide the best support (e.g., where they might safely eat seagrass)." (Lesson 12, Teacher Assessment Tool Instructional Guidance 12)

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

- Lesson 4, Assessment Guidance: "Providing written or verbal feedback to students on Odd Pod Argue from Evidence can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect. This feedback should be provided to students prior to Lesson 8 where they have another opportunity to develop arguments for claims about why the manatee joined the dolphin pod." (Lesson 4, Teacher Guide)
- Lesson 6, Assessment Guidance: "You can support the development of students' ideas by helping them refer to the seagrass cards from Lesson 5, their own observations from this lesson, and the parent/offspring data tables from this lesson." (Lesson 6, Teacher Guide)
- Lesson 10, Assessment Guidance: "If students need support comparing solutions, have them focus on one constraint at a time and highlight which solution has the least cost/effect for that constraint. Then students can use the highlights to minimize the amount of information that they need to process as they evaluate solutions." (Lesson 10, Teacher Guide)

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

- Lesson 2, Connect, Teaching Tip sidebar: “Extension Opportunity: Some students may have experiences, knowledge, and/or wonders related to specific areas of coastal waters where freshwaters meet saltwaters. If there is high interest, offer opportunities to seek/share additional information about brackish waters and make connections to coastal waters (e.g., brackish water can be found along the coast and is less salty than ocean water, but more salty than fresh water.)” (Lesson 2, Teacher Guide)
- Lesson 3, Explore, Step 3: “Extension idea: You may want to extend students’ observations by using satellite imagery, such as google Earth, to observe aggregations of manatees near power plants, like the Big Bend power plant in Tampa Bay.” (Lesson 3, Teacher Guide) While students see more pictures of the same thing, **they do not engage more deeply or differently with a Practice, DCI, or CCC through this activity.**
- Lesson 4, Navigate, Step 1: “Extension opportunity: To help students maximize transfer and generalization of the concept of interactions, provide students with an extension opportunity to document interactions in their community. Encourage students to plan a wandering walk with a trusted adult in order to create a drawing or take informal jottings about some interactions they might see in their neighborhoods or communities. This activity could also be conducted while students are engaged in other activities with families such as grocery shopping, a birthday party or visiting a park. Prompt students to notice how things such as food or other resources are being shared by different people, animals, or plants.” (Lesson 4, Teacher Guide) **However, students would not engage more deeply with elements of Practices, DCI, or CCC.**
- Lesson 5, Explore, Teaching Tip sidebar: “Extension Opportunity: Allow interested students to explore more identification cards in the set. You can facilitate this additional investigation by handing out extra cards or sharing the digital file for the cards with students.” This is an extension for students with high interest in seagrasses.
- Lesson 6, Explore, Teaching Tip sidebar: “Optional extension: If students are ready to take their data analysis a step further, direct them to the final item on the Seagrass Data Tables handout to use the patterns they found in the data to predict what another offspring of those same parents (either turtle grass or manatee grass) would look like.” (Lesson 6, Teacher Guide)
- Lesson 11, Document Extension: Broadening to Other Habitats offers three options, one of which is for individual students. “Option 3: I want to extend learning for students with high interest in protecting living things from ecosystem changes. Allow students to investigate a kind of animal of their choice to find out if that kind of animal is experiencing a change to their habitat. The choice of animal could be one they shared as a related phenomena in this unit or one they shared in the Unit 3.3: Why do animals look and act the way they do? unit, or another animal that fascinates them. Have students generate the question they want to answer about changes to the animal they are curious about. Then, have students generate ideas for how to gather information to answer their question. Once the question is decided and students have a plan for investigation, provide the necessary resources. You may want to provide an extra handout to scaffold their thinking about the cause of the problem, the effect, and solutions to disrupt this cause and effect.” (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement:

- Ensure “[d]ifferentiation strategies explicitly clarify how they address the needs of all of the following groups of students. All groups are not necessarily supported in every activity, but they are supported when an obvious need arises [e.g., reading supports during activities that require reading] and at least once while developing each targeted learning outcome...Students who have already met the performance expectation[s] or who have high interest in the subject matter and are ready to develop deeper understanding in any of the three dimensions. Supports for these students could include applying

learning in new contexts [e.g., transfer phenomena] or through the lenses of different CCC elements or could include extending to learning from the next grade level, such as the next level SEP element in a learning progression [e.g., grade 5 students extending to prioritize criteria].” [Detailed Guidance”, p. 28]

II.F. Teacher Support for Unit Coherence

EXTENSIVE

Supports teachers in facilitating coherent student learning experiences over time by:

- i. Providing strategies for linking student engagement across lessons [e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.].
- ii. Providing strategies for ensuring student sense-making and/or problem-solving is linked to learning in all three dimensions.

The reviewers found **extensive** evidence of teacher support for unit coherence. The materials support teachers in facilitating connected learning experiences over time by providing sufficient supports for students to make explicit links between their sense-making of phenomena and learning in all three dimensions.

i. Providing strategies for linking student engagement across lessons (e.g. cultivating new student questions at the end of a lesson in a way that leads to future lessons, helping students connect related problems and phenomena across lessons, etc.).

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

- Lesson 5, Navigate, Step 1: “Ask questions about seagrass. Display slide A. Remind students that last time we figured out that both manatees and dolphins need seagrass. Ask the class what other questions they have about seagrass (and/or other plants) and invite them to write their questions on sticky notes.” (Lesson 5, Teacher Guide)
- Lesson 5, Navigate, Step 6: “Motivate the next lesson’s investigation. Highlight students’ questions about the differences between seagrasses and how they can be so different and/or why they are different. Explain that to answer these scientific questions with a claim based on evidence, we will need more data. Suggest that we investigate real plants to use as evidence next time to figure this out together in Lesson 6.” (Lesson 5, Teacher Guide)
- Lesson 8, Navigate, Step 1: “Have students self-assess their progress. Remind students that they worked with a lot of new information in the last class to investigate reasons why some animals live in groups. They transferred this information to a class data chart that was really helpful for seeing patterns for the reasons why some kinds of animals live into groups. Display slide A. Prompt students to quietly think about how they feel about their success at examining information in the last class to identify common reasons why animals live in groups. After some think time, ask students to use their thumbs to show their confidence level. Share that you appreciate this feedback to you because it can help you adjust today’s class to help them be more successful.” (Lesson 8, Teacher Guide)
- Lesson 8, Navigate, Step 7: “Revisit our ideas and questions about protected animals. Briefly refer to the Driving Question Board and point out questions related to why manatees and dolphins are protected. Acknowledge that we have figured out a lot about dolphins and manatees, but we haven’t explored much yet about why they are protected. Display slide N and review our Protected Animals chart. Use prompts such as these to move into the work we’ll do next time.” (Lesson 8, Teacher Guide)

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

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

- Lesson 4, Explore, Systems and System Models sidebar: “An important element of this crosscutting concept is describing systems in terms of their components and interactions. If students have experienced Unit 3.1, they described their balance sculptures as systems and in Unit 3.2 they model and test the components of their windbreak designs, but the water habitats in this unit are systems in a quite a different context. Support students in comparing and contrasting the components and interactions in each of these systems.” (Lesson 4, Teacher Guide)
- Lesson 5, Navigate, Systems and System Models sidebar: “As the class reviews and adds to the DQB, make connections to the class consensus model and emphasize how students’ questions relate to components and interactions in the water systems.” (Lesson 5, Teacher Guide)
- Lesson 6, Explore, Patterns sidebar: “This lesson builds on this crosscutting concept that students previously engaged with in Lesson 5 as they looked for patterns across graphs of plant growth data. Here, students look for patterns across different types of observational data to see how the data helps support their claims how seagrass gets to be different.” (Lesson 6, Teacher Guide)
- Lesson 7, Explore, Obtaining, Evaluating and Communicating Information sidebar: “In this lesson, students read grade appropriate text combined with images and words to gather evidence for reasons some animals live in groups and work with members of their group to meet their needs. Students can apply strategies to support their reading of the text, such as previewing images first, followed by reading the text once to circle key words or underline important ideas, and reading a second time to gain more clarity.” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Analyzing and Interpreting Data sidebar: “The Animal Group Observation class chart is one way to represent data to help reveal patterns in the reasons why some animals live in groups (or get into groups). Prompt students to use this chart as a tool to generate conclusions about typical dolphin and manatee group behaviors, but also to start rethinking why a manatee joined a dolphin pod in Tampa Bay.” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Constructing Explanations and Designing Solutions sidebar: “Ideally, by not focusing on constraints at this time, students will feel free to brainstorm creative solutions with fewer limitations. Explain that sometimes engineers also remove constraints when coming up with initial ideas for designs because this gives them the freedom to think of solutions no one has ever considered. Perhaps students have heard the phrase, ‘think outside the box’. If so, ask students what they think this phrase means, and why it might apply here. If students struggle to articulate how this may apply, let students know that in this case the ‘box’ represents the constraints, and by removing them, we might imagine entirely new solutions to help manatees. If you find students motivated to discuss constraints further, you can suggest adding one additional constraint for now - that our designs must not harm any other living organism.” (Lesson 9, Teacher Guide)
- Lesson 11, Connect, Stability and Change sidebar: “In this Connect, use the lens of stability and change to focus students on what is changing in the system to create a problem for manatees. Remind students that they have a model to show the habitats, but these habitats don’t always stay the same so we need to track changes that we are hearing about to help us understand the problem.” (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

II.G. Scaffolded differentiation over time

ADEQUATE

Provides supports to help students engage in the practices as needed and gradually adjusts supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems.

The reviewers found **adequate** evidence that supports are provided to help students engage in the practices, but there is **no gradual adjustment** in the level of independence in the student's use of the elements of the unit's focal SEPs: Analyzing and Interpreting Data, Engaging in Arguments from Evidence, and Obtaining, Evaluating, and Communicating Information. Elements for each SEP are identified in the Unit Front Matter. These pieces of evidence were selected because they show how the class as a whole is progressing by steps from introduction to independent use of selected elements of the identified focal SEPs. Scaffolds are introduced in the early lessons and **are not consistently** removed later in the unit for some SEP elements as students become more independent in their use of the SEP.

In the 3.4 Ecosystem Change and Survival Unit Front Matter, four of the nine named Intentionally Developed elements are described as being used with increasing responsibility as the unit goes on. The other five named Intentionally Developed elements are described as being used to support overall development of the practice.

DATA: Analyzing and Interpreting Data

DATA-E2: Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation.

