# Community Waters
# EQuIP Rubric for Science Evaluation

**Unit Name:** Community Waters
**Grade:** 4
**Date of Review:** January 2019
**Overall Rating (N, R, E/I, E):** E/I
*Category I: NGSS 3D Design Score (0, 1, 2, 3)*: 2
*Category II: NGSS Instructional Supports Score (0, 1, 2, 3)*: 2
*Category III: Monitoring NGSS Student Progress Score (0, 1, 2, 3)*: 2
*Total Score (0–9)*: 6
*Click here to see scoring guidelines*

This review was conducted by the Science Peer Review Panel using the EQuIP Rubric for Science.

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

## Summary Comments

The Achieve Science Peer Review Panel reviewers found sufficient evidence to support the Community Waters grade four unit as an Example of High-quality Next Generation Science Standards (NGSS) Design if Improved (E/I).

The review team appreciates the developer's attention to engaging students in the three-dimensions of science. The variety of modalities with which students will interact and respond to the materials is worth applauding. The unit presents extensive evidence of phenomena-based instruction and design for the NGSS, but would benefit from some improvement in building progressions over time and providing scoring guidance for teachers.

Overall Notes to Highlight:

- The review team advocates that curriculum materials include suggestions for how educators may make adjustments to ensure the phenomenon is relevant to all students, no matter where they live or what their background is. The additional resources (e.g., Teacher Guides for individual schools) can be kept as exemplars to model how other communities may support their educators.

- The review team recommends that the progression of the claimed Science and Engineering Practices is addressed throughout the unit with increased fidelity. As this is a lengthy unit, progress with students using *and developing* the Science and Engineering Practices is recommended to be more intentional. For example, the unit could be revised to scaffold students from being given an investigation procedure to creating an investigation procedure collaboratively.
- In addition to referencing the resources provided by the Ambitious Science Teaching Model, the review team advocates that the unit is revised to include explicit call-outs throughout the lessons that address the needs of diverse learners. The review team found a lack of evidence within the individual lessons of guidance for educators on how to support all learners in the context of each task.
- For the consideration of accessibility for and feasibility to educators nationwide, the Achieve Peer Review Panel members recommend reflection on the following:
    - This unit is stated to take 14–20, 45–60 minute blocks. The unit covers two science NGSS Performance Expectations (PEs) (three science DCIs, six total DCIs). There are fourteen total science PEs (15 science DCIs, 18 total DCIs) outlined for fourth grade by the NGSS. With approximately 168 days of school in the Seattle Public School System, as an example, 12% of the school year would dedicated to only two science PEs. The review team recommends that the curriculum capitalizes on any meaningful opportunity to draw in additional science Performance Expectations.
    - The materials were found to be cumbersome to navigate. Classroom educators may be better served if each lesson were a separate document so the header/footer of every page could include a lesson number. All individual lessons could then be bundled into one pdf.

While this serves as a summary of the review team's overall perspective, please review all specific categories and criterion, including the individual suggestions for improvement.

PHENOMENON-SPECIFIC CONSIDERATION:

- Consider adding a teacher note regarding sensitivity to the damaging effects of flooding. Students in a class may have experienced loss of property, including but not limited to a home, or the loss of a family member or friend due to flooding. Teachers should be provided with guidance on how to approach this topic with sensitivity to student experience.

SAFETY CONCERNS:

- The note included on Teacher Manual, page 31 about potential mold should come with direction to use proper personal protective equipment (mask, gloves, goggles) when handling/cleaning up mold. See NIH webpage on mold: https://www.niehs.nih.gov/health/topics/agents/mold/index.cfm, OSHA: https://www.osha.gov/SLTC/molds/hazards.html, or EPA https://www.epa.gov/mold
    - Instead of explaining that mold may grow, the note should focus on what can be done to reduce or prevent mold growth.
- As it is never recommended to drive through flood waters, so please consider finding/editing video to avoid footage of cars driving through flood water. The current phenomena video shown in Lesson 1 may serve as an inappropriate model for students.

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

# Category I. NGSS 3D Design

Score: 2

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

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

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

The reviewers found extensive evidence that learning is driven by students making sense of phenomena and/or designing solutions to a problem because the anchoring phenomenon and the investigation-level phenomena are a common shared experience. The use of a class public record board and consensus model keeps the phenomena (unit, investigation, and activity) in focus. The anchoring phenomenon, "Why does flooding happen in Seattle" truly drives all of the learning and sense-making in this unit.

Student learning is focused on supporting students to better make sense of the phenomenon or design a better solution to a problem. Students regularly return to the phenomenon and/or problem to add layers of explanation/iterate on solutions based on learning. The following are examples of evidence for where this is happening in the materials:

- Explanatory model (individual), Consensus Model (whole group pages 50, 62, 76, 88, 99, 100, 111) and Summary Table (whole group, pages 44, 61, 71, 87, 99, 111, 145) are revisited throughout unit.
- page 35, Lesson 1, Procedure, “Start with a turn-and-talk to have students share observations about what they saw and heard with a partner. Then have individuals share what they noticed with the whole class (as you write them down on the board). *Has anybody in the class experienced any of these things themselves?”*
- page 36, Lesson 1, Reflect and Explain, “The explanatory model scaffold is intended to help students explain **their** understanding of stormwater. It is a working recording that they can add to or start over as the unit progresses and their understanding builds. It is important they have enough time working on this model to accurately represent their thinking.”
- page 37, Lesson 1, Reflect and Explain, “What hypotheses do students have about what kinds of things happen to stormwater in the city and why flooding occurs? Discuss as a class and add ideas to the List of Hypotheses as you do so.” However, this list of hypotheses is not returned to by students at any other time throughout the unit.
- page 37, Lesson 1, Apply and Extend, “On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference.” However, this question sheet is not returned to by students at any other time throughout the unit.

- page 39, Lesson 1, Planning Next Steps, "Review the **Public Records**. Do the students' hypotheses and/or questions lead naturally into the lessons to come? If so, they could become the focus question of the lesson and make the unit more student driven. "
- page 39, Lesson 1, Planning Next Steps, "Review the **Public Records**. Do the students' hypotheses and/or questions lead naturally into the lessons to come? If so, they could become the focus question of the lesson and make the unit more student driven."
- page 44, Lesson 2, Preparation, "*Adjust the Focus question if students came up with an appropriate hypothesis or question in Lesson 1."
- page 46, Lesson 2, Procedure, "Have students turn-and-talk about their experiences and prior observations of when it rains lightly and when it rains heavily on bare ground (not covered with concrete or plants). What happens to the soil? What does the soil look like before and after it rains? OPTION: Have students independently write/draw about their experiences first before partner talk."
- page 48, Lesson 2, Procedure, #5, "Are there any other observations students would add from their own experiences outside of this investigation?"

All the student learning across the three dimensions targeted by the unit is in service of students making sense of phenomena or designing solutions to a problem.

- The engineering problem is integrated with the DCI: 4-ESS3.B Element – *A variety of natural hazards result from natural processes and humans cannot eliminate the hazards but can take steps to reduce their impacts.*
- In lessons 6 and 7, students explore their own community for evidence of stormwater runoff.
- In lesson 8, students define the problem and begin to develop a solution. Students return to their original thinking to revise their models (individually and as a class) and add questions to class public record.
- In lessons 12 and 13, students create a model and test that model against the criteria and constraints presented.

Suggestions for Improvement
N/A

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

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

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

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

## Rating for Criterion I.B. Three Dimensions: ADEQUATE

The reviewers found adequate evidence that the materials give students opportunities to build understanding of grade-appropriate elements of the three dimensions because there are numerous examples of opportunities for students to develop and use elements of each of the three dimensions in this unit. All the activities are at the grade-appropriate level for a fourth-grade student and aid in student sense-making of the anchoring and lesson-level phenomena.

***Science and Engineering Practices (SEPs): ADEQUATE***

The reviewers found adequate evidence that students have the opportunity to use or develop the SEPs Claimed by the Developer:

- **Asking Questions and Defining Problems**
  - *Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.*
- **Planning and Carrying Out Investigations**
  - Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.
  - Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
- **Constructing Explanations and Designing Solutions**
  - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.

Students explicitly use the SEP elements to make sense of the phenomenon or to solve a problem. Numerous opportunities for students to use and develop the SEPS exist. All activities are at grade appropriate levels.

