EQuIP Rubric for Science

Overall Rating: **R**

Revision needed

Unit
Peer Review Panel Feedback

Unit Name: An Ocean of Plastics
Grade Level: Middle School

Category I. NGSS 3D Design

		Evidence of Quality?			
		None	Inadequate	Adequate	Extensive
Unit Criteria	A. **Explaining Phenomena/Designing Solutions**: Making sense of phenomena and/or designing solutions to a problem drive student learning.			X	
	B. **Three Dimensions**: Builds understanding of multiple grade-appropriate elements of the science and engineering practices (SEPs), disciplinary core ideas (DCIs), and crosscutting concepts (CCCs) *that are deliberately selected to aid student sense-making of phenomena and/or designing of solutions*.			X	
	i. *Provides opportunities to develop and use specific elements of the SEP(s).*			*x*	
	ii. *Provides opportunities to develop and use specific elements of the DCI(s).*			*x*	
	iii. *Provides opportunities to develop and use specific elements of the CCC(s).*			*x*	
	C. **Integrating the Three Dimensions:** Student sense-making of phenomena and/or designing of solutions requires student performances that integrate elements of the SEPs, CCCs, and DCIs.			X	
	D. **Unit Coherence**: Lessons fit together to target a set of performance expectations.		X		
	E. **Multiple Science Domains**: *When appropriate*, links are made across the science domains of life science, physical science and Earth and space science.			X	
	F. **Math and ELA:** Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.		X		

Category I Rating: **2**

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

Criterion A.

Specific evidence from materials and review team consensus reasoning:

i. Lesson 1: The video of the Plastic Pollution in the world's oceans serves to introduce the phenomena for the unit. Students are asked to generate questions linked to the Crosscutting Concepts about this phenomenon. In lessons 2-7 students work to explain how plastics end up in gyres.

ii. Lesson 1: Students created questions related to the phenomena and categorized them into which CCC they most closely aligned. These questions are not referred to in subsequent lessons. Students are able to compare what they began the unit thinking/awareness with what they think after progressing through the lesson in the Reflection portion of the packet. For example, in Lesson 13 Students are involved in an engaging activity with the feeding game. As the students play additional rounds, the species they represent encounter physical impairments representing entanglement from plastic and/or ingesting plastic.

iii. The limited engineering opportunities occur in lessons 14 and 15 integrate life science with the end goal of designing a method to minimize the effects of plastic pollution on marine ecosystems.

This was marked as adequate because there is evidence from the lessons that students are supposed to make sense of the plastic pollution phenomena and design a method to minimize the effect of plastic pollution.

Suggestions for improvement:

The anchoring phenomena could be strengthened if instead of the 5 Gyres video, students were presented with several of the provocative photos of damage to ocean organisms from the video to provide more student-led sense making of the phenomena. The unit is very geared to the California area when species and locations are mentioned.