- Lesson 5, Explore, Step 4: "Introduce a tool to organize and record data from the identification cards. Display slide H. Distribute the Seagrass Data Sheet handout and walk students through it. Have students point out where and how they can write and draw to record data on the handout that can help them notice patterns among the seagrasses. Work with a partner to look for patterns. Recall with students that we just discussed what was in the identification cards and that now we will look at the data for the different types of seagrass." (Lesson 5, Teacher Guide) Students complete this task with partners.
- Lesson 6, Explore, Step 3: "Distribute the Seagrass Data Tables handout to each student. Use slide G to walk through one example as a class. Start by orienting students to the columns and rows of the data table. Explain that scientists pollinated seagrass parent #2 with the pollen from seagrass parent #1. Then they grew the seeds from that flower, and one seed grew into offspring # 1, and one grew into offspring #2. After the offspring plants grew into adults, they measured the leaves. Ask a few guiding questions to check that students are able to interpret the data table accurately, such as, Can anyone tell us what the leaf width was for Turtle Grass parent #1? Ask about a few more data points to make sure all students can locate the information in the table. Support students in the task. Provide about 10 minutes for students to work in their small groups. Circulate to support their process." (Lesson 6, Teacher Guide) **However, students are provided more scaffolding here than in Lesson 5 and they continue to work in groups or with a partner.**

DATA-E4: Analyze data to refine a problem statement or the design of a proposed object, tool or process.

- Lesson 10, Synthesize, Step 5: "Revise our design solutions to protect manatees based on additional evidence. Display slide L. Pass back or have students locate their Designs to Protect Manatees handout from Lesson 9. Invite them to review their initial design solutions and then give them time to revise their idea or generate a new idea based on the additional research. Students can record their ideas on the second page of the handout. As students are revising their design ideas encourage them to represent their thinking using both words and pictures and be specific about

how their designs better meet our criteria and constraints.” (Lesson 10, Teacher Guide) Students complete this task independently with their Designs to Protect Manatees handout.

- Lesson 11, Synthesize, Step 4: “Explain that we will use what we know from our research to make claims about which solution we think is the best for each problem. We will use evidence from the research cards and the notes on their Seagrass and Boat Solutions: Comparison Tool handout to support these claims. Emphasize that the goal is not to come to consensus, but rather to present claims and evidence and listen to others’ claims and evidence.” (Lesson 11, Teacher Guide) Students complete this task independently with their Designs to Protect Manatees handout. **This is the same support that students are given in Lesson 10.**

ARG: Engaging in Argument from Evidence

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

- Lesson 1, Synthesize, Step 3: “Make initial claims about the Odd Pod. Distribute the My Initial Claims handout to each student. Remind students that we know, from Michael, that manatees and dolphins often share the same waters in and around Florida. Direct students to the ‘Claim #1’ part of their handout and have them write and/or draw their answer to the question, Why do manatees and dolphins often share the same waters?” (Lesson 1, Teacher Guide) Students complete this task whole group.
- Lesson 2, Synthesize, Step 6: “Ask students to share a claim (or answer) they might have that answers the lesson question and press them to use some evidence either the maps, the videos, the Scientists cards, or the Class Consensus model. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart.” (Lesson 2, Teacher Guide) Students complete this task whole group. **This is the same support that students are given in Lesson 1.**
- Lesson 3, Synthesize, Step 8: “Use the claim and evidence cards to start an argument. Display slide R. Ask students to work with a partner to pick one claim that they think best answers our question and select the evidence cards that they think help support their claim. Partners can lay their deck out on a table and move the evidence cards under the claim that they have selected. The evidence cards include a sentence starter to support students in describing what we observed in the evidence that supports their claim. As students are working with partners, circulate the room and use the Following Student Sensemaking (Lessons 2-4) to document student’s individual sense making. During this lesson, students have the opportunity to expand their thinking of how to connect evidence to claims, and they start to verbally construct an argument with a peer. In the next lesson, students will have an opportunity to revisit the same question and individually write an argument using evidence to support a claim.” (Lesson 3, Teacher Guide) Students complete this independently. **However, students are given more support here than in Lessons 1-2.**
- Lesson 4, Synthesize, Step 6: “Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain in writing why their claim is most likely the best answer to their question.” (Lesson 4, Teacher Guide) Students complete this independently.
- Lesson 7, Synthesize, Step 6: “Introduce the Springer assessment. Distribute the The Orca Named Springer assessment to each student. Display slide N and read the introduction of the assessment together. Introduce the new question, which is a slight variation on the lesson question: Does living in a group help an orca survive? Provide time for students to complete the assessment independently. Circulate the room as students work and assist as needed, such as by explaining unknown words or prompting students to use evidence from the book and/or Animal Group Observations chart.” (Lesson 7, Teacher Guide) Students complete this independently.

- Lesson 8, Synthesize, Step 6: “Display slide L to review how they might use the evidence cards to pick out pieces of evidence to support their claims. Point to Our Growing Ideas chart, Animal Group Observation chart, and the Class Consensus Mode as additional resources they can use for their arguments. Give students time to write their arguments. Circulate around the room providing support and feedback as needed. If students get stumped on evidence, cue them to look through the evidence cards to identify at least 2 that helped them understand the odd pod better.” (Lesson 8, Teacher Guide) Students complete this task independently using class developed resources. This is [more support here than in Lesson 7](#).
- Lesson 12, Synthesize, Step 2: “Make a claim for a design and support it with an argument. Then, tell students they will complete Steps 3-6 on their own. Preview these questions with students and give students time to ask clarifying questions. Reorient students to slide C.” (Lesson 12, Teacher Guide) Students complete this task independently.

ARG E6: Make a claim about the merit of a solution to a problem by citing relevant evidence about how it meets the criteria and constraints of the problem.

- Lesson 10, Explore, Step 4: “Individually, argue from evidence about which solution is best. Display slide I. Say something like, Now that we have researched different solutions for protecting Florida manatees, let’s use our evidence about how these solutions meet our criteria and constraints to pick one solution that we think is best. Invite students to spend time individually responding to the prompts on the slide and jotting down their idea on their Warm Water Solutions: Comparison Tool handout.” (Lesson 10, Teacher Guide) Students complete this independently.
- Lesson 11, Synthesize, Step 4: “ Give directions for the four corner activity. Display slide J. Acknowledge that we have a bunch of different solutions, but constraints would limit us from installing all of them. Explain that we will use what we know from our research to make claims about which solution we think is the best for each problem. We will use evidence from the research cards and the notes on their Seagrass and Boat Solutions: Comparison Tool handout to support these claims. Emphasize that the goal is not to come to consensus, but rather to present claims and evidence and listen to others’ claims and evidence.” (Lesson 11, Teacher Guide) Students complete this independently. [However, this is the same support that students are given in Lesson 10](#).
- Lesson 12, Synthesize, Step 2: “Make a claim for a design and support it with an argument. Depending on which solution they choose, they will also need to consider constraints on that solution (e.g., if they choose to plant seagrass, one constraint might be time it takes to grow; if they choose to put in boater lanes, one constraint might be people not following the rules).” (Lesson 12, Teacher Guide) Students complete this independently. [However, this is the same support that students are given in Lesson 11](#).
- Lesson 13, Synthesize, Step 5: “Individually compare solutions. Display slide M and read aloud the directions on Part 3: Compare solutions of the Sea Turtle Task assessment.” (Lesson 13, Teacher Guide) Students complete this independently. [However, this is the same support that students are given in Lessons 11-12](#).

INFO: Obtaining, Evaluating and Communicating Information

INFO E1: Read and comprehend grade-appropriate complex texts and/or other reliable media to summarize and obtain scientific and technical ideas and describe how they are supported by evidence.

- Lesson 4, Explore, Step 2: “Organize students into groups. Give students time to obtain information about their animal or plant. Display slide E. Explain that you have a website with information and images/videos about different kinds of plants and animals that may help us figure out what lives in the shared waters and how they may interact with manatees and dolphins. Help students get connected to the Wildlife in Our Waters Website and preview with students how the site is organized. Distribute a copy of the Wildlife Data Sheet handout to each student. Remind students of the question we are investigating, What else lives in these waters that could help us explain the odd pod?” (Lesson 4, Teacher Guide) Students complete this task in groups.

- Lesson 5, Connect, Step 3: “Motivate reading the identification cards with a partner to look for patterns. Point out that we just explored one of the identification cards, and it said Turtle Grass is one type of seagrass. Suggest that we can work with partners to read other identification cards about other types of seagrasses to answer our questions and look for patterns - how are seagrasses the same and different? Then we can come back together to find out if other students notice the same patterns we observed.” (Lesson 5, Teacher Guide) Students complete this task with partners. *However, this is the same support that students are given in Lesson 4.*

INFO E2: Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.

- Lesson 2, Synthesize, Step 5: “Develop an individual model first. Display slide L. Say something like, Now that we have gathered so much information about these habitats, let’s describe what we know about these three different waters. Pass out 1 copy of the Individual Model handout to each student. Tell students to use the evidence they have to describe as much as they know about each type of water onto their individual handout. They will use their observation and evidence from their Explore Shared Waters handout to sketch or write some initial descriptions of each type of water on the model. Give students about 5 minutes to work quietly on describing each system. Have them wait to add stickers or anything more permanent until the whole class comes together for consensus.” (Lesson 2, Teacher Guide) Students complete this task independently.
- Lesson 4, Explore, Step 2: “Organize students into groups. Give students time to obtain information about their animal or plant. Display slide E. Explain that you have a website with information and images/videos about different kinds of plants and animals that may help us figure out what lives in the shared waters and how they may interact with manatees and dolphins. Add to our model. Display slide F. Ask students to bring their individual work from Wildlife Data Sheet to a Scientists Circle.” (Lesson 4, Teacher Guide) Students complete this task in groups. *However, this is less support than students are given in Lesson 2*
- Lesson 7, Synthesize, Step 4: “Examine and discuss our data in a Building Understandings Discussion. Display slide I and facilitate a Building Understandings Discussion. Have the Better Together: Animals in Groups available for students to point to and use follow up prompts to push for students to identify evidence from images and text or the class data chart to support their ideas.” (Lesson 7, Teacher Guide) Students complete this activity as a whole group; *therefore, they are receiving the same amount of support that was received in Lesson 4.*
- Lesson 8, Synthesize, Step 4: “Share and discuss data. Bring the students back together to share data for typical dolphin and manatee groups. Facilitate a Consensus Discussion. Use slide G to orient students to the questions the class will share and discuss. Elicit ideas for manatees first.” (Lesson 8, Teacher Guide) Students complete this activity whole group. *However, this is the same support that students are given in Lesson 7.*
- Lesson 10, Connect, Step 2: “Gather more information from a second video. Display slide D and remind students of our guiding questions: What change is happening in the habitat? How is it affecting manatees? Play the Causes of Warm Water Problems video. Then have students turn and tell a partner what changes have happened and how they are affecting manatees. Invite 2-3 students to share and record the additional information on the chart.” (Lesson 10, Teacher Guide) Students complete this task in groups. *However, this is the same support that students are given in Lesson 4*

Criterion-Based Suggestions for Improvement:

- To increase the rating of this criterion, ensure that “[s]caffolding is explicitly reduced over time for the use of nearly all SEP elements stated as targeted learning objectives.” [Detailed Guidance, p. 33]

CATEGORY III

Monitoring NGSS Student Progress

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III.A. Monitoring 3D Student Performance

EXTENSIVE

Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions.

The reviewers found **extensive** evidence that the use of student artifacts shows direct, observable evidence of using all three dimensions at a grade-appropriate level. Tasks require students to integrate all three dimensions as part of their learning performance. Assessments are similar in style and context to student learning activities. The focus is on using student sense-making of the phenomenon to uncover student understanding of all three dimensions.

