Formative Assessment Exemplar - 8.1.4

Introduction:

The following formative assessment exemplar was created by a team of Utah educators to be used as a resource in the classroom. It was reviewed for appropriateness by a Bias and Sensitivity/Special Education team and by state science leaders. While no assessment is perfect, it is intended to be used as a formative tool that enables teachers to obtain evidence of student learning, identify gaps in that learning, and adjust instruction for all three dimensions (i.e., Science and Engineering Practices, Crosscutting Concepts, Disciplinary Core Ideas) included in a specific Science and Engineering Education (SEEd) Standard.

In order to fully assess students' understanding of all three dimensions of a SEEd standard, the assessment is written in a format called a cluster. Each cluster starts with a phenomenon, provides a task statement, necessary supporting information, and a sequenced list of questions using the gather, reason, and communicate model (Moulding et al., 2021) as a way to scaffold student sensemaking. The phenomenon used in an assessment exemplar is an analogous phenomenon (one that should not have been taught during instruction) to assess how well students can transfer and apply their learning in a novel situation. The cluster provides an example of the expected rigor of student learning for all three dimensions of a specific standard. In order to serve this purpose, this assessment is NOT INTENDED TO BE USED AS A LESSON FOR STUDENTS.

Because this assessment exemplar is a resource, teachers can choose to use it however they want for formative assessment purposes. It can be adjusted and formatted to fit a teacher's instructional needs. For example, teachers can choose to delete questions, add questions, edit questions, or break the tasks into smaller segments to be given to students over multiple days.

General Format:

Each formative assessment exemplar contains the following components:

1. Teacher Facing Information: This provides teachers with the full cluster as well as additional information including the question types, alignment to three dimensions, and answer key. Additionally, an example of a proficient student answer and a proficiency scale for all three dimensions are included to support the evaluation of the last item of the assessment.
2. Students Facing Assessment: This is what the student may see. It is in a form that can be printed or uploaded to a learning platform. (Exception: Questions including simulations will need technology to utilize during assessment.)

Accommodation Considerations:

Teachers should consider possible common ways to provide accommodations for students with disabilities, English language learners, students with diverse needs or students from different cultural backgrounds. For example, these accommodations may include: Providing academic language supports, presenting sentence stems, or reading aloud to students. All students should be allowed access to a dictionary.

References:

Moulding, B., Huff, K., & Van der Veen, W. (2021). *Engaging Students in Science Investigation Using GRC*. Ogden, UT: ELM Tree Publishing.

Teacher Facing Information

Standard: 8.1.4

Assessment Format: Online Only (Requires students to have online access)

Phenomenon	
You are invited to a party at your friend's house and your friend doesn't want to wash the dishes afterwards. Your friend has two different types of plates to choose from.	Proficient Student Explanation of Phenomenon: Natural materials come from plants, animals, or rocks. Natural materials can be combined to make synthetic materials, which will have different properties than the original natural material. Both types of materials have different uses and affect society differently.

Cluster Task Statement

(Represents the ultimate way the phenomenon will be explained or the design problem will be addressed)
In the questions that follow, you will obtain and evaluate information from the data table to describe the functions, role in society, and effects of sugarcane and styrofoam plates on the environment.

Supporting Information

Table 1: Comparison of Sugarcane Plate and Styrofoam Plate

	Sugarcane Plate	Styrofoam Plate
Picture		
Natural vs Synthetic	Natural	Synthetic
What it's made from	dry pulpy fibrous material that remains after crushing sugarcane (sugarcane is a plant used to make sugar)	Natural gas changed into plastic foam
Properties	strong, grease and cut resistant	heat resistant light weight sturdy

Cost	Case of sugarcane takeout boxes is $64	Case of styrofoam takeout boxes is $24
Other Uses	Paper, cardboard, sugar, polishes, insulation, biofuel	Insulator, packing materials, hot cocoa cups, take out containers
How it decomposes	Video Link	

Table 1 compares the properties of sugarcane plate and styrofoam plate.

Cluster Questions

Gather:
Cluster Question #__1____
Question Type:Fill in the blank and Short Answer
Addresses:
_x___ DCI : PS1.A, PS1.B, ESS3.A)
__x __ SEP: Obtaining, Evaluating, and Communicating Information
____ CCC
Answer: Natural
Sugarcane fibers and natural gas

Question 1:
Synthetic materials come from _____ materials?

What natural materials are found in both plate types?

Gather:
Cluster Question #__2____
Question Type: Table Match
Addresses:
__x_ DCI: PS1.A, PS1.B, ESS3.A
____ SEP:
__x__ CCC: Structure and Function
Answer:
Sugarcane properties: grease resistant, cut resistant, and strong
Styrofoam properties: heat resistant, sturdy, and lightweight.