- page 39, Lesson 1, Planning Next Steps: "In the next lesson, students use models to make basic observations about how rainwater interacts with soil and use some readings to build their understanding of groundwater and erosion."
- page 43, Lesson 2, Objectives and Overview: "**Learning Target:** I make observations and read texts to understand what happens when rain falls on soil."
- page 47, Lesson 2, Back-Pocket Questions: "Observations What did you see happen to the soil as it rains? What happens as the rainwater hits the land? Where did the water end up? How does the tub look different?"
- page 48, Lesson 2, Procedure, #5: "What did students **observe** from their own models and other's models that could be recorded on the table? Students can look at their sketches and written observations as well as the runoff water they poured back into their rain jars."
- page 60, Lesson 3, Explore and Investigate: "*RAINY day:* record their observations about the direction of water flow, any pollution they see in the water, and any areas of flooding. Students could keep maps under covered areas and write on them after exploring OR use a plastic bag to cover the map while writing."
- page 69, Lesson 4, Preparation: "Do you want to provide the students the investigation procedure (provided below) or have them write their own as a class?"
- page 69, Lesson 4, Preparation: "**Part II: Data analysis during math time?** At the beginning of Part II in this lesson students will be using mathematics as they analyze and interpret data. This is a Science and Engineering Practice that overlaps nicely with math standards."
- page 73, Lesson 4, Procedure, Part II: "Give students think time, then turn-and-talk with a partner about their answer to the investigative question: How do plants affect stormwater runoff? What evidence from the investigation supports their conclusion? Give students time to write a conclusion on the front of the data sheet (question 1) to answer the investigation question."
- page 144, Lesson 10: Students will be researching a variety of solutions. Students do not generate solutions.

***Disciplinary Core Ideas (DCIs): ADEQUATE***

Numerous examples of opportunities for students to develop and use elements of the Disciplinary Core Ideas (DCIs) exist in this unit. All of the activities are at the grade appropriate level for 4th grade student and aid in student sense-making of the anchoring and lesson-level phenomena.

Claimed by Developer:

- **ESS2.A: Earth Materials and Systems**
  - *Rainfall helps to shape the land and affects the types of living things found in a region. Water, ice, wind, living organisms, and gravity break rocks, soils, and sediments into smaller particles and move them around.*
- **ESS2.E: Biogeology**
  - *Living things affect the physical characteristics of their regions.*
- **ESS3.B: Natural Hazards**
  - *A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.*
- **ETS1.A: Defining and Delimiting Engineering Problems**
  - *Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.*
- **ETS1.B: Developing Possible Solutions**
  - *Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.*
  - *At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.*
  - *Testing a solution involves investigating how well it performs under a range of likely conditions.*
  - *Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.*
- **ETS1.C: Optimizing the Design Solution**
  - *Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.*

Engineering lessons require students to acquire and use elements of DCIs from physical, life, or Earth and space sciences together with elements of DCIs from engineering design (ETS) to solve design problems.

ESS2.A: Earth Materials and Systems

- Lesson 1 highlights the effects that too much stormwater runoff can have.
- Lesson 2 has students investigate and model how rainfall shapes the land.
- In Lesson 3, students investigate how rainfall shapes/affects their schoolyard.
- In Lesson 4, students investigate how plants affect stormwater runoff.
- Lesson 5 focuses on how runoff can pick up and move dirt and sand.
- In Lesson 6, students investigate stormwater runoff in their community.

- In Lesson 7, students use the previous lessons about stormwater runoff and its effect on land to choose a problem site.

ESS2.E: Biogeology: *Living things affect the physical characteristics of their regions*

- In Lesson 6, students consider how humans have an impact on stormwater runoff within their community.
- In Lesson 7, students chose potential locations for their problem site taking into consideration the impervious surfaces. They also consider the impact that their solution might have on the area selected. Therefore, they demonstrate that living things can affect both positively and negatively a region.
- In Lesson 12, students test their models to collect data on the impact that their solution might have in the real world.

ESS3.B: Natural Hazards: *A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts.*

- In Lesson 1, students are presented with the impact that flooding has on the city of Seattle.
- In Lesson 3, students investigate the impact that water runoff has within their own schoolyard.
- In Lesson 5, students learn about their local stormwater systems and their purpose.
- In Lesson 6, students explore their community collecting evidence of how stormwater runoff has been reduced as well as how it needs to be controlled.
- In Lesson 7, students use their understanding of flooding to choose a problem site.
- In Lesson 10, students research solutions to other stormwater solutions.
- In Lesson 12, students create a model of their solution to reduce the impact of stormwater runoff.
- In Lesson 15, students share the results of their solutions with other groups and consider other solutions.

ETS1.A: Defining and Delimiting Engineering Problems

- *Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.*

ETS1.B: Developing Possible Solutions

- *Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions.*
- *At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs.*
- *Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved.*
- *Testing a solution involves investigating how well it performs under a range of likely conditions.*

ETS1.C: Optimizing the Design Solution

- *Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.*
    - In Lessons 10–15, Students use the Engineering Design Process to create a solution to a stormwater runoff problem within their community/schoolyard. This solution should be tested to determine what best solves the problem given criteria and constraints.

***Crosscutting Concepts (CCCs): ADEQUATE***

The reviewers found adequate evidence that students have the opportunity to use or develop the CCCs in this unit because students have multiple opportunities to use and develop the CCCs while making sense of the phenomenon with partners, individually, and as a class. Consensus models are used to show sense-making that is revised with new understanding using the CCC category of Cause and Effect. One consideration to the authors is to include how students are being asked to use their understanding of cause and effect to explain change.

Claimed by Developer:

- **Cause and Effect**
    - *Cause and effect relationships are routinely identified, tested, and used to explain change.*

Numerous examples of opportunities for students to develop and use elements of the Crosscutting Concepts (CCCs) exist in this unit. All of the activities are at the grade-appropriate level for a 4th grade student and aid in student sense-making of the anchoring and lesson level phenomena.

- page 43, Lesson 1, Objectives and Overview, "Students have many experiences with rain and the effects of rain on land from their own lives without necessarily thinking about what is happening to cause the mud, puddles, and flow that they see. This lesson gives them the opportunity to explore that more deeply."
    - "Students make and share observations about the effects of rain on land."
- page 47, Lesson 2, Back-Pocket Questions "Cause and Effect - Why did less water end up in the bucket than was poured over the soil? Where did the water go? How did sand and gravel get into the bucket? Are there more of some materials than others in the bucket? Why were some materials moved more than others?"
- page 70, Lesson 4, Procedures, "Tell students that they will be running an investigation to compare plants on slopes with bare soil and see if there is any difference in the soil erosion and runoff. Share the investigation question and have students write it in their science journals: **What is the effect of plants on runoff and erosion?**"
- Green Solutions to Stormwater Runoff Video, Lesson 10, shows examples of people at Green Stormwater Infrastructure ("GSI") as well as people in a community identifying cause and effect relationships related to different tools that help manage run off. These include pros and cons of vegetative roofs and green walls, rain gardens, cisterns, permeable pavement, roadside rain gardens, and tree retention and planting. The video goes over the effects of these tools and why some are better for certain situations.

<u>Suggestions for Improvement</u>

*SEPs* – An area that the review team feels could be stronger is with planning investigations. By engaging in discussions students can have their misconceptions addressed as well as share other creative ideas to collect the same data. Additionally, consider how students may first generate, test, and compare their own solutions, before researching already existing solutions.

*DCIs* – In order to move this unit from adequate to extensive, connections to DCIs in other domains would give it some additional strength. As suggested below in Criterion I.E, creating a connection with life science during Lesson 4 would help strengthen the unit.

*CCCs* – CCCs could be strengthened by demonstrating how they are connected in other domains of science as well as ELA and Math. CCCs are designed to bridge concepts, which could be helpful with the previous suggestions to link life science to this unit.

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

## Rating for Criterion I.C. Integrating the Three Dimensions: EXTENSIVE

The reviewers found extensive evidence that student performances integrate elements of the three dimensions in service of figuring out phenomena and/or designing solutions to problems because the lesson is designed to build student proficiency in at least one grade-appropriate element from each of the three dimensions. The three dimensions intentionally work together to help students explain a phenomenon or design solutions to a problem. All three dimensions are necessary for sense-making and problem-solving.

The lessons within this unit integrate each of the three-dimensions to make sense of the phenomenon of why and how stormwater runoff can cause problems. For example, each dimension is explicitly described in the lesson overview and there is evidence in each lesson of their integration. Students continue to use the three dimensions in the engineering aspect of this unit. They apply the science taught in the first half of the unit to design a solution to stormwater runoff. The connection between the science and the engineering is clear through the use of the three dimensions.