Key Formative and Summative assessments offer open-ended tasks that relate back to the anchoring phenomena of the unit. For example:

- Lesson 4 Student Assessment 2 Odd Pod Argue From Evidence: “Use the deck of data cards to help you write an explanation for our question: Why do manatees and dolphins sometimes share the same waters?” (Lesson 4, Student Assessment)
- Lesson 6 Key Formative Assessment: “How are seagrasses different? (What are some of their trait variations?) Why are seagrasses different? (What causes them to have trait variations?) How do you know? (What evidence do you have?)” (Lesson 6, Exit Ticket) This exit ticket asks students to recall and summarize points from class discussion, *rather than engage with a phenomenon*:
- Lesson 7 Student Assessment The Orca Named Springer: “Using the data, how did being alone affect Springer? Using the data, how did being in the pod affect Springer? Our question is: Does living in a group help an orca survive? Which claim best answers the question? Circle one: Support the claim you circled with data and science ideas you figured out about animal groups.” (Lesson 7, Student Assessment)
- Lesson 12 Plan To Protect Manatees Student Assessment: “Step 5. Make an argument to answer the question: How does your design protect manatees and help them survive? Your claim is the first sentence. It should answer the question. Then, add sentences for how your plan meets the criteria. Use evidence we have and ideas from Our Growing Ideas chart to support your claim.” (Lesson 12, Teacher Guide)
- Lesson 13 Student Assessment Sea Turtle Task: “Caleb claims that turtle friendly lights are the best solution because they do not create new problems for plants and animals. They do not create safety problems for people. Ava claims that turning off the lights is the best solution because it has a low cost. Turning off the lights can be started right away. Their teacher, Ms. Miller, claims the city can block the light using plants. The plants will make habitat for other plants and animals. Who do you agree with most and why is this the best solution? Include evidence to support your idea. I agree with...(circle one)” (Lesson 13, Student Assessment Task)

Lessons 8 and 13 contain summative assessments. In Lesson 8, students are constructing an argument for why the Odd Pod formed. Students have been diving deeper into why certain animals live in groups and have been discussing the Odd Pod topic. Lesson 13 is a transfer task where students must use their existing knowledge to construct a new understanding of the scenario presented. Students complete these tasks independently, and these artifacts can be collected and evaluated to determine student mastery of the learning objectives.

- Lesson 8, Synthesize, Assessment Opportunity: “Students’ arguments on Odd Pod New Argument provide an opportunity to gather evidence about learning goal 6, with the purpose of summatively assessing students’ understanding of group behaviors, and formatively assessing and providing feedback on engaging in arguments from evidence and using cause and effect reasoning.” (Lesson 8, Teacher Guide)

- Lesson 13, Explore, Step 4: "Introduce the protecting nests and hatchlings task. Share that students will explore a new problem with baby sea turtles. Set up the new context by reading together a series of slides that contain images and videos of the sea turtles. Pass out the Sea Turtle Task assessment so students can read along on the first page. Define the problem (Part 1). Direct students to Part 1. Display slide J. Give students time to individually jot down their ideas to the first question in Part 1. Investigate Solutions (Part 2). Set the context for comparing three solutions. Read Part 2 together, display slide K as you read. Take time to discuss the new criteria and new constraints." (Lesson 13, Teacher Guide)
- Lesson 13, Synthesize, Step 5: "Individually compare solutions. Display slide M and read aloud the directions on Part 3: Compare solutions of the Sea Turtle Task assessment. Invite clarifying questions, then provide time for students to work independently to make decisions about the sea turtle solutions. Encourage students to write and/or draw clearly and use appropriate punctuation and capitalization like they do in other content areas, like ELA. Remind students how using punctuation and writing clearly ensures others, like the partners they will do peer feedback with in the next step, will be able to understand their thinking." (Lesson 13, Teacher Guide)

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

- Following Student Sensemaking Lessons 2 - 4 gives teachers a format to collect informal evidence about students' use of 3 integrated dimensions: "Checklist of Listen/Look-Fors" Use handouts, small group discussions, and whole class discussions. Lesson 2: **Combine information across texts and media (information cards, maps, and videos) to develop a system model to describe the populations that live in a variety of aquatic habitats.** Lesson 3: **Support a claim** about **why manatees and dolphins often share the same waters.** Lesson 4: **Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.**" (Following Sensemaking Tool Lessons 2-4)
- Following Student Sensemaking Lessons 7-8 gives teachers a format to collect informal evidence about students' use of 3 integrated dimensions: "Checklist of Listen/Look-Fors" Use handouts, small group discussions, and whole class discussions. Lesson 7: **Construct an argument** for how **living in groups or being separated from groups affect how well some animals survive.** Lesson 8: **Construct an argument** for why **(cause) a manatee and dolphin pod formed a group.**" (Following Sensemaking Tool Lessons 7-8)
- Following Student Sensemaking Lessons 10-12 gives teachers a format to collect informal evidence about students' use of 3 integrated dimensions: "Checklist of Listen/Look-Fors" Use handouts, small group discussions, and whole class discussions. Lesson 9: **Design initial solutions to reduce the harmful effects of human caused environmental change(s) to manatee habitats.** Lesson 10: **Generate and compare multiple solutions** for the **loss of warm water places** which **causes Florida manatees to get sick or die.** Lesson 11: **Generate and compare multiple solutions to reduce the harmful effects of loss of seagrass and more boats (causes) manatee habitats.** Lesson 12: **Make a claim about the merit of a solution to protect manatees** in a new **system by citing relevant evidence about how it meets the criteria and constraints,** and **then improve designs based on feedback from peers.**" (Following Sensemaking Tool Lessons 10-12)

Throughout the unit, students routinely produce artifacts with evidence of using the grade-appropriate elements of SEPs, CCCs, and DCIs that are targeted as learning objectives. For example,

- Lesson 6, Synthesize Step 5 "Individually record what we have figured out about differences in seagrass. Display slide J, and distribute the Exit Ticket. Encourage students to use data from their Seagrass Observations and Seagrass Data Tables handouts as they work. Give students a few minutes to record their ideas individually." (Lesson 6, Teacher Guide)

- Lesson 6: Three Dimensional Goal: **Analyze and interpret data to provide evidence that plants (seagrass) have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** SEP: DATA-E2: **Analyze and interpret data to make sense of phenomena, using logical reasoning, mathematics, and/or computation** DCI:LS3.B-E1: **Different organisms vary in how they look and function because they have different inherited information.** CCC: PAT-E1 **Similarities and differences in patterns can be used to sort and classify natural phenomena.**
- Lesson 8, Synthesize, Step 4, Analyzing and Interpreting Data Callout: “The Animal Group Observation class chart is one way to represent data to help reveal patterns in the reasons why some animals live in groups (or get into groups). Prompt students to use this chart as a tool to generate conclusions about typical dolphin and manatee group behaviors, but also to start rethinking why a manatee joined a dolphin pod in Tampa Bay.” (Lesson 8, Teacher Guide)
- Lesson 8: Three Dimensional Learning Goal: **Construct an argument** for why (cause) **a manatee and dolphin pod formed a group.** ARG-E4 **Construct and/or support an argument with evidence, data, and/or a model.** CE-E1 **Cause and effect relationships are routinely identified, tested, and used to explain change.** LS2.D-E1 **Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size (Note: Moved from K-2).**
- Lesson 10, Explore, Step 4 “Examine Problem 1: Fixing Springs as a whole group. As a class, investigate the solution of fixing warm water springs. Begin by reading problem 1, which tells the story of the problem with Warm Mineral Springs in Southwest Florida. You may choose to read the text aloud to students, or ask student volunteers to read one of the text boxes aloud for their peers. After reading problem one, invite students to turn and talk to partners about how the problem makes it hard for manatees to meet their needs. Students should individually record their ideas in the ‘additional notes’ section of their Warm Water Solutions: Comparison Tool. Invite 2-3 students to share what their partner said.” (Lesson 10, Teacher Guide)
- Lesson 10: Three Dimensional Goal: **Compare multiple solutions** for the **loss of warm water places** which **causes Florida manatees to get sick or die.** SEP: INFO-E2: **Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices.** DCI:LS2.C-E1: **When the environment changes in ways that affect a place’s physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die.** CCC: CE-E1 **Cause and effect relationships are routinely identified, tested, and used to explain change**

Criterion-Based Suggestions for Improvement: N/A

III.B. Formative

EXTENSIVE

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

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

Materials include explicit, frequent, and varied support for formative assessment processes. Formative assessment opportunities are called out for each lesson, with connection to all three dimensions highlighted in separate colors. These include a “How can I use the information I gather from this assessment?” section in the assessment instructions at the beginning of each lesson, often in a clear if-then format. For example,

- Lesson 3, Teacher Assessment Guidance: “If students need support identifying the cause-and-effect relationships involving the seasons and manatee locations, have them first identify when manatees and dolphins share the same waters and ask if they notice any patterns. Ask, how might the time of year affect where the manatees are? Ask, are there any locations that show a different pattern? It may help students to focus on the manatees’ and dolphins’ needs to explain the animals’ movements and locations.” (Lesson 3, Teacher Guide)
- Lesson 5, Teacher Assessment Guidance: “You can support the development of students’ data analysis by asking them to describe the patterns they found in the seagrass data. Use the differences students notice between seagrasses to motivate wondering how/why these plants got their differences.” (Lesson 5, Teacher Guide)
- Lesson 6, Teacher Assessment Guidance: “You can support the development of students’ ideas by helping them refer to the seagrass cards from Lesson 5, their own observations from this lesson, and the parent/offspring data tables from this lesson.” (Lesson 6, Teacher Guide)

Key formative assessments are labeled separately from other formative assessment opportunities, and include more specific support in the 3.4 Ecosystem Change and Survival Assessment System Overview document, as well as more support in the Teacher Guide for that lesson and in the associated Following Student Sensemaking documents. For example,

- Lesson 2, Synthesize, Step 5: “Formative assessment: This is an opportunity to assess learning goal 2 with the purpose of determining how well students integrate data and information across multimedia resources to develop a system model. For this lesson, give students an opportunity to think through their ideas first individually and with a partner, but have them wait to add stickers and permanent words/symbols until the class has come to a consensus on what the model should represent. As you add agreed-upon information and ideas to the Class Consensus model, ask questions such as, What do we know about rivers/springs? (coastal oceans, deep oceans). Are they saltwater or freshwater? Where did we get that information? Do others agree?” (Lesson 2, Teacher Guide)
- Lesson 5, Synthesize, Step 5: “Formative assessment: This partner work provides an opportunity to gather evidence about Learning Goal 5 with the purpose of providing feedback and supporting students in analyzing and interpreting data to make sense of phenomena using logical reasoning to identify patterns of similarities and differences in seagrasses.” (Lesson 5, Teacher Guide)
- Lesson 10, Explore, Step 4: “Formative assessment: This is the opportunity to formatively assess learning goal 8 with the purpose of determining how students compare multiple solutions based on how well they meet design criteria and constraints. Use the Warm Water Solutions: Comparison Tool to assess students’ ability to evaluate solutions against the criteria of warm water during the winter and constraints of time, money, and effect on animals and people.” (Lesson 10, Teacher Guide)
- Following Student Sensemaking tools are provided for Lessons 2-4, 7-8, and 10-12. These three documents provide a chart that a teacher can use to formatively assess each individual student on aspects of the learning goals for the lesson set, as well as possible examples of student sensemaking that a teacher might observe. For example,
 - Following Student Sensemaking Lessons 2-4 gives teachers a format to collect informal evidence about students’ use of 3 integrated dimensions: “Checklist of Listen/Look-Fors” Use handouts, small group discussions, and whole class discussions. Lesson 2: **Combine information across texts and media (information cards, maps, and videos) to develop a system model to describe the populations that live in a variety of aquatic habitats.** Lesson 3: **Support a claim** about **why manatees and dolphins**

often share the same waters. Lesson 4: **Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.**” (Following Sensemaking Tool Lessons 2-4)