	This can be used in any ocean area and although suggestions are made for other waterways, (i.e. Lesson 4) it may not transfer to other areas as well.
Criterion B.	**Specific evidence from materials and review team consensus reasoning:** Lesson 1 Explore (Teacher Facilitation Guide): "For step 5 of the QFT, have each student group record their top 3 questions about the phenomenon on the whiteboard or chart paper in the front of the room so that all groups can see." • Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. (Asking Questions and Defining Problems) Lesson 2 (Student Handout): "Use your data and graphs to complete the following calculations. 1) Estimate how much total waste (recycled and non-recycled) your class uses in 1 week, 1 month, and 1 year assuming that everyone consistently produces the same amount of waste in a day that you recorded." • Use graphical displays (e.g. maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships. (Analyzing and Interpreting Data) Lesson 5 (Student Handout): "Imagine the apartment buildings, single family homes, and factories that make up your city. Add binder clips, paper clips, and/or paper fasteners to represent these. Place some factories on mountain or hillsides and others near the bottom. You may want to place several in one area to show populated urban areas versus less populated areas. Place a few drops of one color of food coloring near the factories on the mountain/hillsides and a few drops of another color of food coloring near the factories at the bottom. The food coloring represents point source pollution or pollution that comes from a known source, in this case emissions/solid waste from factories. Use the spray bottle to simulate precipitation again." • Develop or modify a model - based on evidence- to match what happens if a variable or component of a system is changed. (Developing and Using Models) Lesson 5 (Student Handout): "Add to your explanation how point sources of solution move through the watershed. Use specific observations from your experiment to support your reasoning." • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meets the goals of the investigation. (Planning and Carrying Out Investigations) Lesson 6: Students use a Cloud in a Bottle Model to choose an explanation for how a cloud forms. They complete a CER chart and a written explanation. • Apply scientific ideas, principles, and/or evidence to construct, revise, and/or use an explanation or real world, phenomena, examples or events. (Constructing Explanations and Designing Solutions) • This SEP element is evident in this lesson, but is not identified in the Unit Outline. Lesson 7: Students use a globe to model the Coriolis Effect. • Develop a model to describe unobservable mechanisms. (Developing and Using Models) Lesson 8 (Unit Learning Plan): "Conduct an experiment to analyze and identify the chemical makeup of different types of plastics based on the observed properties from physical and chemical tests." • Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation. (Planning and Carrying Out Investigations) Lesson 8 (Student Handout): "State a claim identifying the 2 unknown plastic samples. Support your claim using 2-3 specific observations from your experiment and use information provided in the reading and charts to justify your reasoning." • Construct, use, and/or present an ~~oral~~ and written argument supported by empirical evidence and scientific reasoning to ***support or refute an explanation*** or a ~~model for a phenomenon or a solution to a problem.~~ (Engaging in Argument from Evidence) o This activity does not quite fit the SEP. Having students simply explain how they identified an unknown sample is not supporting or refuting an explanation. There are other SEPs in this lesson (Planning and Carrying out Investigations) that are more evident.

Lesson 9: In the Unit Learning Plan, Developing and Using Models and Analyzing and Interpreting Data are identified as the corresponding SEPs. The elements of these SEP's that most closely fit this lesson are:

- Develop and/or use a model to predict and/or describe phenomena.
- Analyze and interpret data to provide evidence for phenomena.

Lesson 10 (Teacher Facilitation Guide): "Have students use the class data to calculate the percent of prey vs. non-prey items and then use the calculated percentages to make a bar graph of prey vs. non-prey food items."

- Apply mathematical concepts and/or processes (such as ratio, rate, percent, basic operations, and simple algebra) to scientific and engineering questions and problems. (Using Mathematics and Computational Thinking)

ii. Elements of multiple DCI's are used and developed in this unit. Several of the DCI's are addressed in more than one lesson allowing students multiple opportunities to gain the knowledge needed to explain the unit phenomena.
ESS3.C (Lessons 1,2,3,4,14,15)

ESS2.C (Lessons 5,6,7)

PS1.A (Lessons 6,8,9)

PS3.A (Lesson 6)

ESS2.D (Lesson 7)

LS2.A (Lessons 9,10,13)

LS1.A (Lesson 11)

LS2.B (Lesson 12)

LS2.C (Lesson 13)

iii. The specific elements that *students* engage in connect to the following CCCs.:

Patterns:

Patterns can be used to identify cause and effect relationships.

Graphs charts and images can be used to identify patterns in data.

Cause and Effect:

Cause-and-effect relationships may be used to predict phenomena in a natural or designed systems.

Phenomena may have more than one cause, and some cause-and-effect relationships in systems can only be described using probability.

Scale, Proportion and quantity: Phenomena that can be observed at one scale may not be observable at another scale.

Suggestions for improvement:

i. In Lesson 9, students are developing a model after they analyze data in the lesson. However, it is not connected with a phenomenon. The language of the SEP indicates that models should be used to predict or describe a phenomenon. Refer to this document explaining the NGSS definition of phenomena.

Consider adding language for both the CCCs and SEPs that corresponds to the ELEMENT level of the dimension to strengthen connections to those dimensions.

In Lesson 4, the SEP is identified as "Collect and Analyze Data." This is not one of the Science and Engineering Practices.