- page 70, Lesson 4, Procedures, "Tell students that they will be running an investigation to compare plants on slopes with bare soil and see if there is any difference in the soil erosion and runoff. Share the investigation question and have students write it in their science journals: **What is the effect of plants on runoff and erosion?**"
- page 188, Lesson 15, Examining Student Work, "The presentations of the students are the summative assessments of the unit, the culmination of learning about what is going on with stormwater at the school, local and city level, and how people are designing and building solutions to stormwater runoff problems using an engineering design process."

Suggestions for Improvement
N/A

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

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

## Rating for Criterion I.D. Unit Coherence: ADEQUATE

The reviewers found adequate evidence that lessons fit together coherently to target a set of performance expectations because each lesson builds on each other resulting in an evolving understanding of science ideas and concepts needed to explain the phenomenon and design a solution to a problem.

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.

- page 39, Lesson 1, Planning Next Steps, "Review the **Public Records**. Do the student's hypotheses and/or questions lead naturally into the lessons to come? If so, they could become the focus question of the lesson and make the unit more student driven."
- page 44, Lesson 2, Preparation, "*Adjust the Focus question if students came up with an appropriate hypothesis or question in Lesson 1"
- page 45, Lesson 2, Preparation, "**Using a Consensus Model** While students have and can update their own models with their understanding about stormwater, a classroom consensus model can be a good way to visually review and record the main concepts and key terms from each lesson."
- page 50, Lesson 2, Procedure, #9, optional "Introduce the poster-sketch of the explanatory model you created earlier and pose the question to the class as to how today's learning might be represented on the model.
- page 76 "Uncover the class Consensus Model and either discuss what to add to it as a class or ask students to write on post its things they feel should be added."

Limited guidance is provided to support cultivation of student questions. Student questions do not drive the current lesson and questions unanswered by the sense-making opportunities in that lesson do not drive the next lesson.

- page 37, Lesson 1, Reflect and Explain, "What hypotheses do students have about what kinds of things happen to stormwater in the city and why flooding occurs? Discuss as a class and add ideas to the List of Hypotheses as you do so." However, this list of hypotheses is not returned to by students at any other time throughout the unit.
- page 37, Lesson 1, Apply and extend, "On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference." However, this question sheet is not returned to by students at any other time throughout the unit.

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

- page 48, Lesson 2, Procedure, #5 "Introduce the Class Summary Table as a place where the class will be recording their observations and learning after each lesson. Having a shared summary on the wall provides the students something they can look back on when they are trying to understand what is happening with stormwater in their schoolyard or neighborhood."

Suggestions for Improvement

What is the "need to engage" in each next lesson (felt by the students)? While the coherence of the unit is strong, and each lesson does thematically build on the last, the reviewers hesitate to give an "extensive" score because each lesson is concluded with a frame of what was learned and how it contributes to the overall understanding, but does not provide opportunity for students to ask questions that will drive the motivation for learning in the next lesson. Consider adding a column to the Summary Table, "What questions do we still have/need answered?"

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

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

## Rating for Criterion I.E. Multiple Science Domains: ADEQUATE

The reviewers found adequate evidence that links are made across the science domains when appropriate because the phenomenon used in the unit is appropriately addressed with the chosen science domains; students can make sense of the phenomenon using only one domain.

- page 73, Lesson 4, "Have students pull up some of the ground cover in the tubs and observe the roots and soil.
- page 73, Lesson 4, "For a close-up on some roots, skip to 5:00 and watch from there. Link can be found at communitywaters.org or https://www.youtube.com/watch?v=im4HVXMGI68"
- page 74, Lesson 4, "Project the information about plant roots. How can knowing about roots help us explain our data?"
- page 74, Lesson 4 "On this side of the sheet, the students should show how/why plants interact with the water and how it affects runoff and erosion using what they learned from patterns in the data as well as prior videos or readings."
- page 76, Lesson 4, "Uncover the class Consensus Model and either discuss what to add to it as a class or ask students to write on post its things they feel should be added. Where on the model could you show plants keeping soil from eroding with their roots?"

Suggestions for Improvement
An "adequate" rating has been assigned by reviewers because students are able to make sense of the phenomenon presented using only one science domain. To move to "extensive," the materials must contain evidence of intentional links across multiple science domains.

Consider calling out for educators the connections to DCI LS1.A Structure and Function during Lesson 4.

**I.F. Math and ELA:** Provides grade-appropriate connection(s) to the Common Core State Standards in Mathematics and/or English Language Arts & Literacy in History/Social Studies, Science and Technical Subjects.

## Rating for Criterion I.F. Math and ELA: ADEQUATE

The reviewers found adequate evidence that the materials provide grade-appropriate connections to mathematics, English language arts (ELA), history, social studies, or technical standards. The unit provides extensive opportunities for students to engage in listening, speaking, writing, and reading throughout unit, utilizing a large variety of formats. Expectations for each ELA connection opportunity are appropriately rigorous. There are missed opportunities to intentionally, and more fully, lift up grade-appropriate math skills.

Students use grade level reading skills to develop understanding and explanations of the scientific concepts/phenomena/results. Students use grade level writing skills to explain and communicate their understanding of the scientific concepts/phenomena/results. Students have opportunities for verbal classroom discourse.

- There are CCSS ELA references on pages 144, 152, 174, and 184.
- page 26, Unit Storyline, Lesson 2: “Students create “rain” on a tub with soil in it, record observations, and relate them to readings about groundwater & erosion.”
- page 39, Lesson 1, Planning Next Steps: “**In the next lesson,** students use models to make basic observations about how rainwater interacts with soil and use some readings to build their understanding of groundwater and erosion.”
- page 43, Lesson 2, Objectives and Overview: “**Learning Target:** I make observations and read texts to understand what happens when rain falls on soil.”
- page 45, Lesson 2, Preparation: “**Decide on Readings:** Select 2 appropriate readings about groundwater, runoff, and erosion that students can read and compare to the physical model they create. These readings could be from Appendix 3: Student Readings (also on communitywaters.org) or similar short readings from library books or other sources.”
- page 48, Lesson 2, Procedure, #6: “NOTE: This reading task could happen during reading time as an ELA activity. Provide students the two readings you chose earlier.”
- page 48, Lesson 2, Procedure, #6: “Review the observations recorded on the Class Summary Table (with emphasis on observations that relate to runoff and groundwater) and have students turn and talk about anything they learned from the readings that helps them explain their observations.”
    - CCSS.ELA-LITERACY.RI.4.6 *Compare and contrast a firsthand and secondhand account of the same event or topic; describe the differences in focus and the information provided.*
- page 49, Lesson 2, Procedure, #6: “Students pick something that was in the readings that is supported by their observations of the models and write about the connection in their science journals”
    - CCSS.ELA-LITERACY.RI.4.9 *Integrate information from two texts on the same topic in order to write or speak about the subject knowledgeably.*
- page 73, Lesson 4, Procedure, Part II: “Give students think time, then turn-and-talk with a partner about their answer to the investigative question: How do plants affect stormwater runoff? What evidence from the investigation supports their conclusion? Give students time to write a conclusion on the front of the data sheet (question 1) to answer the investigation question.”
- page 143, Lesson 10, Objectives and Overview: “**Learning Target**: I can do research to learn more about stormwater solutions.”
- page 144, Lesson 10, Preparation: “Consider whether the reading and taking notes that is done in this lesson could fit into your ELA time.”
- page 146, Lesson 10: “Procedure, “Students will be reading about possible solutions and taking notes about each. Notes will be used later to compare the various solutions and see which ones best fit the criteria and constraints of our site.”
- page 147, Lesson 10, Explore and Investigate: “ELA Connection: Read and interpret informational text and graphics. Give students time to read and take notes about the different solutions presented in the Stormwater Solutions Research.”
- page 178, Lesson 14, Reflect and Explain: “ELA Connection: Write a conclusion as a research-based argument essay. Each individual student will now be writing a conclusion about what they have learned about the solution their group modeled. They will be making a claim about the question: **‘How effective is the solution I modeled?’**”

- page 185, Lesson 15, Explore and Investigate: "ELA Connection: Students expand on written conclusion and communicate results with peers."

There are missed opportunities to connect to and for students to apply math skills / concepts. Students are asked to use math skills that are not grade-level appropriate.