- The What To Look and Listen For column of each lesson’s Lesson Assessment Guidance is also color-coded to emphasize elements from each dimension. Lesson 3 “Where Can I Check for Understanding” Where to check for understanding: In the Synthesize, where students **use evidence to support a claim** about **why manatees and dolphins often share the same waters**. What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **claims that manatees and dolphins both live in coastal waters. claims that manatees can survive in coastal waters during the summer months because the water is warm, but survive in rivers and springs in the winter because of warm, fresh water. claims that manatees and dolphins move around coastal waters because they need food for survival.**” (Lesson 3, Teacher Guide)
- Instructional Guidance Assessment Tools are included for Lessons 4,6,7,and 12. These tools include specific actions the teacher can take to support students if they are struggling with different parts of the Lesson Assessment Opportunities. For example,
 - Lesson 4, Teacher Assessment Tool Instructional Guidance 4: “If you notice students are struggling to initiate the task, a possible next step is to gather the students in a small group with you and/or circulate to each student who is struggling to talk one-on-one. Break the task down into manageable steps. Use an evidence card from Lesson 3 or 4, point to the picture, and ask students to recall what we have done and why. Using the evidence cards provides visual support for students with auditory processing, working memory, language, and executive function needs. The following prompts may support you in this: Look at this evidence card. Can you remind me what we did or what we looked at? Why did we decide to explore ____? When we ____ what did we observe?” (Lesson 4, Teacher Assessment Tool Instructional Guidance 4)
 - Lesson 7, Teacher Assessment Tool Instructional Guidance 7: “If you notice Students are not connecting the evidence on Springer to a claim about orca survival in groups, some possible next steps are to return to the meerkat example that the class did together. Imagine together that a meerkat is separated from its mob. Have the class work together to generate a list of all the things the meerkat would need to do in a day to survive on its own. Then, ask the students to turn and talk about: How does being in a group help or harm the meerkat? How would being on its own help or harm the meerkat? Bring students back together to decide if the information and data they have on meerkats support that they live best in groups or on their own. Practice writing a class argument together using the video, images, and text evidence to support the argument. As you write, circle moments where you use evidence from these resources to support the claim.” (Lesson 7, Teacher Assessment Tool Instructional Guidance 7)

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

- Lesson 3, Synthesize, Broadening Access sidebar: “Provide options for comprehension by optimizing access to tools and assistive technologies that support multilingual learners construct arguments from evidence cards. If possible, providing students with digital access to evidence cards that can support with card translations might be beneficial as multilingual learners use claims to construct their argument.” (Lesson 3, Teacher Guide)
- Lesson 7, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures, especially on question 4. This allows for multiple means of action or expression.” (Lesson 7, Teacher Guide)
- Lesson 10, How Can I Use This Assessment Information: Remember that evidence of students’ ideas may be expressed in words, drawings, written or spoken descriptions, movement, and/or gestures. You can use the evidence you have gathered on the Following Student Sensemaking (Lessons 10-12) from this lesson, combined with evidence

on students' Warm Water Solutions: Comparison Tool and revised design ideas from Designs to Protect Manatees for a more complete picture of student progress." (Lesson 10, Teacher Guide)

- Lesson 11, Synthesize, Broadening Access sidebar: "This assessment moment has students use their comparison of solutions to start making claims about which ones best meet the criteria and constraints. Encourage students to use multiple modalities, including writing and drawing models. Some students may benefit from presenting their ideas verbally with you or with another student acting as a scribe to record their thinking on paper. Some students may benefit from using gestures, images, or manipulatives in lieu of written text. Encouraging students to choose what best shows their thinking creates an equitable pathway for all students to demonstrate proficiency and will give you the best insight into their progress." (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

III.C. Scoring Guidance

EXTENSIVE

Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.

The reviewers found **extensive** evidence that the materials include scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students. The materials include several teacher supports, including guidance for interpreting student progress, feedback prompts, and ideas for how teachers can support students in developing upcoming concepts in the unit.

The Lesson Assessment Guidance in each Teacher Guide offers support for planning instruction.

- Learning targets are clearly stated and incorporated into scoring guidance for each of the Teacher Assessment Tool documents. These documents are provided for each of the summative assessments. The other Teacher Assessment Tools list the Performance Expectations addressed in the assessment at the top of the page and include learning targets in a table correlating them to elements of each dimension and to specific questions on the assessment.
- Guidance for teachers to interpret progress is present in tables in the rubric for each summative assessment in Lessons 8 and 13. Column labels of "Beginning", "Developing", and "Secure" for each question or step in the assessment indicate what a teacher should look for in order to tell which level best fits a student's work. The Summative Assessment Instructional Guidance describes students' performance levels and provides guidance for teachers to use to provide feedback to students during the assessment.
- Lesson 8 provides two options for the summative assessment and both are focused on the Assessment Statement: Construct an argument for why (causes) a manatee and dolphin pod formed a group (effect). The assessment statement above is specific to the anchoring phenomenon, but related to the NGSS Performance Expectation: 3-LS2-1. Construct an argument that some animals form groups (cause) that help members survive (effect).
 - Lesson 8, Lesson Materials and Preparation: "Examine the Odd Pod New Argument assessment ahead of time. There are two options that you may choose to use depending on your students' needs. The front side of the assessment is for students who are ready to construct their argument independently. The reverse side provides more scaffolded support, which may be beneficial for multilingual learners and/or students who

would benefit from space to draw their ideas. Copy the assessment as needed, 1 per student. Alternative activity: Consider printing the Odd Pod New Argument assessment 2-sided and allowing students to choose the side they feel ready for.” (Lesson 8, Teacher Guide)

- The materials include information to support teachers in providing feedback to students in Lesson 8. The 3.4 Ecosystem Change and Survival Assessment System Overview states: “In Lesson 8, students return to their Initial Claims #2 about why a manatee joined a dolphin pod when this rarely happens. Using the new evidence gathered across Lessons 2-7, students revise their claims and write an argument to support their claims. Students received several supported opportunities prior to this moment making claims, supporting claims with evidence, and writing arguments. Use this moment to assess students’ progress individually, using the Odd Pod New Argument assessment. Note that there are two options on this assessment so you can choose the one that will work best for the students in your class. Students can also use the Odd Pod Claim and Evidence Cards for L3, L4, L8 as a support. Use the Scoring Guidance for Odd Pod Argument to provide feedback to students. This tool can also help you adjust upcoming instruction, particularly in supporting students further in engaging with arguments using evidence. When coupled with the Following Student Sensemaking (Lessons 7-8) tool, you can have a more complete picture of how students’ are progressing toward the learning goals. If you do not have notes for certain students on the Following Student Sensemaking (Lessons 7-8), make sure to talk individually with those students so they have an opportunity to explain their thinking and inform your summative assessment of their progress.” (3.4 Ecosystem Change & Survival Assessment System Overview)
- The 3.4 Ecosystem Change and Survival Assessment System Overview includes Lesson 13 as a summative assessment. It states “In Lesson 13, students apply what they have figured out to a new, related context about sea turtle hatchlings’ environment changing using the Sea Turtle Task assessment. You can evaluate students’ progress toward the learning goals using the Scoring Guidance for Sea Turtle Task tool. When coupled with the Lessons 10-12 Following Student Sensemaking tool, and students’ work on the key formative assessment in Lesson 12, this can provide a more complete understanding of students’ progress. If you do not have notes for certain students on the Lessons 10-12 Following Student Sensemaking tool, make sure to talk individually with those students so they have an opportunity to explain their thinking and inform your summative assessment of their progress.” (3.4 Ecosystem Change & Survival Assessment System Overview)
- The Lesson 13 Teacher Assessment Tool, Scoring Guidance for Sea Turtle Task, contains a color-coded, three-dimensional rubric for teachers to assess students’ understanding during this individual performance assessment. Each element that is used in this assessment is identified in the NGSS Reference Table and the guidance for how to interpret student progress is included. There are row labels (learning targets), and column labels (Beginning, Developing, Secure, Feedback), that contain detailed descriptions of what the students should include for different questions on the assessment.
- Suggestions for feedback are found in the Lesson Assessment Guidance section of the Teacher Guides for each lesson. For example,
 - Lesson 4, How Can I Use This Assessment Information: “This is a critical moment for you to provide feedback to students. Use Instructional Guidance 4, Following Student Sensemaking (Lessons 2-4), and students’ self-check on slide J in combination to gather and analyze student progress. Providing written or verbal feedback to students on Odd Pod Argue from Evidence can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect. This feedback should be provided to students prior to Lesson 8 where they have another opportunity to develop arguments for claims about why the manatee joined the dolphin pod.” (Lesson 4, Teacher Guide)
 - Lesson 5, How can I Use This Assessment Information: “Provide feedback on students’ analysis on the Seagrass Data Sheet handout before Lesson 6, either in conferences or in writing with time to review the feedback.” (Lesson 5, Teacher Guide)

- Lesson 6, Assessment Opportunity sidebar: “The following discussion provides an opportunity to gather evidence about Learning Goal 6, to provide feedback, and support students in using evidence to explain how seagrass is different. Use prompts such as these to provide feedback and determine next steps before moving on to the next lesson: What did we figure out from previous investigations about patterns in seagrass similarities or differences? What did we figure out about variation in traits from the parent and offspring seagrass data?” (Lesson 6, Teacher Guide)
- Lesson 13, Lesson Assessment Guidance: “Give feedback to students, such as: How clear is their claim? Did they cite evidence to support the claim? Did they say how well the solution meets the criteria? Did they include evidence for how well the solution meets the constraints? Consider options for students to complete the assessment in writing, or verbally by making a video or giving a small group or individual presentation. Use Scoring Guidance for Sea Turtle Task and Following Student Sensemaking (Lessons 10-12) to look across all evidence for students’ progress toward the learning goals. Refer to the Assessment Guidance at the beginning of the lesson.” (Lesson 13, Teacher Guide)
- Teachers are given the choice for students to track their own progress on a personal Our Growing Ideas chart, or use the class chart. The Lesson 2 Materials and Preparation information states: “In 3rd grade OpenSciEd, the units include a class-level Our Growing Ideas chart similar to the units in K-2. However, if your students are ready to begin tracking their ideas individually or in combination with a class-level chart, print My Growing Ideas for each student. Use this handout periodically throughout the unit to track the progress of student ideas over time. Consider adding the lesson question to the handout before making copies to reduce the writing burden for students.” (Lesson 2, Teacher Guide)
- Self-reflection opportunities claimed for lessons 3, 4, 8 and 11. For example:
 - Lesson 3 Slide deck slide S: “How confident do I feel about...using evidence to support a claim about why manatees and dolphins often share the same waters?” This self-check addresses a practice and a DCI, **but not a cross-cutting concept**.
 - Lesson 4 slide deck slide O: “How successful was I at... making a claim about why manatees and dolphins share the same waters? using evidence we gathered to support my claim? using our system model to support my claim?”
 - Lesson 8 slide deck slide A: “How successful was I at... making claims about why many animals live in groups and some do not live in groups?” This self-check addresses a practice and a DCI, **but not a cross-cutting concept**.
 - Lesson 11 slide deck slide L: “How successful was I at... comparing seagrass and boat solutions using our criteria (that they reduce problems for manatees)?” This self-check addresses a practice and a DCI, **but not a cross-cutting concept**.

