Stackable Instructionally-embedded Portable Science (SIPS) Assessments Project

Grade 5 Science

Unit 3 Instructionally-embedded Assessment Task Specification Tool:

"Clean Water on the Trail"

Earth Systems and the Solution of Water Problems

April 2023

Grade 5	Unit 3	Instructional Segment 2	Task 1	Task Title: Clean Water on the Trail

Unit 3: Earth Systems and the Solution of Water Problems

Anchor Phenomenon	Problematization/Investigative Strategy for the Unit
In this unit, the anchor phenomenon is based on a glass of water filled from a source in the school. Students brainstorm where it could have come from. They discover that the faucet is actually in the *middle* of the water's path, not the beginning. The teacher can problematize this for students by setting up the general question of, "What water does our school use, what does it use it for, and where does it go? (e.g., inside the building, outside the building, etc.)?" Further details for this anchor phenomenon activity appear in the lesson, *A Glass of Water.*	The unit opening focuses on students experiencing and discussing a phenomenon that sparks their interest and curiosity. To do so, the class engages with an "anchor phenomenon" and generate questions based on that phenomenon, posting their questions to the "driving question board." Some of the questions added to the driving question board can be used by the teacher to transition into Instructional Segment 1 by framing the lessons (and segment) as a means by which to investigate and answer some of the questions that students generate based on the anchor phenomenon. Throughout the unit (e.g., at the conclusion of each instructional segment) the teacher returns to the driving question board and has students reflect on their recent learning, and which questions they can now answer based on their learning in the prior segment. Following this reflection, the teacher uses the driving question board again, this time identifying remaining unanswered (or partially answered) questions that can motivate the activities and investigations that are the focus of the next instructional segment.

Segment 2 Overview

By engaging in the practices of obtaining, evaluating, and communicating information, using mathematics and computational thinking, constructing explanations and designing solutions, and asking questions and defining problems, students are able to explore and develop engineered solutions to problems regarding water conservation and/or obtaining cleaner water in and around the community.

Lesson Title(s)	Lesson Description(s)
Water, Water, Everywhere and Not a Drop to Drink You Are What You Drink	In the lesson "Water, Water, Everywhere and Not a Drop to Drink," students are presented with a local real-life problem involving water access and water usage. Students read an article detailing the problem with an anticipation guide. After learning about the problem, students begin working through an engineering design process of identifying the problem, constraints, and brainstorming potential solutions.

a. Solutions to a design problem use available information sources that provide information on constraints and criteria (CCC: Influence of Science, Engineering, and Technology on Society and the Natural World).

In the lesson "You Are What You Drink," students explore the idea of water purification, and design and build simple water filters. Then, they test their filters using dirty water. They investigate how soil and other inexpensive organic substances can be used as a filter.

What Students Figure Out
a. Solutions to a design problem require information on criteria and constraints (CCC: Systems and System Models).
b. Solutions to a design problem use available information sources that provide information on constraints and criteria (CCC: Influence of Science, Engineering, and Technology on Society and the Natural World).

Formal Assessment Title	Assessment Description
Clean Water on The Trail	The teacher introduces the assessment by showing a water bottle filled with muddy water. The teacher asks the class how they could make this muddy water drinkable and elicits student responses. The teacher then introduces the scenario: Jessie is on a long hiking trip to where she will camp overnight. She just discovered a hole in the bottle of water that she planned to use for cooking. Her water must have drained while she walked. The only water source nearby is a creek, but the water isn't very translucent (clear). Jessie empties the contents of her bag to search for materials that she could use to clean the water before she cooks with it.

The teacher introduces the activity to students:

- Problem: Jesse needs two (2) cups of clear and clean water to cook the rice for dinner.
- Constraints: Jesse can only use the materials she has in her backpack.
- Criteria for success: Jesse needs to clarify the water by filtering out the dirt and debris and boil that water to cook with.

While engaging with the task, students watch the video, *Water purification facts for kids*, located at https://www.youtube.com/watch?v=__JWa0ftr5k to build their understanding of the process of water purification. Students also read a short article "*Water purification facts for kids*" to help them answer prompt 4.

NGSS PE(s) Code(s) & Description(s)

3-5-ETS1-1. 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.

AG(s) Code(s) & Description(s)

A5. Define the problem provided to them in ways that specify criteria for success and the nature of the resources and materials that will be used in solving the problem.

A8. Specify a design that provides a solution to a given problem, indicating the way resources and materials will support meeting the design criteria and addressing constraints.

Evidence Statement(s)

- Identify how elements of a design are supported by information from available resources, materials and/or prior design ideas.

- Describe the constraints of a problem, including criteria for success, and available resources and materials for solving problems.

- Describe a design for a solution to a problem.

- Describe how resources and materials support the design of a problem.

- Describe how a solution to a problem addresses constraints of a problem.

Phenomenon or Phenomenon-rooted Design Problem

- The teacher shows the class a water bottle filled with muddy water. The teacher asks the class how they could make the muddy water clear and elicits student responses.

General Scenario Description

Jessie is on a long hiking trip to where she will camp overnight. She just discovered a hole in the bottle of water that she planned to use for cooking. Her water must have drained while she walked. The only water source nearby is a creek, but the water isn't very translucent (clear). Jessie empties the contents of her bag to search for materials that she could use to clean the water before she cooks with it.

Chain of Sensemaking

- Students develop a design plan to filter dirty water based on available materials.
- Students identify the need for the design and the criteria for success.
- Students create a diagram of their design plan.
- Students describe the elements of their design.
- Students evaluate their design plan to filter dirty water based on reading an article about water purification.
- Students reflect upon what parts of their design were most successful and how the design may have limitations.

Work Products

- Completed diagram
- Constructed response

Application of Universal Design for Learning-based Guidelines to Promote Accessibility (https://udlguidelines.cast.org/)

Multiple Means of Engagement	Multiple Means of Representation	Multiple Means of Action & Expression
☒ Context or content ☒ Age appropriate ☒ Appropriate for different groups ☒ Makes sense of complex ideas in creative ways ☒ Vary the degree of challenge or complexity within prompts	☒ Provide visual diagrams and charts ☐ Make explicit links between information provided in texts and any accompanying representation of that information in illustrations, equations, charts, or diagrams ☒ Activate relevant prior knowledge ☐ Bridge concepts with relevant and simple analogies and limited use of metaphors ☐ Highlight or emphasize key elements in text, graphics, diagrams, formulas ☐ Use outlines, graphic organizers, unit organizer routines, concept organizer routines, and concept mastery routines to emphasize key ideas and relationships ☐ Give explicit prompts for each step in a sequential process	☒ Solve problems using a variety of strategies ☒ Sentence starters ☒ Embed prompts to "show and explain your work"

Targeted PE(s) Code(s) and Alternate Conception(s)

- **NGSS PE: 3-5-ETS1-1.** 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.
  - **Common Alternate Conceptions**
    - Engineering solutions should only consider achieving success, not relevant costs.
    - Human wants and needs do not fundamentally change.

Unit 3 Vocabulary

- Water resources
- Design
- Particles

- Purification
- Absorbed
- Impurities

- Filter
- Chemicals
- Sedimentation