- page 69, Lesson 4, Preparation: "**Part II: Data analysis during math time?** At the beginning of Part II in this lesson students will be using mathematics as they analyze and interpret data. This is a Science and Engineering Practice that overlaps nicely with math standards. Depending on the timing of your week and/or where your students are in their math lessons, this section could be done as a part of your math class."
- page 72, Lesson 4, Procedure, Part II: "After collecting data, scientists need to analyze and interpret it to see what they learned from it. Have student groups discuss what patterns they see in the data. What do they notice about differences between the slopes with plants and no plants? How did the amount of erosion change? Did the water samples look any different? Either in small groups or as a class, discuss how you could use mathematics to interpret the data. Would you want to put it in a chart, or find the mean or median of the numbers for each slope? If you average the numbers could you subtract one from the other to show the difference between the two?"
- page 137, Lesson 9, Reflect and Explain, call-out box: "**Math Time?** It is not needed for the purposes of this unit, but consider whether you want to do any deeper analysis of the differences in student results during math time. Could it help you reinforce the Measurement & Data standards you are working on?" CCSS.MATH.CONTENT.4.MD.B.4 CCSS.MATH.CONTENT.4.MD.A.1 CCSS.MATH.CONTENT.4.MD.A.1

Suggestions for Improvement

In Lesson 2, consider adding language that prompts teachers to set a purpose for reading. The question "What do the readings help us understand about our observations?" is indicated to be intended for the Turn-and-Talk. (CCSS.ELA-LITERACY.RF.4.4.A Read grade-level text with purpose and understanding.)

Finding averages has not yet been introduced through Common Core State Standards for Mathematics by the time students have reached fourth grade. Engaging students in finding averages is not appropriate for this grade level. If asking students to compare averages, there must first be a basic introduction to what "average" means.

Consider referencing the relevant CCSS Mathematics codes, throughout the unit, in addition to the CCSS ELA codes included. Ideally, materials should not only recognize the connections, but design learning in a way that reinforces these connections.

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

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

## Category II. NGSS Instructional Supports

Score: **2**

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

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

### Rating for Criterion II.A. Relevance and Authority: ADEQUATE

The reviewers found adequate evidence that the materials engage students in authentic and meaningful scenarios that reflect the real world because there is sufficient evidence that the phenomenon and the design problem are set up in a way that connects with students' lives.

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

- page 26, Unit Storyline, Lesson 3: "Students walk their school grounds as a class and fill in where water goes…"
- page 35, Lesson 1, Procedure: "Tell students they are going to see a video showing some effects of too much stormwater runoff in Seattle. While watching, they should be making observations: what problems are being caused in the video?" Direct link: https://vimeo.com/238148653/
- page 60, Lesson 3, Explore and Investigate: "*RAINY day:* record their observations about the direction of water flow, any pollution they see in the water, and any areas of flooding. Students could keep maps under covered areas and write on them after exploring OR use a plastic bag to cover the map while writing."

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

- page 26, Unit Storyline, Lesson 5: "Students analyze maps to determine where their stormwater goes and watch a video about the problems it causes."
- page 27, Unit Storyline, Lesson 7: "The class chooses a local site with a stormwater problem…"
- On website https://communitywaters.org/teaching-community-waters/lesson-1-flooding-in-seattle/ Not in lesson plan: "*NEW* – Pre-Unit Take Home Interview – This worksheet is designed for students to take home and interview an adult in their household. It is intended to support incorporation of cultural understandings into discussions about stormwater. It could be handed out before starting the lesson or after Lesson 1 is complete. We have translations of this document (including Amharic, Arabic, Chinese, Somali, Spanish, Tagalog, Tagrini and Vietnamese)."
- A Take-Home Interview is also referenced in Lesson 14
- page 40, Lesson 1, Teacher Reflection Worksheet: "Name and describe one issue around equity that arose during this lesson. Consider change(s) to the next lesson to help address this issue. Here are some categories to help you name a specific issue of equity:"

- page 88, Lesson 5, reflect and Explain: "Challenge students to sketch a picture showing an effect the stormwater from their community could have **after** it flows into a storm drain. They should include labels. OR Have students write a story about a place and the people and/or animals that would be affected by too much stormwater runoff (could be flooding or pollution). OR In pairs or small groups: Discuss why stormwater runoff matters to people and places. Who or what might be affected? How?
- On page 123 there are optional interviews of stakeholders.

The unit 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.

- page 37, Lesson 1, Apply and extend: "On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference.: ***However, this question sheet is not returned to by students at any other time throughout the unit.***
- page 39, Lesson 1, Planning Next Steps: "Review the **Public Records**. Do the student's hypotheses and/or questions lead naturally into the lessons to come? If so, they could become the focus question of the lesson and make the unit more student driven."
- page 39, Lesson 1, Planning Next Steps: "If your students would benefit more from observing water interacting with soil in the real world first, you could skip to lesson 3 where they investigate (and pour water on surfaces in) the schoolyard, and then come back to the readings (and potentially the water on soil investigation) afterwards."
- page 44, Lesson 2, Preparation: "* Adjust the Focus question if students came up with an appropriate hypothesis or question in Lesson 1."
- page 49, Lesson 2, Procedure, #8: "Provide sticky notes to students to write down one idea on how today's learning can help us explain what happens to stormwater in the city. After writing their idea down they can put the sticky note in the last column on the class summary table. Then sort the provided ideas and decide as a class what to write in that column."

Suggestions for Improvement

Since this unit is designed to address the flooding in the Seattle area, much of the context presented is directly related to one specific region. The website that contains the links and additional resources is developed for the Seattle area. The specific location does provide some limitations. However, many of the lessons and the engineering design challenge could be connected to other areas that also have flooding issues. Consider adding language throughout the unit to guide educators, nationwide, in making connections to their local community.

While the Summary Table and Consensus Model are referenced throughout the unit, there are not many explicit opportunities outlined for students to ask, answer, and revise questions. A suggestion would be to add an additional column to the Summary Table to address discourse (questions and answers) during the unit to monitor student sense-making.

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

## Rating for Criterion II.B. Student Ideas: ADEQUATE

The reviewers found adequate evidence that the materials provide students with opportunities to both share their ideas and thinking and respond to feedback on their ideas. There are appropriate ways for students to make their thinking explicit and there are feedback loops (from the teacher and/or peers as appropriate) to help them to improve their understanding.

**Student ideas drive some instruction:**

- Classroom discourse focuses on explicitly expressing and clarifying student reasoning.
- Students have opportunities to share ideas and feedback with each other directly.
- Students discuss their own and each other's ideas and can describe connections and/or disparate ideas.
- page 46, Lesson 2, Procedure: "Have students turn-and-talk about their experiences and prior observations of when it rains lightly and when it rains heavily on bare ground (not covered with concrete or plants). What happens to the soil? What does the soil look like before and after it rains? *OPTION: Have students independently write/draw about their experiences first before partner talk."*
- page 48, Lesson 2, Procedure, #5: "Introduce the Class Summary Table as a place where the class will be recording their observations and learning after each lesson. Having a shared summary on the wall provides the students something they can look back on when they are trying to understand what is happening with stormwater in their schoolyard or neighborhood"

**Student Reasoning:** Student artifacts include elaborations (which may be written, oral, pictorial, and kinesthetic, modeling) of reasoning behind their answers, and shows how students' reflective thinking has changed evolved time.

- page 36, Lesson 1, Reflect and Extend: "The explanatory model scaffold is intended to help students explain **their** understanding of stormwater. It is a working recording that they can add to or start over as the unit progresses and their understanding builds."
- page 50, Lesson 2, Procedure, #9: optional "Introduce the poster-sketch of the explanatory model you created earlier and pose the question to the class as to how today's learning might be represented on the model.
- page 113: "Give each other feedback by agreeing or disagreeing and saying why you think the evidence they picked supports their idea or if you think another piece of evidence from our summary table would be stronger. After the discussion, you will have time to add more evidence or clarify your ideas on your models."

**Eliciting Student Ideas:** The lesson provides supports to teachers for eliciting student ideas.

- page 35, Lesson 1, Procedure: "Start with a turn-and-talk to have students share observations about what they saw and heard with a partner. Then have individuals share what they noticed with the whole class (as you write them down on the board). *Has anybody in the class experienced any of these things themselves?"*
- page 49, Lesson 2, Procedure, #8: "Provide sticky notes to students to write down one idea on how today's learning can help us explain what happens to stormwater in the city. After writing their idea down they can put the sticky note in the last column on the class summary table. Then sort the provided ideas and decide as a class what to write in that column."

Teacher/student feedback is limited in modality and does not consistently provide opportunity for students to reflect and apply that feedback. Overall, opportunities for feedback are assumed to be generalized and not specific to student performance.