The Lesson Assessment Guidance in each Teacher Guide offers suggestions on how to act on assessment information, and often includes individual feedback suggestions. For example,

- Lesson 2, Lesson Assessment Guidance: “Use Following Student Sensemaking (Lessons 2-4) to begin tracking student ideas shared in small groups and whole class discussions. Continue using this assessment tool across lessons 2-4 to gather information about student learning toward the learning goals. Use My Growing Ideas for students’ to individually reflect on what they are figuring out. This is an optional resource to combine with the class’ Our Growing Ideas chart. If you choose to use it, let students update their individual one before doing the class-level chart.” (Lesson 2, Teacher Guide)

- Lesson 4, Lesson Assessment Guidance: “This is a critical moment for you to provide feedback to students. Use Instructional Guidance 4, Following Student Sensemaking (Lessons 2-4), and students’ self-check on slide J in combination to gather and analyze student progress. Providing written or verbal feedback to students on Odd Pod Argue from Evidence can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect. This feedback should be provided to students prior to Lesson 8 where they have another opportunity to develop arguments for claims about why the manatee joined the dolphin pod...Refer to the Instructional Guidance 4 tool for instructional guidance suggestions based on students’ current sensemaking.” The Instructional Guidance Tool contains (Lesson 3, Teacher Guide)
- Lesson 6, Synthesize, Assessment Opportunity: “The following discussion provides an opportunity to gather evidence about Learning Goal 6, to provide feedback, and support students in using evidence to explain how seagrass is different. Use prompts such as these to provide feedback and determine next steps before moving on to the next lesson: What did we figure out from previous investigations about patterns in seagrass similarities or differences? What did we figure out about variation in traits from the parent and offspring seagrass data?” (Lesson 6, Teacher Guide)
- Lesson 11, Explore, Assessment Opportunity: “Students’ work on the Seagrass and Boat Solutions: Comparison Tool handout is an opportunity to gather evidence about Learning Goal 11, with the purpose of providing feedback. Gather evidence using Following Student Sensemaking (Lessons 10-12) as you listen to partner discussions while students use Seagrass and Boat Solutions: Comparison Tool. See the Assessment Guidance at the beginning of the lesson. If students need support comparing solutions, have them focus on one constraint at a time and highlight which solution has the least cost/effect for that constraint. Then students can use the highlights to minimize the amount of information that they need to process as they evaluate solutions.” (Lesson 11, Teacher Guide)

Criterion-Based Suggestions for Improvement: N/A

III.D. Unbiased Tasks/Items

EXTENSIVE

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

The reviewers found **extensive** evidence that tasks/items assess student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students. The materials offer many suggestions for assessing students through multiple modes of communication and provide options for students to choose how they demonstrate understanding on **some** summative assessments.

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

- Lesson 3, Synthesize, Step 8: “Revisit the odd pod video. Display slide P. Suggest we check back in on the claims we made about why the manatee and dolphins share the same waters. Re-watch a short segment of The Odd Pod video. Refer to the Possible Claims chart from Lesson 1 and explain that we might want to keep these claims, revise them, and/or make new ones. Use the claim and evidence cards to start an argument. Display slide R. Ask students to work with a partner to pick one claim that they think best answers our question and select the evidence cards that they think help support their claim.” (Lesson 3, Teacher Guide)

- Lesson 7, Synthesize, Step 6: “Introduce the Springer assessment. Distribute the Orca Named Springer assessment to each student. Display slide N and read the introduction of the assessment together. Introduce the new question, which is a slight variation on the lesson question: Does living in a group help an orca survive?” (Lesson 7, Teacher Guide)
- Lesson 10, Explore, Broadening Access sidebar: “In order to increase access to the informational text on the Solution Research Cards, you may choose to encourage student partners to take turns reading different parts of the cards aloud to each other. Alternatively, you may choose to read multiple cards aloud to the whole class and provide partners subsequent time to discuss and complete their solution comparison tool.” (Lesson 10, Teacher Guide)
- Lesson 11, Explore, Step 3: “Research and compare. Display slide I. Pass out a set of Seagrass and Boat Solution Cards to each pair of students, and 1 copy of the Seagrass and Boat Solutions: Comparison Tool handout to each student. As students work to compare solutions, circulate to provide support.” (Lesson 11, Teacher Guide)
- The Lesson 13 Sea Turtle Assessment Task contains several color photographs to assist students in applying their knowledge to the given scenarios. The photos ensure that students who struggle more with written descriptions can still understand the types of solutions using the color photographs provided.

The materials support success for all students. Examples include:

- Lesson 4, Synthesize, Teaching Tip sidebar: “The Odd Pod Graphic Organizer is provided as an optional support for students who may need a graphic organizer to help them sort evidence to the claim they choose. This resource is optional and students can sort without using it. However, it may be beneficial to some students who could use help deciding on the best evidence to support a claim and why. If you use this optional resource, use it before students complete the Odd Pod Argue from Evidence.” (Lesson 4, Teacher Guide)
- Lesson 5, Explore, Broadening Access sidebar: “To guide information processing and visualization during and after the identification cards, consider providing multiple means of expression, such as allowing students to share similarities and differences orally, through writing, or through gestures such as pointing. If you feel that some students might be overwhelmed by looking at all of the cards at once, you can assign a range of cards for students to focus on. If students need language support in constructing their findings, consider providing sentence stems like: “One similarity I found was____, One difference I found was____, I observed that most seagrass ____, Something interesting I noticed was____.” (Lesson 5, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Examine the Odd Pod New Argument assessment ahead of time. There are two options that you may choose to use depending on your students’ needs. The front side of the assessment is for students who are ready to construct their argument independently. The reverse side provides more scaffolded support, which may be beneficial for multilingual learners and/or students who would benefit from space to draw their ideas. Copy the assessment as needed, 1 per student. Alternative activity: Consider printing the Odd Pod New Argument assessment 2-sided and allowing students to choose the side they feel ready for.” (Lesson 8, Teacher Guide)

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

- Lesson 1, Explore, Broadening Access sidebar: To optimize relevance, value, and authenticity, record students’ ideas on the Notice and Wonder chart in alignment with the ways they shared them (e.g., using their own words, capturing gestures they might have used, etc.). Doing so not only helps students understand what is recorded in the chart, but also sends the message that their language resources and practices are valuable.” (Lesson 1, Teacher Guide)
- Lesson 2, Synthesize, Broadening Access sidebar: “As students share their ideas, encourage alternative forms of communication including hand gestures or head nods. It may be helpful to teach your students a few signs from

American Sign Language (ASL) so that they may share understanding when thoughts are shared with gestures. ASL is a visual language with a long history, complex rules, and rich culture. Therefore, be mindful of accuracy when sharing this language with your students. In addition to the physical signs, ASL is directional. This means that the direction of your hands and their movements is a key part of the language and should also be addressed when teaching the signs. Two terms that may be helpful to teach are ‘same’ to indicate when a student agrees with an idea shared by a fellow student and ‘disagree’ to indicate when a student disagrees. This site can act as a resource:” (Lesson 2, Teacher Guide)

- Lesson 5, Explore, Broadening Access sidebar: “Accept and record all ways of describing what students observed; capture not only students’ ideas, but also the rich ways that students express their ideas, such as with drawings or gestures, inviting both familiar and scientific language. This is especially important for multilingual students because their language resources are not always noticed or valued in school spaces. If a student shares an idea using words in a language other than English (e.g., in Spanish, Arabic, Mandarin, etc.), record their idea exactly as they shared it and then add a translation in English next to it. If possible, have students record ideas onto the chart themselves.” (Lesson 5, Teacher Guide)
- Lesson 6, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. Consider alternative formats, such as creating a short video or verbal conference for students to share their ideas. These options allow for multiple means of action or expression.” (Lesson 6, Teacher Guide)
- Lesson 7, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures, especially on question 4. This allows for multiple means of action or expression.” (Lesson 7, Teacher Guide)
- Lesson 8, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. This allows for multiple means of action or expression. You may want students to write their claim and list their evidence, but draw their reasoning that includes science ideas to support their claim. Encourage students to use the Our Growing Ideas chart to help them think about evidence and science ideas.” (Lesson 8, Teacher Guide)
- Lesson 11, Synthesize, Broadening Access sidebar: “This assessment moment has students use their comparison of solutions to start making claims about which ones best meet the criteria and constraints. Encourage students to use multiple modalities, including writing and drawing models. Some students may benefit from presenting their ideas verbally with you or with another student acting as a scribe to record their thinking on paper. Some students may benefit from using gestures, images, or manipulatives in lieu of written text. Encouraging students to choose what best shows their thinking creates an equitable pathway for all students to demonstrate proficiency and will give you the best insight into their progress.” (Lesson 11, Teacher Guide)
- Lesson 12, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. Consider alternative formats, such as creating a short video to demonstrate learning about solutions to protect manatees and how best those solutions could work in this new system. These options allow for multiple means of action or expression.” (Lesson 12, Teacher Guide)
- Lesson 13, Preparation Checklist: “If you have specific options you’d like students to consider (e.g. connecting with ELA to write an opinion paragraph, co-writing a blurb for the classroom newsletter, planning for this month’s all-school meeting) or avoid (e.g. the class has used the same video platform for every sharing opportunity so far this year), be ready to raise those ideas.” Navigate, Step 1, Broadening Access Callout: Provide multiple means of engagement to synthesize and summarize the current state of the class’ learning so far, using words, pictures, and gestures. This is helpful for many students to review science ideas that they have developed across many days of class to prepare them to complete the Sea Turtle Task. It provides an opportunity to ask clarifying questions or add new ideas.” (Lesson 13, Teacher Guide)

While the expectations for formative and summative tasks are clearly communicated, and the formative tasks offer a structured variety of modalities for student responses, the **summative task materials do not explicitly provide students with a choice of responses across multiple modalities.** Examples include,

- Lesson 4, Synthesize, Broadening Access sidebar: “If time and/or resources allow, consider offering students the option of conferring with you or recording a video to speak rather than write about their argument on the Odd Pod Argue from Evidence assessment.” (Lesson 4, Teacher Guide)
- Lesson 6, Synthesize, Broadening Access sidebar: “Provide opportunities, as needed, for students to communicate their ideas through words, pictures, verbally, or using gestures. Consider alternative formats, such as creating a short video or verbal conference for students to share their ideas. These options allow for multiple means of action or expression.” (Lesson 6, Teacher Guide)
- Lesson 8, Synthesize, Step 6: “Have students choose the argument format best suited to their needs. Display slide K. Pass out 1 copy of the Odd Pod New Argument assessment to each student with the side you chose for them (see the Materials Preparation section). Have a set of Odd Pod Claim and Evidence Cards for L3, L4, L8 with the new Lesson 8 evidence cards readily available for students to use. You can remove the two claim cards from Lessons 3 and 4, but keep the evidence cards. The set of evidence cards match the list of evidence under option 1 on students’ handout.” (Lesson 8, Teacher Guide) **The teacher chooses which modality students will use to present the information.**
- Lesson 13, Synthesize, Assessment Opportunity: “Consider options for students to complete the assessment in writing, or verbally by making a video or giving a small group or individual presentation.” (Lesson 13, Teacher Guide) **However, teachers are encouraged to consider alternative modalities for students to demonstrate their understanding; therefore, they may choose whether to allow a different modality.**

Criterion-Based Suggestions for Improvement:

- Consider adding the opportunity for students to have multiple means of expressing their understanding in the summative assessment tasks.