In Lesson 6/Explain (Teacher Facilitation Guide), explanation is given on how to use the SEPs of Constructing Explanations and Designing Solutions and Engaging in Argument from Evidence. Neither of these SEPs are included in the Unit Learning Plan matrix for Lesson 6

ii. The unit submission identifies 8 DCI's: ESS2.C ESS3.C ESS2.D PS1.A PS3.A LS2.A LS2.B LS2.C
The breadth of DCIs does allow for students to investigate Earth science, Physical science, and life science. The exposure to so many DCI's dilutes the power of deeply focusing on a select few to allow students to develop and use their knowledge of the DCI. Suggestions include identifying which are the focal DCI and which DCIs are there to support the learning of the focal DCIs.

	iii. In Lesson 1 students engage in a highly interactive and engaging gallery walk of posters with the CCC. Students develop questions related to the phenomena using the CCC. In Lessons 2-15 the CCC are not explicitly mentioned to students or used as a focus. The CCC appear in the Guiding Questions and Objectives column in the unit learning plan, but are not highlighted in student documents. Students are not made aware that they are leveraging the CCC. For a stronger connection to the elements of the CCCs, consider adding directions in the Teacher Facilitation Guide indicating that connection beyond the mention in the Unit Learning Plan. The language of the elements of the CCCs could also be more evident in the student handouts.
Criterion C.	**Specific evidence from materials and review team consensus reasoning:** Lesson 9 authentically engages all three dimensions when students predict (CCC) which marine animal would be most affected by a soda bottle cap using their model (SEP) and understanding of interactions of living and nonliving factors (DCI). Lesson 12 Students are tasked with using their model to inform their argument from evidence: If you could eliminate toxins from entering one organism in your food chain which one would you remove and why? State a claim and support your claim using evidence from simulation data and your model to explain why removing toxins from this organism would have the greatest impact on the food chain. Lesson 13 The conclusion: After student are involved in a game to simulate generations of sea species being impacted by plastic they are prompted to "construct an evidence-based explanation using your unit tracker and previous lessons to answer the question: How do plastics affect marine organisms and cause changes to ecosystems?"
	Suggestions for improvement: While the objectives listed in the Teacher Facilitation Guide are color-coded to indicate the integration of the three dimensions for *each* lesson, *students* are not authentically engaged in all three dimensions in each lesson. The unit tracker tool could be used to meet the goal of students engaging in 3D learning.
Criterion D.	**Specific evidence from materials and review team consensus reasoning:** i. According to the Unit Design Principals and Teacher Background document "There are 3 different ways that teachers can use unit module. "A. Implement lessons as one cohesive unit without using supplemental materials. B. Integrate lessons into one or more units of study over the course of a semester or a year in addition to using other curricular materials. C. The lessons within the module could also serve as isolated lessons taught in conjunction with other curricular materials being used to help students explore individual content ideas as they relate to the plastic pollution phenomena." Evidence from the unit that support coherence: Lesson 3 (Elaborate): "Before starting this section, review with students the past two lessons. Students monitored their waste for a day and then explored their local community to learn possible sources of pollution. Point out that plastic was frequently used and thrown away/recycled from the monitoring waste activity. Producing plastic is also a potential source of pollution, so now we'll take a look at the process of how plastic is made and can contribute to pollution." By Lesson 7 students are building on what has been introduced/reviewed in earlier lessons. The Engage activity of Part 3: Spill Spread in this lesson requires students to use information to make sense of the data they analyze. Lesson 12 ties in what has been learned in previous lessons and relates it to bioaccumulation in the food chain. Though there is some evidence of ideas connecting to previous lessons criterion D. coherence is inadequate for the following reasons: A.it is implied that the lessons build and support connecting knowledge. Skilled teachers do this without prompting, however in lesson materials it needs to be explicit where and what teachers should point out for students. Each lesson should build on prior lessons by addressing 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 prior student experiences. Because this unit has three options for implementation and three parts (A, B, and C) lessons appear disjointed without explicit directions to connect or refer to previous lessons. Because we were tasked to evaluate this as an entire unit, not parts of a unit, it should reflect strong unit coherence.