- page 45, Lesson 2, Preparation: "**Using a Consensus Model** While students have and can update their own models with their understanding about stormwater, a classroom consensus model can be a good way to visually review and record the main concepts and key terms from each lesson."
- page 48, Lesson 2, Procedure, #5: "Have students circulate to each table group for about 15 seconds per group to see whether the other models look like theirs." Call-out box: "**If the models look different** You could have students write some observations they made under their sketches using the following sentence starters: *Our rain model looked like others because they all had…Our rain model looked different than the model in group [name/number] because ours ______________ and theirs …..*"
- page 61, Lesson 3: "Give students time to share/review their maps with someone who hasn't seen it yet and discuss their findings. Turn-and-talk: 'What did you put on your map and what else could you add to it' Encourage students to add things to their maps based on conversations with their peers."
- page 76, Lesson 4: "Uncover the class Consensus Model and either discuss what to add to it as a class or ask students to write on post its things they feel should be added."
- Page 133, Lesson 9: "Have the students build their models without an example (after discussing it as a class), and then work with the class to refine the examples so they are as similar as possible."

Students all have a point of entry and have opportunities to revise thinking and revision work is evident within their discussions/written work/models/etc. Students are able to compare various solution strategies and through the use of CCCs and SEPs to determine which solution is most precise/accurate/efficient, etc.

- page 37, Lesson 1, Reflect and Explain: "What hypotheses do students have about what kinds of things happen to stormwater in the city and why flooding occurs? Discuss as a class and add ideas to the List of Hypotheses as you do so." However, this list of hypotheses is not returned to by students at any other time throughout the unit.
- page 37, Lesson 1, Apply and extend: "On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference." However, this question sheet is not returned to by students at any other time throughout the unit.
- page 61, Lesson 3: "Give students time to share/review their maps with someone who hasn't seen it yet and discuss their findings. Turn-and-talk: 'What did you put on your map and what else could you add to it' Encourage students to add things to their maps based on conversations with their peers."

Suggestions for Improvement

- Provide more language, guidance, or resources for how teachers can provide feedback to students (strategies and example content).
- How are students responding to feedback? What evidence will be collected that they are demonstrating new thinking based on peer and teacher feedback? Provide specific examples of how a teacher will know that a student understands.

- Consider how students will be able to transfer or apply their learning (understanding) to situations beyond the specific phenomenon or problem.

**II.C. Building Progressions:** Identifies and builds on students' prior learning in all three dimensions, including providing the following support to teachers:

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

## Rating for Criterion II.C. Building Progressions: INADEQUATE

The reviewers found inadequate evidence that the materials identify and build on students' prior learning in all three dimensions because the authors have not clearly identified the expected learning or communicated a plan for how that learning will be enhanced during the outlined learning experiences.

Materials did not make clear the expected level of proficiency students should have with all three dimensions for the core learning in the unit.

- Teacher Manual, page 8, reference to http://ngss.nsta.org/3-5-engineering-design.aspx: "Students' capabilities as problem solvers build on their experiences in K–2, where they learned…"
- There is no evidence of a description of what students should already understand about variables.
- There is no evidence of a description of what students already should understand about Claim-Evidence-Reasoning.
- There is no evidence of an outline of a developmental progression of Science and Engineering Practices.
- There is no evidence of an outline of a developmental progression of Crosscutting Concepts.

The materials make little to no connection between expected prior learning and the learning in the unit.

- Teacher Manual, page 8 Disciplinary Core Idea Progressions chart.
- Teacher Manual, page 9 Engineering Disciplinary Core Idea Progressions chart.

Suggestions for Improvement

Use NGSS Appendices F and G to outline the expected student progressions for the Science and Engineering practices, as well as the Crosscutting Concepts.

Consider revising the front matter of each lesson to include a section for connecting necessary prior knowledge to learning targets. In this way, the educator is informed of the prior learning that is necessary for each student to access the new material, as well as the new learning's connection to a bigger picture.

To achieve an extensive rating, materials must provide suggestions for adaptation if students are above or below the expected level. Materials also must be designed to build upon the typical levels of proficiency that students at this grade level have with each of the three dimensions.

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

## Rating for Criterion II.D. Scientific Accuracy: ADEQUATE

The reviewers found adequate evidence that the materials use scientifically accurate and grade appropriate scientific information because the topics addressed are accurate and meet the fourth-grade expectations.

All science ideas included in the materials are accurate.

- The developers provide teacher background information for the science content knowledge as well as an explanation about the phenomenon being presented to the students. (pages 12 through 20)
- In addition to the science content, there is also information about structuring and conducting learning in outside spaces. (pages 21 and 22)

Suggestions for Improvement
To achieve an extensive rating, the materials should provide strong support for teachers to clarify potential alternate conceptions and misconceptions that they (or their students) may have.

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

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

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

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

## Rating for Criterion II.E. Differentiated Instruction: ADEQUATE

The reviewers found adequate evidence that the materials provide guidance for teachers to support differentiated instruction because a variety of differentiated strategies, with examples and guidance for use, were provided, as well as strategies for extra support (related phenomena, multiple modalities) for students who are struggling to meet performance expectations.

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

- The Home interview is offered in several languages.
- page 48, Lesson 2, Procedure: "Add erosion and groundwater to your Word Wall Cards." However, there is no other mention of using the Word Wall in the entire unit.
- page 48, Lesson 2, Procedure, #6: "Scaffold the reading as appropriate for your class."
- page 48, Lesson 2, Procedure, #6: "scaffold this writing as appropriate for your students."

- page 178, Lesson 14, Reflect and Explain: "Providing students sentence starters can help students who are unfamiliar or uncomfortable with disagreeing with others publicly. There is a good example on: http://uwcoeast.wpengine.com/tools-scaffolding/"
- page 179, Lesson 14, Reflect and Explain: "For a scaffold, use the **Stormwater Solution Conclusion** template: **Claim:** A general statement about the effectiveness of the solution. **Evidence:** Possibilities to include: Data from their tests of the solution. Reference to where the solution has worked elsewhere. Site specific criteria and constraints that it meets, partially meets, or does not meet. **Reasoning:** The reasons why the evidence meets (or does not meet) the criteria for success and the constraints (how the evidence supports the claim). Reasons may also include scientific understandings that help explain the evidence.
- page 182, Lesson 14: C-E-R student graphic organizer
- Picture supports are not consistently used.

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

- page 39, Lesson 1, Planning Next Steps: "If your students would benefit more from observing water interacting with soil in the real world first, you could skip to lesson 3 where they investigate (and pour water on surfaces in) the schoolyard, and then come back to the readings (and potentially the water on soil investigation) afterwards."
- page 40, Lesson 1, Teacher reflection Worksheet: "Tools scaffold student thinking and can house student ideas. Tools in this lesson included the explanatory model scaffold and public records/charts. How did tools support students in communicating and capturing their ideas/thinking?"
- page 107, Lesson 7, Objectives and Overview: "PRESSING FOR EVIDENCE-BASED EXPLANATIONS: This practice happens as a summation, but parts can be introduced at other times when students talk about evidence. This requires that several tools be available to students: 1) their current models, 2) an explanation checklist, 3) the summary table, and 4) a scaffolded guide to help students create, in writing and drawing, their final model. For more visit http://AmbitiousScienceTeaching.org"
- page 148, Lesson 10, Planning Next Steps: Students need an idea of the advantages and disadvantages to be able to figure out which solutions will fit the criteria and constraints of their site. If students are struggling with the research, you could revisit it as a whole class or work with them individually."
- pages 174–175, Lesson 14, Preparation: "**Differentiation Needed for CERs?** Writing out a full Claim-Evidence-Reasoning can be beyond the capacity of some students. Consider alternatives for students who do not have the writing skills to effectively write out a full claim with evidence and reasoning: Would they be helped by more scaffolding with sentences mostly written out for them? Could they instead explain it to you or an assistant who could write it out? Could they better represent their thinking with diagrams or pictures? Any of these alternatives could still be evaluated with the rubric (below) used for written CERs."
- page 179, Lesson 14, Reflect and Explain: Example CERs are provided

Extensions are provided 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.

- page 48, Lesson 2, Procedure, #6: "Scaffold the reading as appropriate for your class."
- page 48, Lesson 2, Procedure, #6: "scaffold this writing as appropriate for your students."

- page 77, Lesson 4, Planning Next Steps: "Alternatively, it could be interesting to develop an experiment to explore the phenomenon further." (referencing frost wedging)
- page 189, Lesson 15, Planning Next Steps: "Do you want to extend this unit into an action project? Having done all this work to think about solutions to a local problem, why not channel students' energy to bringing actual change?**" Possible Extensions:** Sharing at school: Put up posters and models in the library or other common space at the school so that other students can learn about stormwater and engineering. Share during a Science Night. Letter writing: Write a letter to a local or state elected official, letting them know about the work you've done and the importance of taking care of stormwater runoff in your community. This can really influence how money is spent in our region, and help get more funding for stormwater solutions! Building solutions: Implementing the student's solutions is beyond the current scope of this unit. However, we are developing next step options for interested teachers. This is a work-in-progress, with ideas at: https://communitywaters.org/implementing-a-project-at-your-school/.