III.E. Coherent Assessment System

EXTENSIVE

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

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

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

- Lesson 3, the three-dimensional learning objective is: “**Support a claim** about **why manatees and dolphins sometimes share the same waters.**”

- Lesson 3, Assessment Guidance: “Where to check for understanding: In the Synthesize, where students **use evidence to support a claim** about **why manatees and dolphins often share the same waters**. What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **claims that manatees and dolphins both live in coastal waters, claims that manatees can survive in coastal waters during the summer months because the water is warm, but survive in rivers and springs in the winter because of warm, fresh water., claims that manatees and dolphins move around coastal waters because they need food for survival.**” (Lesson 3, Teacher Guide)
- Lesson 6, the three-dimensional learning objective is: “**Analyze and interpret data to provide evidence that plants (seagrass) have traits inherited from parents and that variation of these traits exists in a group of similar organisms.**”
 - Lesson 6, Assessment Guidance: “Where to check for understanding: In the second Explore when students are analyzing data tables of seagrass parents and offspring trait variations (slide G), and the second Synthesize on the Exit Ticket assessment (slide J) What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **Analyze and interpret patterns in data of seagrass offspring and parent leaf thickness and length to provide evidence that information about trait variations is inherited from parents, Use interpretation of patterns in data as evidence that seagrasses inherit information about trait variations from their parent(s).**” (Lesson 6, Teacher Guide)
- Lesson 10, the three-dimensional learning objective is: “**Compare multiple solutions** for the **loss of warm water places** which **causes Florida manatees to get sick or die.**”
 - Lesson 10, Assessment Guidance: “Where to check for understanding: In the Explore (slide I), where students compare multiple solutions What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about **Defining the problem by** Identifying that **warm water is a critical need for manatees to survive.**, Identifying that **manatees can meet this need mostly in warm water springs, but also power plants in coastal places**, like Tampa Bay. Describing that the **warm water problem affects manatees during the winter.** Describing how **barriers, sand building up, humans taking water, and power plants closing are all part of the problem affecting manatees, Using evidence for how a solution meets the criteria of providing manatees with warm water. Using evidence for how a solution is limited by the constraints of time, money, and effect on animals and people.**” (Lesson 10, Teacher Guide)

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

Pre-Assessment

- The 3.4 Ecosystem Change and Survival Assessment System Overview document states: “As students engage in these lessons, there are multiple opportunities to gather pre-assessment evidence. This evidence can be used to determine what incoming ideas, experiences, and sensemaking strategies students bring to the unit. All ideas and experiences should be invited into the classroom and be considered as resources to support students’ ongoing sensemaking. These opportunities should not be used to assign a score or a grade.”
- One pre-assessment opportunity is claimed in Lesson 1. The Lesson 1 Assessment Guidance states: “This is a pre-assessment. This is not an opportunity to take a grade or score. Instead, use this information to uncover students’ initial ideas about what habitats are, why animals live in particular habitats, and why animals sometimes live in groups. Throughout the lesson, encourage students to share their initial ideas and reasoning.” The Lesson 1 Learning Objective is: “**Support initial claims** about **why manatees and dolphins often share the same waters and unexpectedly formed a group.**”

- Lesson 1, Synthesize, Assessment Opportunity: “Pre-assessment: Developing their initial claims on My Initial Claims is your assessment moment for Learning Goal 1.A with the purpose of determining students initial claims based on evidence for why: (1) manatees and dolphins often share the same waters (habitat), and (2), a manatee and several dolphins unexpectedly formed a group together. At this point, accept all student claims whether evidence is provided or not. Students may struggle to include evidence at this point because it’s not clear what is an observation and what counts as evidence at the moment. After the class develops the Driving Question Board for this unit, you will explain that evidence can take many forms, some of which they’ve already seen in this lesson. At that point you’ll be able to push students to consider what types of evidence may help strengthen their claims.” (Lesson 1, Teacher Guide)
- Another pre-assessment opportunity is claimed in Lesson 9. The Lesson 9 Assessment Guidance states: “This is a pre-assessment. This is not an opportunity to take a grade or score. Instead, use this information to uncover students’ initial ideas about how environmental changes impact organisms, and how solutions can be designed to protect them from habitat changes. Encourage students to share related experiences and use these as they brainstorm initial designs.” The Lesson 9 Learning Objective is: **“Design initial solutions to reduce the harmful effects of human caused environmental change(s) to manatee habitats.”**
 - Lesson 9, Synthesize, Assessment Opportunity: “Page 1 of Designs to Protect Manatees is your pre-assessment moment for learning goal 9. Accept all design ideas as long as they: select at least one cause of a problem faced by manatees, explain how the cause impacts manatees, select at least one criteria for protecting manatees, provide an explanation (words, drawings, or both) for how their solution works, select where their solution works and why there. It’s not essential that the solutions work at this point. Students will have additional opportunities to research the causes further, and to revise their designs. At this point, encourage students to: connect one cause to one effect, explain how their design meets the agreed upon criteria.” (Lesson 9, Teacher Guide)

Formative Assessment

- Ongoing formative assessments are claimed for lessons 2, 3, 4, 5, 6, 7, 10, 11, and 12. Descriptions in the 4.3.4 Ecosystem Change & Survival Assessment System Overview provide details about the assessments. For example:
 - Lesson 4, Assessment Guidance: “Assessment Type: Key formative assessment, Self Reflection Where to check for understanding: In the third Synthesize, when students complete the Odd Pod Argue from Evidence task, also shown on slide I and self check on slide O. What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **making claims that manatees and dolphins share the same waters (cause) to meet their needs (effect). using evidence and science ideas about animals sharing waters when they have needs such as temperature, food, protection, and raising young (cause) that can be met in that habitat (effect). constructing arguments that manatees move to coastal waters (cause) when they have the need for seagrass (effect), shared with the dolphins who also live there.**” (Lesson 4, Teacher Guide)
 - Lesson 5, Assessment Guidance: “Assessment Type: Formative Where to check for understanding: In the Explore, on the Seagrass Data Sheet handout (slide H), and during the Synthesize discussion (slide J) What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **Analyze data** from identification cards to **describe similarities and differences** among **seagrasses. Interpret data** from identification cards **as evidence of patterns** of **similarities and differences** that exist **in these similar organisms (seagrasses)**” (Lesson 5, Teacher Guide)
 - Lesson 12, Assessment Guidance: “Assessment Type: Key Formative Assessment and Peer Feedback Where to check for understanding: In the Synthesize as students complete Plan to Protect Manatees and give and receive feedback using Design Peer Feedback. What to look and listen for: Students drawing, writing, verbally explaining, acting out, and/or gesturing ideas about: **Using criteria** for **manatees’ needs**, identify the

potential **problem for manatees** in the **current system**. **Make a clear claim for at least one design solution** that **changes the system** and could solve the **problem faced by manatees**. **Include evidence to support how the solution meets the criteria and constraints** for **protecting manatees** in the **system**. **Give and receive feedback on claims and use these ideas to improve design solutions to protect manatees.**“ (Lesson 12, Teacher Guide)

- See III.B. for additional examples.

Summative Assessment

Summative assessment opportunities are identified in lessons 8 and 13. The summative assessments in Lessons 8 and 13 are related to the lesson progression Learning Goals and to grade-level Performance Indicators. For example,

- Lesson 8’s Learning Goal: “**Construct an argument** for why (**cause**) **a manatee and dolphin pod formed a group**.” relates to the Performance Expectation: 3-LS2-1. Construct an argument that some animals form groups (cause) that help members survive (effect).
 - Lesson 8, Synthesize, Assessment Opportunity” “Students’ arguments on Odd Pod New Argument provide an opportunity to gather evidence about learning goal 6, with the purpose of summatively assessing students’ understanding of group behaviors, and formatively assessing and providing feedback on engaging in arguments from evidence and using cause and effect reasoning. Choose which of the two assessment options your students will use depending on their: the front side for students who are ready to construct their argument independently or the reverse side for students who would benefit from more scaffolding. Have Scoring Guidance for Odd Pod Argument handy to provide in-the-moment support and feedback to students and you can use Following Student Sensemaking (Lessons 7-8) to record evidence of sensemaking at any moment in this lesson. Refer to the Assessment Guidance at the beginning of the lesson.” (Lesson 8, Teacher Guide)
- Lesson 13’s Learning Goal: “**Make a claim about the merit of a solution to the problem of turtles getting lost on their way to the ocean caused by lights that people use on land.**” relates to the Performance Expectation: 3-LS4-4: Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
 - Lesson 13, Synthesize, Assessment Opportunity: “This is an opportunity to assess Learning Goal **13** with the purpose of determining how well students can apply their ideas to make a claim about the merit of a design solution, Consider options for students to complete the assessment in writing, or verbally by making a video or giving a small group or individual presentation. Use Scoring Guidance for Sea Turtle Task and Following Student Sensemaking (Lessons 10-12) to look across all evidence for students’ progress toward the learning goals. Refer to the Assessment Guidance at the beginning of the lesson.” (Lesson 13, Teacher Guide)

Self Assessment

- Lessons 3, 4, 8, and 11 are identified as containing self-reflection opportunities. The 3.4 Ecosystem Change and Survival Assessment System Overview states: “These lessons provide opportunities to support students in reflecting on their own learning and sensemaking. These opportunities allow students to take ownership of their learning and use their reflections to guide future sensemaking. The self-reflections in this unit are designed to be short check-in moments for students to gauge their progress toward the learning goals. The slides provide a prompt with options for students to quickly share their reaction. This allows you to identify students who need more support and provide additional feedback, guidance, or practice. The final reflection in Lesson 13 is a way for students to celebrate their progress and all they have accomplished in the unit. Starting in Lesson 2, the My Growing Ideas is available as an option for students to use to reflect, record, and revise their understandings. This is a resource to combine with the class’ Our Growing Ideas chart. If you choose to use it, let students update their individual chart before doing the

class-level chart, and use this resource at moments you want students' to self-reflect on their progress. Some lessons include moments for students to revise or refine arguments and/or design ideas. These moments can be used for self-reflection, prompting students to share what they added or changed to their ideas and why. Their revisions may be based, in part, on the additional research and evidence collected or on feedback from peers and the teacher (see Lessons 10 and 11 when students revise their design ideas)."