	ii. The Unit learning plan identifies PE's: MS-ESS2-4 MS-ESS2-6 MS-ESS3-3 MS-PS 1-4 MS-LS1-3 MS-LS2-1 MS-LS2-3 MS-LS2-4 MS-ETS1-1 MS-ETS1-2. The targeted PE 'moves' and is aligned to the lesson rather than the unit.
	Suggestions for improvement: i. Unit tracker is attached to TFN lesson 1, the document identified as lesson tracker is actually for Lesson 2. Additional information about how to leverage the unit tracker to support unit coherence would strengthen this tool. Instead of students creating multiple separate models, have students continue to add to the same model. This would connect lessons together seamlessly, rather than having students create 8 individual models. ii. Consider identifying 2-3 PEs as the primary focus of the entire unit, and indicating which PEs are included because portions of them are supported at the lesson level.
Criterion E.	**Specific evidence from materials and review team consensus reasoning:** 1. ESS (Lesson 1, 2, 3, 4, 5, 6, 7, 14, 15), PS (Lessons 6, 8), LS (Lesson 9, 10, 11, 12, 13), and ETS (lesson 15- somewhat depending on choice of project) are used throughout the unit. The multiple science domains used together to explain properties (density) of plastic PS1. A and how that effects the food chain ESS3.C and LS2.A ii. The CCC of Cause and Effect is evident in almost every lesson in this unit. Cause and Effect is used to make sense of the unit phenomena throughout multiple science domains. This was adequate because the connections between science domains where appropriate and the CCC were used in making sense of the multiple science domains.
	Suggestions for improvement: NA
Criterion F.	**Specific evidence from materials and review team consensus reasoning:** Math skills are used to graph and analyze data (such as in Lesson 2, 10, 13) Explanation of types of graphs is done in Lesson 2 with a review activity on what kind of graph for different situations. Students analyze a prepared graph in Lesson 9. Percent (Lesson 2, 10, 12, 13) Ratios/proportions are used (Lesson 3) ELA: Reading assignments are done in several lessons such as: 1, 2,3, 5, 7, 11, 12, 13. In Lesson 5's optional Extend Activity students read a children's book, relating it back to the movement of pollution through storm drains. Another option is for students to create their own book about pollution. Lesson 13 includes an argumentative writing assignment. Lesson 15 students write letters to manufacturers. Also in Lesson 15 students research at least two resources that are suggested to them to gain more insight into global plastic pollution issues. They take notes on a table provided to them. Social Studies connection in Lesson 4 with "circular economy" of products and "extended producer responsibility". Geography connections are available with the different gyres (Lesson 7) and current movements. Reasoning: The above examples from the unit where both Math and ELA connections are leveraged. The appropriate ELA/Literacy/Math CCSS could be easily called out in teacher and student documents, especially when students analyze information text in numerous lessons in this unit. However, no explicit connections are made to the ELA/Literacy CCSS.
	Suggestions for improvement: Include documentation of specific grade-appropriate connections to Common Core State Standards in Math and/or ELA in teacher and student documents.

Category II. NGSS Instructional Supports:

		Evidence of Quality?			
		None	Inadequate	Adequate	Extensive
Unit Criteria	A. **Relevance and Authenticity**: Engages students in authentic and meaningful scenarios that reflect the practice of science and engineering as experienced in the real world.			x	
	B. **Student Ideas:** Provides opportunities for students to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.			x	
	C. **Building Progressions**: Identifies and builds on students' prior learning in all three dimensions, including providing support to teachers.		x		
	D. **Scientific Accuracy**: Uses scientifically accurate and grade-appropriate scientific information, phenomena, and representations to support students' three-dimensional learning.			x	
	E. **Differentiated Instruction**: Provides guidance for teachers to support differentiated instruction.		x		
	F. **Teacher Support for Unit Coherence:** Supports teachers in facilitating coherent student learning experiences over time.		x		
	G. **Scaffolded differentiation over time:** Provides supports to help students engage in the practices as needed and gradually adjusts supports over time so that students are increasingly responsible for making sense of phenomena and/or designing solutions to problems.		x		

Category II Rating: **1**

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

Criterion A.

Specific evidence from materials and review team consensus reasoning:

i. Lesson 2: Students use data from their own waste monitoring.

ii. Lesson 3 Explore (Teacher Facilitation Notes): "Students work in pairs on the computer to explore the area around their school for possible sources of pollution. Show students how to look at different parts of Google Maps (ie. Street view, zooming, moving around, etc.)"