Suggestions for Improvement

To achieve an extensive rating, extra supports could be provided throughout each lesson for students who are struggling to meet performance expectations with guidance on how to determine their understanding at that point in the lesson and how the suggested support will help students demonstrate progress towards understanding the PEs. The unit materials must be accessible to ALL students and ALL teachers. Differentiation is present and adds to the experience for the individual student in a way that is meaningful, respectful, relevant, and engaging. Here are a few suggestions:

- More consistently include language that prompts teachers to use the Word Wall. Provide suggestions for strategies for utilizing the Word Wall in a meaningful way.
- Instead of stating, "scaffold as appropriate," add language, perhaps in a call-out box, that provides further supports for teachers. Provide a variety of options for scaffolding, for both struggling students and for students in need of extension.
- Consider how might the individual lesson plans more consistently include language about extensions for students working at a faster pace.
- Increase the number of translations, graphic organizers, and picture supports to be consistent throughout all lessons
- Use language that directly addresses the needs of Special Education students and ELs

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

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

## Rating for Criterion II.F. Teacher Support for Unit Coherence: ADEQUATE

The reviewers found adequate evidence that the materials support teachers in facilitating coherent student learning experiences over time because the sense-making or problem solving is linked to learning in all three dimensions throughout the course of the unit.

The unit provides 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.).

- A unit "Storyline" chart is provided for teachers.
- The Explanatory model (individual), Consensus Model (whole group pages 50, 62, 76, 88, 99, 100, 111), and Summary Table (whole group, pages 44, 61, 71, 87, 99, 111, 145) are revisited throughout unit.
- page 37, Lesson 1, Apply and extend: "On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference. However, this question sheet is not returned to by students at any other time throughout the unit.
- page 39, Lesson 1, Planning Next Steps: "Review the **Public Records**. Do the student's hypotheses and/or questions lead naturally into the lessons to come? If so, they could become the focus question of the lesson and make the unit more student driven."
- page 44, Lesson 2, Preparation: "*Adjust the Focus question if students came up with an appropriate hypothesis or question in Lesson 1"

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

- page 36, Lesson 1, Reflect and Extend: "The explanatory model scaffold is intended to help students explain **their** understanding of stormwater. It is a working recording that they can add to or start over as the unit progresses and their understanding builds."

Suggestions for Improvement

This unit provides opportunities for students to engage in asking questions about the phenomenon. However, these questions are not directly linked to the instruction. To strengthen this unit, student questions need to be addressed in upcoming lessons, and future investigations should be focused on answering these student-generated questions. The phenomenon does drive the learning across lessons, however the student questions do not. Another suggestion is to encourage students to figure out what is the next question(s) to pursue in making sense of the phenomenon.

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

## Rating for Criterion II.G. Scaffolded Differentiation Over Time: ADEQUATE

The reviewers found adequate evidence that the materials support teachers in helping students engage in the practices as needed and gradually adjusts supports over time because there is evidence of a change in how the SEP is being used from the beginning to the end of the unit.

The Explanatory Model and the Public record provide a scaffold representation of understanding the phenomenon. The beginning of the unit has students conducting investigations that are teacher-created and facilitated. As the unit progresses, students are returning to those investigations to develop a deeper understanding of how plants affect erosion. Finally, as part of the engineering task, students use the previous investigations to test their design solution. The scaffolding of these investigations supports students taking increasing responsibility for not only making sense of the phenomenon but also designing their solution to the problem. Modeling is another area where student demonstrate increased responsibility in their learning. The models at the beginning of the unit are teacher-created (Lesson 3) as the students move toward creating their own model of the problem site (Lesson 7). Students are also expected to increase the complexity of their explanations, both oral and written, throughout the unit.

**Evidence for this criterion includes:**

- page 155, Lesson 11, Examining Student Work: “Review the solution proposals each group writes to see if they were able to explain why their proposal would meet the criteria for success. When reviewing their drawings, how different are each student’s images of what the solution might look like? This may be useful to help guide what scaffolding is needed when they model the solution.”
- pages 174–175, Lesson 14, Preparation: “**Differentiation Needed for CERs?** Writing out a full Claim-Evidence-Reasoning can be beyond the capacity of some students. Consider alternatives for students who do not have the writing skills to effectively right out a full claim with evidence and reasoning: Would they be helped by more scaffolding with sentences mostly written out for them? Could they instead explain it to you or an assistant who could write it out? Could they better represent their thinking with diagrams or pictures? Any of these alternatives could still be evaluated with the rubric (below) used for written CERs.”
- page 178, Lesson 14, Reflect and Explain: “Providing students sentence starters can help students who are unfamiliar or uncomfortable with disagreeing with others publicly. There is a good example on: http://uwcoeast.wpengine.com/tools-scaffolding/”
- page 179, Lesson 14, Reflect and Explain: “For a scaffold, use the **Stormwater Solution Conclusion** template: **Claim:** A general statement about the effectiveness of the solution. **Evidence:** Possibilities to include: Data from their tests of the solution. Reference to where the solution has worked elsewhere. Site specific criteria and constraints that it meets, partially meets, or does not meet. **Reasoning:** The reasons why the evidence meets (or does not meet) the criteria for success and the constraints (how the evidence supports the claim). Reasons may also include scientific understandings that help explain the evidence.
- Claim, Evidence, Reasoning is not worked on progressively throughout the unit. Claims are mentioned during Lesson 7, but then not mentioned until Lesson 14.

Suggestions for Improvement

To move toward the extensive rating, highlight the transition towards greater student responsibility with their learning. Developing a progression chart of learning would be a valuable tool in recording progress in engaging in the practices. Developing supports for all students to engage in the SEPs in ways that not only integrate the other two dimensions, but also explicitly build student understanding and proficiency in the SEPs over the course of the unit, would strengthen the unit.

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

| Unit Scoring Guide – Category II |
| --- |
| **Criteria A-G:**<br>**3:** At least adequate evidence for all criteria in the category; extensive evidence for at least two criteria<br>**2:** Some evidence for all criteria in the category and adequate evidence for at least five criteria, including A<br>**1:** Adequate evidence for at least three criteria in the category<br>**0:** Adequate evidence for no more than two criteria in the category |

## Category III. Monitoring NGSS Student Progress

Score: **2**

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|---|
| **III.A. Monitoring 3D student performances:** Elicits direct, observable evidence of three-dimensional learning; students are using practices with core ideas and crosscutting concepts to make sense of phenomena and/or to design solutions. |

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

The reviewers found adequate evidence that the materials elicit direct, observable evidence of students using practices with core ideas and crosscutting concepts to make sense of the phenomena and design solution because tasks are regularly driven by a phenomenon or problem, as well as consistently connect and require students to engage in all three dimensions.

Most scenarios driving tasks involve a phenomenon and/or problem (not a topic). All scenarios require sense-making using three-dimensional (or at least high-quality two-dimensional) performances to address (e.g., the scenario cannot be fully explained by describing DCI understanding alone).

- page 155, Lesson 11, Examining Student Work: "Review the solution proposals each group writes to see if they were able to explain why their proposal would meet the criteria for success. When reviewing their drawings, how different are each student's images of what the solution might look like? This may be useful to help guide what scaffolding is needed when they model the solution.
- page 185, Lesson 15, Explore and Investigate: "**Creating a Poster**: Draw the problem area and the imagined solution; incorporate pictures or other images cut and paste onto a poster. Things to include: Diagram of current problem area (somewhat like a "before" picture). This could be copied from the drawing they did in the What Happens to Stormwater at our Site explanatory model, or be enlarged photos (printed on 8.5x11" paper). It should show: Surfaces in the area that contribute to the problem. Arrows showing how water moves through the site during a storm. Diagram of Solution (like an "after" picture), showing the proposed solution and its features. Key (if using symbols in drawings). Claim-Evidence-Reasoning written conclusion. Stakeholder needs, constraints and criteria for success, and whether each is addressed (could be included in conclusion).

Suggestions for Improvement

A rating of extensive requires that there are multiple varied opportunities for students to visibly demonstrate their understanding and ability to use grade-appropriate elements of the SEPs. How might the lesson materials guarantee opportunities for educators to monitor students' ability to plan an investigation, as well as generate solutions?