- Lesson 3, Synthesize, Step 8: "Ask students to self-reflect about using evidence to support a claim. Display slide S. Once students have had time to verbally construct arguments from evidence with their partner using the claim and evidence cards, ask students to self-reflect about using evidence to support a claim using thumbs up, sideways, or down to reflect their level of confidence. Use what you heard students share with their partners as well as this self reflection to inform how you continue to support students in the next lesson, build on the verbal arguments they constructed with partners and individually construct a written argument." (Lesson 3, Teacher Guide) *However, this self-assessment is not three-dimensionally aligned.* While students are engaging with the SEP and DCI, *they are not engaging with the CCC.*
- Lesson 4, Synthesize, Step 6: "Self check. Slide O is provided as a quick self assessment for students to reflect on how comfortable and confident they are with making and supporting claims with evidence. This reflection moment can provide you with formative feedback about which students may need support moving forward." (Lesson 4, Teacher Guide)
- Lesson 8, Navigate, Step 1: "Have students self-assess their progress. Remind students that they worked with a lot of new information in the last class to investigate reasons why some animals live in groups. They transferred this information to a class data chart that was really helpful for seeing patterns for the reasons why some kinds of animals live into groups. Display slide A. Prompt students to quietly think about how they feel about their success at examining information in the last class to identify common reasons why animals live in groups. After some time, ask students to use their thumbs to show their confidence level." (Lesson 8, Teacher Guide) *However, this self-assessment is not three-dimensionally aligned.* While students are engaging with the SEP and DCI, *they are not engaging with the CCC.*
- Lesson 11, Synthesize, Step 5: "Reflect on comparing solutions. Use the prompt on slide L as a quick self-check to gather information from students about how confident they feel in their progress toward comparing solutions using criteria and constraints. This information can be combined with other input to give you a sense of who may need additional support in the next lesson." (Lesson 11, Teacher Guide) *However, this self-assessment is not three-dimensionally aligned.* While students are engaging with the SEP and DCI, *they are not engaging with the CCC.*

A coherent three-dimensional assessment system rationale is clearly described.

- The rationale and flow of the assessment system are laid out in the document "3.4 Ecosystem Change and Survival Assessment System Overview" which describes the lesson learning goals, assessment types, purposes, and locations for each assessment throughout the unit. The document also contains information on what to look and listen for with each assessment.
- Each lesson plan includes a "Lesson Assessment Guidance" section which echoes the information from the Assessment System Overview about the Learning Goal, type and location of assessment, and what to look and listen for. This section also adds a "How Can I Use This Assessment Information?" column to help the teacher know how they might use their collected data to inform or change instruction for individuals or for the whole class

Criterion-Based Suggestions for Improvement: N/A

III.F. Opportunity to Learn

ADEQUATE

Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback

The reviewers found **adequate** evidence that the unit has multiple opportunities for students to demonstrate increased proficiency in practices related to targeted learning objectives. Assessment opportunities are coherent and interconnected for 3-LS2-1 and 3-LS4-4, *however, evidence of students having opportunities to build understanding of 3-LS4-3 and 3-L-LS3-1 independently was limited.*

The materials offer multiple, interconnected opportunities for students to demonstrate their progress toward proficiency over time.

For example, students build toward 3-LS2-1. Construct an argument that some animals form groups that help members survive, as seen in:

- Lesson 4 Lesson Learning Goal: “**Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.**” (Lesson 4, Teacher Guide)
 - Lesson 4, Synthesize, Step 6: “Review original claims. Display slide M and refer back to the Possible Claims chart, focusing on the first question about why manatees and dolphins share the same waters. Review the claims the class added from Lesson 3, and related initial claims. Remind students that in the previous lesson, they practiced supporting a claim with evidence by talking with a partner. Today they will practice writing an argument to support their claim. That means they will need to use evidence to explain in writing why their claim is most likely the best answer to their question.” (Lesson 4, Teacher Guide)
- Lesson 7 Learning Goal: “**Construct an argument** for how **living in groups or being separated from groups affect how well some animals survive.**” (Lesson 7, Teacher Guide)
 - Lesson 7, Assessment Guidance: “This is a critical moment for you to provide feedback to your students before Lesson 8. Use Instructional Guidance 7 and Following Student Sensemaking (Lessons 7-8) in combination to gather and analyze student progress. Providing written or verbal feedback to students on The Orca Named Springer can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect.” (Lesson 7, Teacher Guide)
- Lesson 8 Learning Goal: “**Construct an argument** for why (**cause**) **a manatee and dolphin pod formed a group.**” (Lesson 8, Teacher Guide)
 - Lesson 8, Assessment Guidance: “This assessment is a formal opportunity to gather summative information about students’ progress on the disciplinary core ideas LS2.D: Social Interactions and Group Behavior and to provide formative feedback on students’ engagement in argument from evidence and using cause and effect.” (Lesson 8, Teacher Guide)

Students have *limited* opportunities to build toward 3-LS3-1: Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. *Although students work toward this PE, the materials do not offer a summative assessment opportunity or opportunities to revise/ revisit ideas related to this PE.*

- Lesson 5 Learning Goal: “**Analyze and interpret data to provide evidence of patterns that similar organisms (seagrasses) vary in how they look and function.**” (Lesson 5, Teacher Guide)
 - Lesson 5, Assessment Guidance: “You can support the development of students’ data analysis by asking them to describe the patterns they found in the seagrass data. Use the differences students notice between seagrasses to motivate wondering how/why these plants got their differences. Provide feedback on students’ analysis on the Seagrass Data Sheet handout before Lesson 6, either in conferences or in writing with time to review the feedback.” (Lesson 5, Teacher Guide)
- Lesson 6 Learning Goal: “**Analyze and interpret data to provide evidence that plants (seagrass) have traits inherited from parents and that variation of these traits exists in a group of similar organisms.**” (Lesson 6, Teacher Guide)
 - Lesson 6, Synthesize, Assessment Opportunity: “The following discussion provides an opportunity to gather evidence about Learning Goal 6, to provide feedback, and support students in using evidence to explain how seagrass is different. Use prompts such as these to provide feedback and determine next steps before moving on to the next lesson: What did we figure out from previous investigations about patterns in seagrass similarities or differences? What did we figure out about variation in traits from the parent and offspring seagrass data?” (Lesson 6, Teacher Guide) *The Key Formative assessment for this PE relies heavily on recall of class discussion rather than asking students to engage in data analysis or other sensemaking.*

Students build towards 3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all, as seen in:

- Lesson 2 Learning Goal: “**Combine information across texts and media (information cards, maps, and videos) to develop a system model to describe the populations that live in a variety of aquatic habitats.**” (Lesson 2, Teacher Guide)
 - Lesson 2, Synthesize, Assessment Opportunity: “Formative assessment: This is an opportunity to assess learning goal 2 with the purpose of determining how well students integrate data and information across multimedia resources to develop a system model. For this lesson, give students an opportunity to think through their ideas first individually and with a partner, but have them wait to add stickers and permanent words/symbols until the class has come to a consensus on what the model should represent. As you add agreed-upon information and ideas to the Class Consensus model, ask questions such as, What do we know about rivers/springs? (coastal oceans, deep oceans). Are they saltwater or freshwater? Where did we get that information? Do others agree?” (Lesson 2, Teacher Guide) *However, since this SEP is addressed through teacher-led whole-class discussion, it is not evident that individual students would receive feedback to help them better leverage the practice.*
- Lesson 3 Learning Goal: “**Support a claim about why manatees and dolphins sometimes share the same waters.**” (Lesson 3, Teacher Guide)
 - Lesson 3, Synthesize, Step 6: “Point to the Manatee Location Data Table and ask students what we have figured out about whether manatees and dolphins share the same waters all year. Use the follow-ups to push students to use evidence to support their thinking and to help the class decide how we should represent ideas on our model. Because this is a Consensus Discussion, make sure the class is in agreement before revising the Shared Waters model.” Synthesize step 7: “Ask students to share a claim (or answer) they might have that answers the lesson question. Start by having one student share a claim. Then, work towards a claim that can answer the whole lesson question using ideas across many of the sources of evidence. Once the class agrees on a claim, add it to the Our Growing Ideas chart. As students are sharing potential claims, also record the evidence that they name, too. Evidence might include maps, underwater videos, scientists cards, interview with a scientist,

and the Shared Waters model.” Claims might be something like the following, but use words and context that is coming from your students: Florida manatees and dolphins mostly share coastal waters during the summer. (optional to add) Tampa Bay is special and has waters they share all year because power plants make some waters warm. When things change, like waters getting cold or more food in another place, manatees and dolphins move to meet their needs.” (Lesson 3, Teacher Guide)

- Lesson 4 Learning Goal: **“Support a claim, using evidence, to explain why dolphins and manatees sometimes share the same waters.”** (Lesson 4, Teacher Guide)
 - Lesson 4, Synthesize, Assessment Opportunity: “Key formative assessment and self-reflection: Students’ Odd Pod Argue from Evidence and the surrounding discussions provide an opportunity to gather evidence about Learning Goal 4, with the purpose of providing feedback to students and guiding instruction in upcoming lessons. Encourage students to evaluate the evidence they have gathered and which pieces can best support their claim about Why do manatees and dolphins share the same waters? Refer to the Instructional Guidance 4 tool and the Assessment Guidance at the beginning of the lesson. Use slide L for students to self-reflect on their progress and confidence.” (Lesson 4, Teacher Guide)
- Lesson 9 Learning Goal: **“Design initial solutions to reduce the harmful effects of human caused environmental change(s) to manatee habitats.”** (Lesson 9, Teacher Guide)
 - Lesson 9, Synthesize, Step 4: “Restate the problem using the ideas students have already shared: manatee numbers are still declining because of the human-related issues described in the news article are related to changes in manatee habitats. Now is a great opportunity to articulate the lesson question with students, something similar to, Why are manatees struggling to survive if they are protected? Remind students that, as we learned in prior units, engineers solve problems. Explain that in order to design effective solutions, it is helpful to think about the problem in terms of causes and effects.” (Lesson 9, Teacher Guide)
- Lesson 11 Learning Goal: **“Compare multiple solutions to reduce the harmful effects of loss of seagrass and more boats (causes) manatee habitats.”** (Lesson 11, Teacher Guide)
 - Lesson 11, Connect, Step 2: “Using the Why Do Manatees Still Need Protection chart from Lesson 9, share with students that we are going to dig deeper into the seagrass and boat problems. When we hear from experts, we want to figure out more about why less seagrass and boats are a problem for manatees. Share that we will add new ideas to the problem, similar to what we did when we investigated the warm water problem in Lesson 10.” (Lesson 11, Teacher Guide)
- Lesson 13 Learning Goal: **“Make a claim about the merit of a solution to the problem of turtles getting lost on their way to the ocean caused by lights that people use on land.”** (Lesson 13, Teacher Guide)
 - Lesson 13, Explore, Step 4: “In this task, there are two cause-and-effect relationships. The first centers on the problem: when the beach has a lot of artificial light (cause), the hatchlings are more likely to get lost on their way to the beach (effect). The second centers on the solution: when we design a solution to minimize the artificial light (cause), the hatchlings are less likely to get lost (effect).” (Lesson 13, Teacher Guide)