Lesson 3 Elaborate (Teacher Facilitation Notes): "Also, include the recycling tips below and share with your students your city/area's recycling guide if one is available to spread the word to their families and communities."

Lesson 5 Elaborate (Teacher Facilitation Notes): "Note For question 3: An image of the LA River watershed is provided in additional handouts. You may print an image of your community's watershed or have students research and look up this information."

iii. In Lesson 14 students evaluate product packaging and may provide alternative better packaging. Lesson 15 asks students to share packaging use and recycling at home with their study of packaging design.

Reasoning: This was marked as adequate because students do have the opportunity to experience a phenomenon, make connections to a student's community, and provides opportunities for student to connect their explanation of a phenomena and design solution to a problem from their own experience.

Suggestions for improvement:

Assumptions are made of fairly significant pollution being in the area where the field study is done in Lesson 4. Alternatives should be provided if this is not the case.

Criterion B.

Specific evidence from materials and review team consensus reasoning:

The gallery walk in Lesson 1 shares student ideas and comprehension.

Students generate questions in Lesson 2 and create a flyer about better alternative materials (BAN). Their opinions are shared in the Lesson 4 Inside/Outside Circle activity.

In Lesson 6 student input is gathered in the Explore activity using a data gathering technique (of fingers on chins.) Student input is collected so that classmates do not as easily influence them.

In Lesson 8 students come up with an experimental plan that is then teacher approved. A peer-review is done.

	Lesson 9 Explore (Teacher Facilitation Notes): "Provide students time to create their models and then revise their models based on new knowledge gained from their peers." Lesson 10 and 11's Reflection page allows students an opportunity to revise misconceptions. Lesson 11- Agree or Disagree activity. Lesson 13- students are asked to describe what it means for ecosystems to be dynamic and resilient and are asked to write a hypothesis re: plastics impact on the environment. This was adequate because students do have opportunities to express, clarify, justify, interpret, and represent their ideas and respond to peer and teacher feedback orally and/or in written form as appropriate.
	Suggestions for improvement: Allow more student input in the models and investigations and less direction from teachers.
Criterion C.	**Specific evidence from materials and review team consensus reasoning:** Teacher Facilitation Notes - Prerequisite knowledge section indicates expected prior learning Lesson 6 (Teacher Facilitation Guide): "This lesson sequence focuses on ocean currents, as such, the exploration of why the earth is unevenly heated is not explored in this lesson section. You may wish to address this concept, between the check for prior knowledge of coloring the map and revealing the thermal world map." This evidence from the lessons supports teachers building on student prior learning related to a DCI. This was marked as inadequate because while the teacher materials do explicitly identify some expectations of prior student knowledge of the disciplinary core ideas, they do not identify and build upon the students' prior learning in the Science and Engineering Practices or the Crosscutting Concepts.
	Suggestions for improvement: Identify and builds on students' prior learning in all three dimensions, not just the DCIs. Include supports to teachers in what sorts of pre-teaching may need to occur in order for students to succeed in all three of the dimensions.
Criterion D.	**Specific evidence from materials and review team consensus reasoning:** All science information is accurate and grade level appropriate based on the DCIs used in this unit.
	Suggestions for improvement: Lesson 8's investigation to identify plastics has some safety concerns for this grade level. It is more effective and engaging for students to perform the lab, but far more dangerous. Offer specifics (such as alternatives for labs without fume hoods) in the lesson for safety procedures when a full lab is not available.
Criterion E.	**Specific evidence from materials and review team consensus reasoning:** i. Evidence of guidance for teachers to support differentiated instruction include: Lesson 5: The reflection sentence stems, prompts for explaining their model "Question to be answered by model" and the space provided for the explanation in graphic organizer. Lesson 15 "Teachers may need to provide additional guidance or scaffolds to help students complete parts of the project…provide students with a checklist of items that they need to complete…" [these guidance and scaffolds are not included in lesson materials] ii. Teachers are given some instructions to circulate through the room, noting where students are struggling in Lesson 5's Engage activity. Lesson 2 Explain (Teacher's Facilitator Notes): "Alternative if students need more guidance in graphing: Show students an example of a bar graph. Ask students to describe what the bar graph is showing them. Tell students they will be creating a bar graph that shows the whole class data. Ask students what they should label their x and y axes. If necessary, guide students in the labeling and numbering of the bar graph Explain to students that there are multiple ways to show data. Direct students to look at a pie chart. Ask students what the pie chart is showing. Explain to students that they will now be creating a pie chart to represent the data they collected. (students may or may not use a calculator)" iii. Lesson 2 Explain (Student Handout): "Challenge: Imagine if each person uses one less plastic item than they used the day before. Estimate how long it would take until the amount of plastic waste used in a day was cut in half (reduced by 50%)." [The Teacher's notes do not indicate if this is for students with high interest or everyone]