Each individual task should allow room for multiple modalities—both for task presentation and student responses. Student agency and their identity as scientists—through decision-making, valuing student ideas, selecting representation formats, etc.—should be prioritized throughout the tasks. All tasks should be fair and unbiased, including additional contextual information when an idea might be unfamiliar to students. All tasks should provide appropriate on-ramping for students to engage with and attend to the appropriate parts of the task.

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

## Rating for Criterion III.B. Formative: ADEQUATE

The reviewers found adequate evidence that the materials embed formative assessment processes throughout that evaluate student learning and inform instruction because the formative assessments are embedded as part of the learning. Students are generating verbal, written, and drawn artifacts. Frequent opportunity for and varied formats of formative assessment are included, along with prompts to encourage teachers to reflect on instruction. However, there is no-to-limited guidance for teachers and students on how to adjust instruction based on the results of the formative assessments.

- Formative assessments take varied forms and are frequently built directly into instructional sequences (e.g., aren't a "separate" assessment).
    - "Back-pocket Questions" are provided on page 36, 47, 60, 71, 72, 86, 112, 135, 137, 154, 162, 169, 171, 176, and 177.
    - Teacher Reflection Worksheets throughout: "*Use the prompts to reflect on the lesson in order to track student thinking and make changes to improve future lessons."* pages 40, 52, 64, 78, 90, 116, 127, 139, 149, 156, 165, 172, 181, and 190.
    - page 36, Lesson 1, Reflect and Extend: "The explanatory model scaffold is intended to help students explain **their** understanding of stormwater. It is a working recording that they can add to or start over as the unit progresses and their understanding builds."
    - page 37, Lesson 1, Reflect and Explain: "What hypotheses do students have about what kinds of things happen to stormwater in the city and why flooding occurs? Discuss as a class and add ideas to the List of Hypotheses as you do so."
    - page 37, Lesson 1, Apply and extend: "On sticky notes, have students write at least one question they have about stormwater runoff in Seattle. Have students place the sticky notes on the Questions sheet. You can then either sort and consolidate them as a class, or after class for later reference."
    - page 45, Lesson 2, Preparation: "**Using a Consensus Model** While students have and can update their own models with their understanding about stormwater, a classroom consensus model can be a good way to visually review and record the main concepts and key terms from each lesson."
    - page 48, Lesson 2, Procedure, #5: "Introduce the Class Summary Table as a place where the class will be recording their observations and learning after each lesson. Having a shared summary on the wall provides the students something they can look back on when they are trying to understand what is happening with stormwater in their schoolyard or neighborhood"
    - page 51, Lesson 2, Examining Student Work: "Examine students' notebooks entries to see students' reasoning about why the water level in the runoff wasn't as much as the starting level in the soda bottle. Use this as well as evidence from science talk about the reading and data table to assess students' progress in understanding erosion and groundwater."
    - page 62, Lesson 3, Planning Next Steps: "**Student Maps:** If some students left things off their maps, you have some options: Provide additional time to compare maps with others. Revisiting the site in different conditions (i.e., heavy rain, light rain, sunny day, etc.) could also provide opportunities to grow their understanding. Lesson 5 provides an opportunity to revisit storm drains; you could have students revisit their maps after the

lesson to see what else they might add."
  - page 89, Lesson 5, Examining Student Work: "The pictures students draw, stories they write, or discussions they have offer an opportunity to see whether they are making the connection between the water going into their local storm drains and the problems it can cause further away. Do the pictures, stories or discussions reveal whether they care about the effects of the stormwater runoff?"
  - page 155, Lesson 11, Examining Student Work: "Review the solution proposals each group writes to see if they were able to explain why their proposal would meet the criteria for success. When reviewing their drawings, how different are each student's images of what the solution might look like? This may be useful to help guide what scaffolding is needed when they model the solution."
  - page 148, Lesson 10, Planning Next Steps: "Students need an idea of the advantages and disadvantages to be able to figure out which solutions will fit the criteria and constraints of their site. If students are struggling with the research, you could revisit it as a whole class or work with them individually."
  - On pages 200 and 201, there is a Rapid Survey of Student Thinking (RSST) and Making Responsive Instructional Decisions organizer.
- The Teacher Reflection Worksheet for Lesson 6 is referenced on page 100 in Planning Next Steps but is not included.

Suggestions for Improvement

Accompanying the formative assessment pieces should be clear guidance for how to interpret a range of student responses and change instruction based on varied student responses. Instead of stating, "This may be useful to help guide what scaffolding is needed," provide suggestions for how teachers can adjust instruction based on a variety of example results. The critical component of formative assessments is the rubrics/interpretation guidance—they should include a range of possible student responses, how these should be interpreted relative to both previous instruction and learning goals, and possible ideas for instruction to help students continue developing their thinking in meaningful ways.

Formative assessment should also consistently attend to issues of student equity and access by including culturally and linguistically responsive strategies to help interpret and respond to student thinking toward the learning targets. These might include providing multiple ways for students to demonstrate their thinking and some supports for interpreting student responses that attend to linguistic and cultural diversity.

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

## Rating for Criterion III.C. Scoring Guidance: INADEQUATE

The reviewers found inadequate evidence of included aligned rubrics and scoring guidelines that help the teacher interpret student performance for all three dimensions.

Assessment targets—for all dimensions being assessed—are not clearly stated and incorporated into the scoring guidance. Exemplar student responses are not included for the majority of the unit assessment opportunities. All major assessment opportunities (major formative assessment opportunities, all summative assessments) do not include scoring guidance for teachers and students. Below is the evidence found of included rubrics and scoring guidelines:

- page 38, Lesson 1, Examining Student Work: "What-How-Why Assessment Tool… When done, revisit your sorting to see if any categories need to change, then transfer key points from each category onto the What-How-Why Scoring Grid (2nd page of teacher worksheet). Write student names across the top and revisit each student's explanatory model to check the boxes for what each student has represented in their model. There may be student representations you will want to follow up on with students to see what they were thinking when they wrote or drew them.
- page 114, Lesson 7, Examining Student Work: "What-How-Why Assessment Tool… When done, revisit your sorting to see if any categories need to change, then transfer key points from each category onto the What-How-Why Scoring Grid."
- page 180, Lesson 14, Examining Student Work: "Review and score each student's Claim-Evidence-Reasoning, using the following rubric:"
- page 188, Lesson 15, Examining Student Work, "SAMPLE RUBRIC for Poster/Model" Rubric only attends to Claim-Evidence-Reasoning.

Suggestions for Improvement

- Include student exemplars.
- Include rubrics more consistently.
- Ensure that rubrics reflect the scoring of student engagement in three-dimensional learning. Scoring rubrics should provide the connection between the assessment, the targeted three-dimensional learning goals (and standards, if those are different), and the learning experiences students have previously had. They should target all dimensions being assessed and provide guidance for how to interpret student performance along all three dimensions as well as their integration/sense-making. Scoring guidance should support teachers, students, and possibly parents in monitoring student progress toward their ultimate learning goals. It should be noted that scoring guidance might vary based on the type (summative, formative, degree of transfer) and the format (written test, model revision, group project, etc.) of the assessment.

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

## Rating for Criterion III.D. Unbiased Task/Items: ADEQUATE

The reviewers found adequate evidence that the materials assess student proficiency using accessible and unbiased methods, vocabulary, representations, and examples. The materials use developmentally appropriate text, provide tasks that do not assume all students know culturally-specific knowledge, and use a variety of modalities to collect information from students.

- Vocabulary (science and non-science) is grade level appropriate and the amount of text in tasks and items is grade appropriate
  - Page 48, Lesson 2, Procedure: "Add erosion and groundwater to your Word Wall Cards." (note that this is the only mention of the Word Wall)

- Representations or scenarios are culturally neutral (unbiased, by not assuming students know culturally-specific information) and provides potential scaffolds to make sure that students have the background they need to be successful with the task.
  - page 35, Lesson 1, Procedure: "Tell students they are going to see a video showing some effects of too much stormwater runoff in Seattle. While watching, they should be making observations: what problems are being caused in the video?" Direct link: https://vimeo.com/238148653/
  - Lesson 3: "Students walk their schoolgrounds as a class and fill in where the water goes and problems it causes on a school-specific map relevant for students feels like this could be a bit of a leap in one lesson."
  - page 62, Lesson 3: "If you are fortunate to have a large rainstorm later in this unit, you could take students for an impromptu walk outside to see more clearly what happens to the stormwater and where it runs off (or challenge them to investigate during recess and report back)."
- While there are a variety of tasks/items (listed below) throughout the unit, when each is examined in isolation the individual tasks provide limited ways for students to convey their answers/thinking.
  - Turn-and-Talk
  - Explanatory/Consensus Model
  - Summary Table
  - Map
  - Physical models
  - Journal writing, data tables, charts
  - Collaborative investigations
  - Individual work
  - Research
  - Claim, Evidence, Reasoning writing
  - Poster
  - Presentation

Suggestions for Improvement

To score an extensive rating would require leveraging students' funds of knowledge within assessment opportunities. Consider revising lessons so that they provide educators with guidance to capitalize on the funds of knowledge that students bring with them to the classroom to better understand scenarios and materials provide clear pathways for students to make connections to their lives beyond the classroom through a variety of representations.