Students build towards 3-LS4-4. Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change as, seen in:

- Lesson 3 Learning Goal: **“Support a claim about why manatees and dolphins often share the same waters.”** (Lesson 3, Teacher Guide)
 - Lesson 3, Synthesize, Assessment Opportunity: “This is the first opportunity to formatively assess learning goal 3 with the purpose of determining how students use evidence to support a claim about why manatees and dolphins often share the same waters. Use the Consensus Discussion in the Scientists circle to collectively

and individually assess students' ideas about the cause-and-effect relationship between season and manatee location and when manatees and dolphins share the same waters. If students need support identifying the cause-and-effect relationships involving the seasons and manatee locations, have them first identify *when* manatees and dolphins share the same waters and ask if they notice any patterns. Ask, how might the time of year affect where the manatees are? Ask, are there any locations that show a different pattern? It may help students to focus on the manatees' and dolphins' needs to explain the animals' movements and locations." (Lesson 3, Teacher Guide) *However, since this CCC is addressed through teacher-led whole-class discussion, it is not evident that individual students would receive feedback to help them better leverage the CCC.*

- Lesson 9 Learning Goal: **“Design initial solutions to reduce the harmful effects of human caused environmental change(s) to manatee habitats.”** (Lesson 9, Teacher Guide)
 - Lesson 9, Explore, Step 2: “Uncover causes and effects. Read aloud the news article as a class. Stop after each paragraph to record noticings and wonderings from the class. Turn and talks may be helpful to intermix with the whole group as a way to allow more students to share their ideas aloud. Use them, as needed, to support student engagement. After reading each paragraph, to emphasize how (cause) each type of habitat change threatens manatees (effect), stop and ask the following questions: What problem is introduced here that threatens manatees? (effect) What seems to be the cause of the problem? (cause) Record student responses under ‘Notice’ on the class chart. Follow a similar routine for each paragraph to record more noticings. After the final paragraph, elicit student questions and wonderings. If needed, go back to point out specific causes and effects for each problem.” (Lesson 9, Teacher Guide)
- Lesson 10 Learning Goal: **“Generate and compare multiple solutions for the loss of warm water places which causes Florida manatees to get sick or die.”** (Lesson 10, Teacher Guide)
 - Lesson 10, Explore, Assessment Opportunity: “Formative: This is the opportunity to formatively assess learning goal 8 with the purpose of determining how students compare multiple solutions based on how well they meet design criteria and constraints. Use the Warm Water Solutions: Comparison Tool to assess students’ ability to evaluate solutions against the criteria of warm water during the winter and constraints of time, money, and effect on animals and people. Refer to the Assessment Guidance at the beginning of the lesson. If students need support comparing solutions, have them focus on one constraint at a time and highlight which solution has the least cost/ effect for that constraint. Then students can use the highlights to minimize the amount of information that they need to process as they evaluate solutions.” (Lesson 10, Teacher Guide)
- Lesson 11 Learning Goal: **“Generate and compare multiple solutions to reduce the harmful effects of loss of seagrass and more boats (causes) manatee habitats.”** (Lesson 11, Teacher Guide)
 - Lesson 10, Assessment Guidance: “During the second Synthesize, examine student ideas on Designs to Protect Manatees and how they respond to slide K. This will give you a sense of where they are individually progressing in their understanding. Provide feedback to students on their revised design ideas before Lesson 12 so they can use your feedback to help them on their next argument.” (Lesson 10, Teacher Guide)
- Lesson 12 Learning Goal: **“Make a claim about the merit of a solution to protect manatees in a new system by citing relevant evidence about how it meets the criteria and constraints, and then improve designs based on feedback from peers.”** (Lesson 12, Teacher Guide)
 - Lesson 12, Assessment Guidance: “This is a key formative and peer feedback assessment to consider a) how well students can communicate their ideas about engineering design solutions, and b) how well students can develop a claim and support it with evidence for how well it meets the criteria and constraints for the system. To do this, students will be constructing a claim in the form of a design solution and writing an argument to support it. Students will receive peer feedback but you should use this opportunity to give feedback to students before the summative assessment in the next lesson.” (Lesson 12, Teacher Guide)

Opportunities for teacher feedback are included in the “How can I use this assessment information?” section of the Lesson Assessment Guidance in some lessons or the body of the lesson. In these feedback experiences, students are given the opportunity to use this feedback to revise their work and adjust their thinking. For example,

- Lesson 4, Lesson Assessment Guidance: “This is a critical moment for you to provide feedback to students. Use Instructional Guidance 4, Following Student Sensemaking (Lessons 2-4), and students’ self-check on slide J in combination to gather and analyze student progress. Providing written or verbal feedback to students on Odd Pod Argue from Evidence can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect. This feedback should be provided to students prior to Lesson 8 where they have another opportunity to develop arguments for claims about why the manatee joined the dolphin pod.” (Lesson 4, Teacher Guide)
- Lesson 5, How Can I Use This Assessment Information: “Provide feedback on students’ analysis on the Seagrass Data Sheet handout before Lesson 6, either in conferences or in writing with time to review the feedback.” (Lesson 5, Teacher Guide)
- Lesson 7, Lesson Assessment Guidance: “This is a critical moment for you to provide feedback to your students before Lesson 8. Use Instructional Guidance 7 and Following Student Sensemaking (Lessons 7-8) in combination to gather and analyze student progress. Providing written or verbal feedback to students on The Orca Named Springer can help students clarify uncertainties about science ideas and/or improve their engagement with arguments from evidence and use of cause and effect.” (Lesson 7, Teacher Guide)
- Lesson 11, Lesson Assessment Guidance: “During the second Synthesize, examine student ideas on Designs to Protect Manatees and how they respond to slide K. This will give you a sense of where they are individually progressing in their understanding. Provide feedback to students on their revised design ideas before Lesson 12 so they can use your feedback to help them on their next argument.” (Lesson 11, Teacher Guide)
- Lesson 12, Lesson Assessment Guidance: “Students will receive peer feedback but you should use this opportunity to give feedback to students before the summative assessment in the next lesson. Support students by asking questions such as...” (Lesson 12, Teacher Guide)

Students have opportunities to give and receive peer feedback, which is **often** lesson-specific and which includes opportunities to revise work based on that feedback. For example:

- 3.4 Ecosystem Change & Survival Assessment System Overview states the following about peer feedback: “These lessons provide opportunities to support students in working together to give and receive feedback on their ongoing work. Students have opportunities to use the feedback to make revisions. Peer feedback is closely tied with the classroom agreement ‘We look, listen, and respond to each other’s ideas’ and ‘We let our ideas change and grow.’ (4 3.4 Ecosystem Change & Survival Assessment System Overview Document) It also highlights Lessons 8,9,12, and 13 as specific opportunities for students to engage in feedback. Each lesson has a specific document that supports students in providing feedback for the identified feedback activity in the lesson.
- Lesson 8, Synthesize, Step 6: ”Provide peer review and feedback. Display slide M. When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Encourage partners to ask questions about each other’s claims and arguments. After both partners have shared, have them trade handouts and read one another’s ideas, using the Argument Peer Feedback handout ask students to write down their 1-2 feedback ideas for their partner. Remind students of the purpose of giving feedback by emphasizing things to look for (see slide N). Use slide O to support students to receive feedback.” (Lesson 8, Teacher Guide)
- Lesson 9, Synthesize, Step 5: “Share and evaluate designs. Once students complete their designs, have them share using a protocol like the Hand Up, Pair Up on slide J. As well as an opportunity to communicate and hear other ideas,

this activity gives students an opportunity to provide and receive peer feedback on how well each design addresses one cause and meets at least one of the agreed upon criteria. Have students share with at least two classmates. If students find out that their initial design does not address at least one cause or does not meet at least one criteria, give students time to revise their idea.” (Lesson 9, Teacher Guide)

- Lesson 12, Synthesize, Step 4: “Provide peer review and feedback. Display slide E. When students complete their individual work on the assessment, have them take turns reading their claims and arguments to a partner. Ask each student to show on their map where their design solutions would work best. Encourage partners to ask questions about each other’s claims and arguments. After both partners have shared, have them trade handouts and read one another’s ideas, examining the map Step 4 and the argument in Step 5. Using Design Peer Feedback ask students to write down their 1-2 feedback ideas to their partner. Remind students of the purpose of giving feedback by emphasizing things to look for (see slide F)” (Lesson 12, Teacher Guide)
- Lesson 13, Synthesize, Step 5: “Give and receive feedback. When students have completed Part 3, display slide N and distribute the Giving and Receiving Feedback handout and pair them up to give and receive feedback about their claims and evidence. Remind students that there is not one correct answer, but rather we can argue for how well the solution meets criteria and constraints. The purpose of giving feedback is to help improve our claims by emphasizing things to look for.” (Lesson 13, Teacher Guide) While this Giving and Receiving Feedback document provides sentence stems to use, **the stems are not lesson-specific or connected to any of the 3 dimensions.**

Criterion-Based Suggestions for Improvement:

- Ensure that “[s]tudents have opportunities to use their feedback to construct new learning and improve their performance in preparation for the next assessment opportunity.” [Detailed Guidance, p. 47].
 - Consider including established times within the lesson for students to use the feedback they have received to improve their performance on upcoming assessments individually.
 - Consider more robust self-evaluation and peer evaluation opportunities that target elements of each dimension separately.

Category Ratings

CATEGORY I	NGSS 3D Design <i>[Criteria A–F]</i>	0	1	2	③
CATEGORY II	NGSS Instructional Supports <i>[Criteria A–G]</i>	0	1	2	③
CATEGORY III	Monitoring NGSS Student Progress <i>[Criteria A–F]</i>	0	1	2	③
TOTAL SCORE		9			

Overall Ratings

Overall ratings:

The score total is an *approximate* guide for the rating. Reviewers should use the evidence of quality across categories to guide the final rating. In other words, the rating could differ from the total score recommendations if the reviewer has evidence to support this variation.

E: Example of high quality NGSS design—High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. [total score ~8–9]

E/I: Example of high quality NGSS design if Improved—Adequate design for the NGSS, but would benefit from some improvement in one or more categories; most criteria have at least adequate evidence [total score ~6–7]

R: Revision needed—Partially designed for the NGSS, but needs significant revision in one or more categories [total ~3–5]

N: Not ready to review—Not designed for the NGSS; does not meet criteria [total 0–2]

Overall rating below:

E