	The Unit Tracker is given as an optional activity "to record new learning" In Lesson 2-8, 10-13. In Lesson 7 teachers are given the option of having students create a brochure, comic, poster, etc. to describe how pollution gets caught in a gyre. In Lesson 10 there is an optional Fact vs. Fiction card sort. In Lesson 14 students may write a letter to manufacturers suggesting more environmentally friendly packaging. Rationale: Though the reviewers were able to tease out a few examples of differentiated instruction explicitly written in the teacher materials, guidance and support needed for students who are ELL, special needs or are well below grade level are not provided. Also, though extra and alternative activities are suggested, materials do not indicate if they are for extra support, high interest students or everyone.
	Suggestions for improvement: Consider adding possible modifications for students who are English Language Learners or have special needs. This could include alternative texts, closed captions for videos, pre-teaching and graphic organizers. Give multiple versions of student sheets with differentiation options such as: add a word bank, chunk the questions, limit the number of questions, use graphic organizers for notes, etc. Alternative reading selections should be provided for those who are challenged with reading and for those who need more challenging materials. Newsela provides reading materials at a variety of reading levels. Consider being more specific in teacher materials where gifted and/or students with high interest could benefit from an activity/reading.
Criterion F.	**Specific evidence from materials and review team consensus reasoning:** i. The unit tracker [improperly identified in the submission materials-- Unit tracker is actually attached to TFN for lesson 1, the document identified as lesson tracker is only for lesson 2]. This tool would be a strategy that has a lot of instructional strength to provide unit coherence for both teacher and student. It is mentioned as optional in the submitted materials. ii. Teacher materials reference all three dimensions in the standards identification, but strategies for linking the learning to all three dimensions are not explicit.
	Suggestions for improvement: The deliberate use of the Unit Tracker (shared in Lesson 1) could strengthen the unit coherence. This criterion could easily be improved to "adequate" or "extensive" by adding simple strategies at the end/beginning of lessons identifying connections between lessons and how to include all three dimensions. These additions could include: techniques for leveraging student questions to drive the learning, 'on-ramps' for returning to the ideas about the anchoring phenomena, and explicit strategies for students to connect the learning in all three dimensions.
Criterion G.	**Specific evidence from materials and review team consensus reasoning:** This unit does not have explicit mentions of scaffolded differentiation over time or any evident gradual adjustment of supports over time so that students are responsible for their learning. Reviewers noted that students do work in whole class, small groups and individually throughout several lessons. i.e. Lesson 6, students are allowed to gain confidence on their water cycle sketches, adding ideas and suggestions from partners, small groups and whole class suggestions. This scaffolds their learning as they are allowed to modify what they gain from videos and other texts to their own work. However, lessons are mostly teacher-led with little student individual input. Lesson 15's teacher notes includes mention of scaffolding options such as teachers providing additional guidance in the form of a checklist of items that are needed to be completed and due dates for each section.
	Suggestions for improvement: Include more independent choice and work opportunities. Make explicit mentions in the teacher and student materials how to differentiate so that 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.