Question 2:
Study **Table 1** above.

What beneficial (good) properties do each of the plate types have?
Complete the table below:

Beneficial properties of the **sugarcane** plate:	Beneficial properties of the **styrofoam** plate:

Beneficial properties of the **sugarcane** plate:	Beneficial properties of the **styrofoam** plate:
Grease resistant	Heat resistant
Cut resistant	Sturdy
Strong	Light weight

Reason:
Cluster Question #____3__
Question Type:
Addresses: Long answer
__x__ DCI: PS1.A, PS1.B, ESS3.A
__x__ SEP: Obtaining, Evaluating, and Communicating Information
___ CCC
Answer: The sugarcane plate would be better for the environment. It is made from natural resources and from the video, it was shown that the sugarcane plate decomposes more and faster than the styrofoam.

Question 3:

Study **Table 1** above and watch the video, "How it Decomposes."

Using the data from **Table 1** and the video "How it Decomposes", evaluate which plate's properties would be better for society. Use evidence to support your answer.

Communicate:
Cluster Question #___4___
Question Type: Long answer
Addresses:
__x__ DCI: PS1.A, PS1.B, ESS3.A
___x_ SEP: Obtaining, Evaluating, and Communicating Information
_x___ CCC: Structure and Function
Answer: answers may vary, but students should address all three areas listed and have evidence from the table for all three parts.

Question 4:
If you were at this party, which plate would you choose to use and why? Think about the following:
1. Function of the plate
2. How using that plate affects society/environment

Make sure you address both 1 and 2 in your answer and use evidence to support your claim.

Proficiency Scale

Proficient Student Explanation:
Natural materials come from plants, animals, or rocks. Natural materials can be combined to make synthetic materials, which will have different properties than the original natural material. Both types of materials have different uses and affect society differently.

Level 1 - Emerging	Level 2 - Partially Proficient	Level 3 - Proficient	Level 4 - Extending
SEP: Does not meet the minimum standard to receive a 2.	**SEP:** Compare and/or combine across complex texts and/or other reliable media to support the engagement in other scientific and/or engineering practices. Combine information in written text with that contained in corresponding tables, diagrams, and/or charts to support the engagement in other scientific and/or engineering practices.	**SEP:** Critically read scientific texts adapted for classroom use to determine the central ideas and/or obtain scientific and/or technical information to describe patterns in and/or evidence about the natural and designed world(s). Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.	**SEP:** Extends beyond proficient in any way.
CCC: Does not meet the minimum standard to receive a 2.	**CCC:** Identifies substructures have shapes and parts that serve functions.	**CCC:** Analyzes complex natural and designed structures/systems to determine how they function. Designs structures to serve particular functions by taking into account properties of different materials, and understands how materials can be shaped and used.	**CCC:** Extends beyond proficient in any way.
DCI:	**DCI:**	**DCI:**	**DCI:**

Does not meet the minimum standard to receive a 2.	**PS1.A: Structure and Properties of Matter** Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. **ESS3.A: Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.	**PS1.A: Structure and Properties of Matter** Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it. **ESS3.A: Natural Resources** Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.	Extends beyond proficient in any way.

(Student Facing Format on following page)

Name: _____ Date: _____

Stimulus

The Good, The Bad, and the Ugly

You are invited to a party at your friend's house and your friend doesn't want to wash the dishes afterwards. Your friend has two different types of plates to choose from.

Table 1: Comparison of Sugarcane Plate and Styrofoam Plate

	Sugarcane Plate	Styrofoam Plate
Picture		
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Cost	Case of sugarcane takeout boxes is $64	Case of styrofoam takeout boxes is $24
Other Uses	Paper, cardboard, sugar, polishes, insulation, biofuel	Insulator, packing materials, hot cocoa cups, take out containers
How it decomposes	Video Link	

Table 1 compares the properties of sugarcane plate and styrofoam plate.

Your Task

In the questions that follow, you will obtain and evaluate information from the data table to describe the functions, role in society, and effects of sugarcane and styrofoam plates on the environment.

Question 1

a) Synthetic materials come from _____ materials.

b) What natural materials are found in both plate types?

_____

_____

Question 2

Study **Table 1** above.

What beneficial (good) properties do each of the plate types have? Complete the table below:

Beneficial properties of the **sugarcane** plate:	Beneficial properties of the **styrofoam** plate:

Question 3

Study **Table 1** above and watch the video, "How it Decomposes."

Using the data from **Table 1** and the video "How it Decomposes", evaluate which plate's properties would be better for society. Use evidence to support your answer.

_____

_____

Question 4

If you were at this party, which plate would you choose to use and why? Think about the following:

1. Function of the plate
2. How using that plate affects society/environment

Make sure you address both 1 and 2 in your answer and use evidence to support your claim.

_____

_____