Consider including more language that directs educators to provide student choice in representation during individual tasks.

How might all students be supported in accessing the vocabulary of the unit?

- More consistently include language that prompts teachers to use the Word Wall. Provide suggestions for strategies for utilizing the Word Wall in a meaningful way.

What alternate experiences or resources will be provided to those students struggling or unable to access the content and assessments?

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

## Rating for Criterion III.E. Coherent Assessment System: ADEQUATE

The reviewers found adequate evidence that the materials include pre-, formative, and summative assessment measures that assess three-dimensional learning. While providing an "adequate" score because most of the tasks are effectively designed to be three-dimensional, and tasks throughout the unit are presented in a variety of formats, the reviewers recommend that this criterion be an additional area of focus when revising materials.

**Matches three-dimensional learning goals:** Materials include assessments that are sometimes designed to connect to learning goals and require students to apply appropriate elements of the three dimensions to make sense of the phenomenon/solve the problem.

**Variety of measures:**
The unit uses a variety of measures (e.g., performance tasks, discussion questions, constructed response questions, project- or problem-based tasks).

- Explanatory model (individual), Consensus Model (whole group pages 50, 62, 76, 88, 99, 100, 111) and Summary Table (whole group, pages 44, 61, 71, 87, 99, 111, 145) are revisited throughout the unit.
- page 38, Lesson 1, Examining Student Work: "What-How-Why Assessment Tool… When done, revisit your sorting to see if any categories need to change, then transfer key points from each category onto the **What-How-Why Scoring Grid** (2nd page of teacher worksheet). Write student names across the top and revisit each student's explanatory model to check the boxes for what each student has represented in their model. There may be student representations you will want to follow up on with students to see what they were thinking when they wrote or drew them.
- page 45, Lesson 2, Preparation: "**Using a Consensus Model** While students have and can update their own models with their understanding about stormwater, a classroom consensus model can be a good way to visually review and record the main concepts and key terms from each lesson."
- page 70, Lesson 4: "Students should make a prediction in their science journals: What do they think will be different between the two models? How much erosion will each model type have? They could write out what they think will happen and/or sketch what they think the plant and soil only tubs will look like."
- page 73, Lesson 4: "Give students time to write a conclusion on the front of the data sheet (question 1) to answer the investigation question."
- page 111, Lesson 7: "Project a blank "**What Happens to Stormwater at Our Site"** explanatory model and explain that students will be creating a new version of the model they created at the start of the unit. This one will be specific to their site."
- page 114, Lesson 7, Procedure: "Quick Write: Pass back initial models and let students look over them. Have students write how their thinking has changed in this unit. *At first, I thought…. Now, I think…I used to think…. Now, I know…Before I didn't know how… But, now, I learned that…*
- page 114, Lesson 7, Examining Student Work: "What-How-Why Assessment Tool… When done, revisit your sorting to see if any categories need to change, then transfer key points from each category onto the **What-How-Why Scoring Grid.**"

- page 134, Lesson 9: “Students will be constructing a physical model of the site that demonstrates what happens to stormwater when it falls there. It will give us a baseline for how much runoff occurs at the site.”
- page 188, Lesson 15, Examining Student Work: “The presentations of the students are the summative assessments of the unit, the culmination of learning about what is going on with stormwater at the school, local and city level, and how people are designing and building solutions to stormwater runoff problems using an engineering design process.”

Suggestions for Improvement

As a point of clarification, any time that student artifacts are being produced by *all* students in the classroom can be considered a measurement of student learning (open discussion that doesn’t intentionally draw out responses from all students does not count).

This criterion focuses on how the whole assessment system works together to measure the intended student learning across the materials. There exists a strong connection here to III.A and III.B, which address three-dimensional performance tasks and the support for formative assessment, but this criterion is focused on how the various assessments work together. It is recommended that materials include a map (text or visual) that clarifies where elements are measured, and how these measures connect/flow throughout the unit. The rationale should be carefully mapped out over the course of the materials for all three dimensions, including how each task will measure student learning target and provide feedback to teachers to inform instruction and students to inform learning.

The coherence of the system—how the pieces work together to measure the targeted three-dimensional learning—drives the rating for this category and is more important than the variation in format and types of assessments.

There are currently limited opportunities for student to self-reflect or self-assess. Consider revising materials to include more consistent opportunity for student self-assessment.

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

## Rating for Criterion III.F. Opportunity to learn: ADEQUATE

The reviewers found adequate evidence that the materials provide multiple opportunities for students to demonstrate performance of practices connected with their understanding of core ideas and crosscutting concepts. Again, while the review team has provided an “adequate” score, it is recommended that this criterion be an additional area of focus when revising materials, due to the limited evidence that students have the opportunity to adjust based on teacher and peer feedback.

For key, claimed learning in the unit, there are multiple, linked student performances that provide students with several opportunities to demonstrate understanding.

- The Explanatory model (individual), Consensus Model (whole group pages 50, 62, 76, 88, 99, 100, 111) and Summary Table (whole group, pages 44, 61, 71, 87, 99, 111, 145) are revisited throughout the unit.

- page 61, Lesson 3: “Give students time to share/review their maps with someone who hasn’t seen it yet and discuss their findings. Turn-and-talk: ‘What did you put on your map and what else could you add to it’ Encourage students to add things to their maps based on conversations with their peers.”
- Page 133, Lesson 9: “Have the students build their models without an example (after discussing it as a class), and then work with the class to refine the examples so they are as similar as possible.”
- page 185, Lesson 15, Explore and Investigate: “**Creating a Poster**: Draw the problem area and the imagined solution; incorporate pictures or other images cut and paste onto a poster. Things to include: Diagram of current problem area (somewhat like a “before” picture). This could be copied from the drawing they did in the What Happens to Stormwater at our Site explanatory model, or be enlarged photos (printed on 8.5x11” paper). It should show: Surfaces in the area that contribute to the problem. Arrows showing how water moves through the site during a storm. Diagram of Solution (like an “after” picture), showing the proposed solution and its features. Key (if using symbols in drawings). Claim-Evidence-Reasoning written conclusion. Stakeholder needs, constraints and criteria for success, and whether each is addressed (could be included in conclusion).

Teacher/student feedback is limited and does not provide opportunity for students to reflect and apply that feedback.

Suggestions for Improvement

At first read, this criterion might seem to be about the development of the practices, but it is actually intended to be about students having multiple opportunities to demonstrate they have met the learning goals. In other words, for a unit, students engage in multiple three-dimensional performances that are opportunities for them to demonstrate learning over the course of the unit and receive feedback on what they have learned.

While the review team is aware that feedback from the teacher, and even peers, will naturally occur during the provided Turn-and-Talks, gallery walks, and Summary Table discussions, the materials lack explicit guidance for educators on how to allow students to adjust their engagement, as well as how educators can collect evidence of student adjustment. This is a crucial element worth repeating: how will the educator know that each student has adjusted his/her learning? Additionally, to the same point, while the Teacher Reflection Worksheets are a helpful resource in encouraging regular contemplation of instructional approaches, they result in only teachers adjusting to meet students. How might you work into the materials opportunities for teachers to allow students to make suggestions for adjustments?

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

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

## Overall Score

**Category I: NGSS 3D Design Score (0, 1, 2, 3): 2**
**Category II: NGSS Instructional Supports Score (0, 1, 2, 3): 2**
**Category III: Monitoring NGSS Student Progress Score (0, 1, 2, 3): 2**
**Total Score: 6**
**Overall Score (E, E/I, R, N): E/I**

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

| Overall Scoring Guide |
|---|
| ***E: Example of high quality NGSS design—****High quality design for the NGSS across all three categories of the rubric; a lesson or unit with this rating will still need adjustments for a specific classroom, but the support is there to make this possible; exemplifies most criteria across Categories I, II, & III of the rubric. (total score ~8–9)*<br><br>***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)*<br><br>***R: Revision needed—****Partially designed for the NGSS, but needs significant revision in one or more categories (total ~3–5)*<br><br>***N: Not ready to review****—Not designed for the NGSS; does not meet criteria (total 0–2)* |