Category III. Monitoring NGSS Student Progress

		Evidence of Quality?			
		None	Inadequate	Adequate	Extensive
Unit Criteria	A. **Monitoring 3D student performances**: Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions.		X		
	B. **Formative:** Embeds formative assessment processes throughout that evaluate student learning to inform instruction.		X		
	C. **Scoring guidance**: Includes aligned rubrics and scoring guidelines that provide guidance for interpreting student performance along the three dimensions to support teachers in (a) planning instruction and (b) providing ongoing feedback to students.			X	
	D. **Unbiased tasks/items**: Assesses student proficiency using methods, vocabulary, representations, and examples that are accessible and unbiased for all students.			X	
	E. **Coherent Assessment system:** Includes pre-, formative, summative, and self-assessment measures that assess three-dimensional learning.		X		
	F. **Opportunity to learn**: Provides multiple opportunities for students to demonstrate performance of practices connected with their understanding of disciplinary core ideas and crosscutting concepts and receive feedback			X	

Category III Rating: **1**

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

Criterion A.

Specific evidence from materials and review team consensus reasoning:

Lesson objectives in teacher materials are written to include all three dimensions. Upon examination of the student materials, the students are not authentically engaged in all three dimensions in every lesson.

Monitoring of student SEP and DCI development are evident in the rubrics and teacher facilitation notes, but evidence of the CCC are not evident in rubrics.

Reviewers identified 3 lessons where students are clearly engaged in three-dimensional learning:

Lesson 9 authentically engages all three dimensions when students predict (CCC) which marine animal would be most affected by a soda bottle cap using their model (SEP) and understanding of interactions of living and nonliving factors (DCI).

Lesson 12 Students are tasked with using their model to inform their argument from evidence: If you could eliminate toxins from entering one organism in your food chain which one would you remove and why? State a claim and support your claim using evidence from simulation data and your model to explain why removing toxins from this organism would have the greatest impact on the food chain.

Lesson 13 The conclusion: Construct an evidence-based explanation using your unit tracker and previous lessons to answer the question: How do plastics affect marine organisms and cause changes to ecosystems?

This unit could easily move from inadequate to adequate by slightly adjusting lessons so that students use practices with core ideas and crosscutting concepts to make sense of a phenomena. With only 3 of 15 lessons identified as students engaged in 3D learning, reviewers determined this was inadequate.

Suggestions for improvement:

Increase the number of lessons that elicit 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. Consider showing how students are engaged in the use of all three dimensions, not just including the vocabulary in teacher materials.

Criterion B.

Specific evidence from materials and review team consensus reasoning:

The reviewers of this lesson found evidence of attempted formative assessment: The front matter of the submission states "…with an SEP serving as a formative assessment within each lesson". However, it's not indicated within the lesson materials how to leverage the SEP to serve as a formative assessment.

While evaluating this unit reviewers found many opportunities for formative assessment. A few are included below:

	Lesson 5: Teacher will circulate and take note of where students seem to be struggling. Lesson 6: Part 1 introduction student poll of what happens when water vapor rises Exit tickets – Lesson 12 in the Elaborate activity. Inside-Outside Circle is used in two lessons. Card sort activity done in lessons 9, 10. Teachers are making observations and prompting students with worksheet and lab packets. This criterion is inadequate because though there are multiple opportunities for formative assessment throughout this unit, it is unclear if they are to be used as formative assessment as there is no direction on how to adapt instruction based on assessment results. The idea suggested in the submission of an SEP serving as a formative assessment within each lesson is not evident in the lessons.
	Suggestions for improvement: Indicate in the Teacher Facilitation Guide which assessments should be used as formative assessments. Give specific guidance as to what to do if formative assessments indicate that students did not meet the standards.
Criterion C.	**Specific evidence from materials and review team consensus reasoning:** Multiple rubrics for models and explanations are included. Some include sample responses and opportunities for revision. Though the rubrics are not 3D, they do support good modeling and constructing explanations Specifically, a model-scoring rubric is provided in Lessons 5-7, 9, 12 for the models produced in these lessons; in Lesson 8 and 13 for the CER conclusions and in Lesson 15 a rubric is provided for the culminating project. This criterion is adequate because the rubrics included are aligned to the SEPs and DCIs, and would benefit from more direct assessment of the CCCs. There are general mentions of opportunities for revision (evidence of ongoing feedback to students). The lessons that include these rubrics are the lessons reviewers identified as being authentically three-dimensional in Category III criterion A. (Lessons 9, 12, and 13).
	Suggestions for improvement: Include more specific guidance for interpreting the student performances along the three dimensions to support teachers planning instruction and providing ongoing feedback to students in lessons other than 9, 12, and 13.
Criterion D.	**Specific evidence from materials and review team consensus reasoning:** Reviewers understand that this unit was originally written for students in California, near the ocean. This is unbiased for the original intended audience. When thinking across the United States, and showcasing this unit for others to hold up as an example of unbiased, some students may have little familiarity with oceans, beaches and marine environments. Because beach clean ups are not accessible for all students nationally, teachers may have to add additional exposure to video/photos in order for students to make sense of the unit objectives. It was very helpful to have the option to complete the bullous dissection lesson virtually.
	Suggestions for improvement: Consider acknowledging in the front matter of the unit options for people not near a marine ecosystem. The Teacher's Guide could suggest ways a teacher could "stage" the beach visit in their own classroom.
Criterion E.	**Specific evidence from materials and review team consensus reasoning:** No coherent assessment system is identified. Reviewers note in Lesson 13 the argumentative writing assignment is an optional summative assessment for the unit. Lesson 15's project is a summative assessment. Students are given the opportunity to self-assess. Rationale: There are rich opportunities for assessment evident in every lesson, but these opportunities are not explicitly identified in the teacher or student materials. The assessments do not include students using an SEP and CCC to explain a DCI. By revisiting the assessment used for this unit, this criterion could be moved to adequate.
	Suggestions for improvement:

	Consider adding pre-assessments with teacher guidance how to use these to inform instruction, self-assessment opportunities and labeling assessments as formative or summative. Also consider adding additional alternative assessments for diverse learners.
Criterion F.	**Specific evidence from materials and review team consensus reasoning:** In Lesson 1 students are involved in learning about each of the CCC and ask questions about each and related phenomenon. This showcases a best practice in leveraging the CCC and having students receive feedback. This was the only lesson where students explicitly connect their understandings to the CCC and receive peer feedback. The following lessons support opportunities for student to demonstrate performance of practice connected with their understanding of the DCI without explicit student use of the CCC. Lesson 2, 3, 4, 10, 11 - Analysis Questions, Reflection Questions Lesson 5, 6, 7, 12 - Model with Explanation Lesson 8 - Experiment Conclusion with Claim and Evidence and peer review of conclusion Lesson 9 - Model with Explanation and Conclusion Lesson 10, 11 - Agree/Disagree Activity students revise misconceptions/note change in opinion Lesson 13 - Conclusion Lesson 14 - Letter to a Manufacturer Lesson 15 - Design Project This criterion was adequate for the extensive evidence of SEP and DCI use. It would be extensive if CCCs were leveraged directly and student ideas were what informed the learning. Much of the activities are teacher driven.
	Suggestions for improvement: Focus more on student-driven learning through this process and include more explicit references for CCC in opportunities for peer feedback and sense making.

Summary Comments

Though this unit is rated "R", this submission shows a lot of promise and potential. Reviewers were encouraged by this because it is one if the best submissions we have evaluated. There wasn't a particular criterion that was exceptional, but there was quality across the unit so that it would be valuable to share this with the public as a "Quality work in progress" while it undergoes revisions.

Reviewers appreciate that there are multiple ways to leverage and use the submitted materials and it is implied that the lessons build and support connecting knowledge but that is not explicit in submitted materials. Because reviewers were asked to evaluate the submission as a unit, the ratings for unit coherence lowered the overall score of the submission.

Easy ways to increase unit coherence would be to have students continue to add to one model, rather than making multiple separate models and leveraging the unit tracker document to show connections across the entire unit. This document has potential to significantly strengthen unit coherence.

In reviewing this unit, authors should also complete a more rigorous editing process to catch typos and distracting formatting errors.

There is still room/need for improvement, significantly the need for more student-driven/student-centered investigations and in support materials for students with learning issues.

Unit Rating Scale for Category I (Criteria A–F):

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

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

1: Adequate evidence for some criteria in Category I, but inadequate/no evidence for at least

one criterion A–C

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

***Unit* rating scale for Category II (Criteria A-G):**

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

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

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

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

Unit Rating scale for Category III (Criteria A–F):

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

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

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

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

Overall Rating:

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)