Introduction

Formative Assessment Exemplar - K.2.4

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.

Of note: All formative assessment clusters were revised based on feedback from educators after being utilized in the classroom. During the revision process, each cluster was specifically checked to make sure the phenomena was authentic to the DCI, supporting information was provided for the phenomena, the SEPs, CCCs, and DCIs were appropriate for the learning progressions, the cluster supported student sensemaking through the Gather, Reason, and Communicate instructional model, and the final communication prompt aligned with the cluster phenomena. As inconsistencies were found, revisions were made to support student sensemaking. If other inconsistencies exist that need to be addressed, please email the current Utah State Science Education Specialists with feedback.

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 Info

Teacher Facing Information

Standard: K.2.4

Design and communicate a solution to address the effects that living things (plants and animals, including humans) experience while trying to survive in their surroundings. *Define the problem by asking questions and gathering information, convey designs through sketches, drawings, or physical models, and compare designs. Emphasize students working from a plant, animal, or human perspective.* Examples could include a plant growing to get more sunlight, a beaver building a dam, or humans caring for the Earth by reusing and recycling natural resources. (ESS3.C, ETS1.A, ETS1.B, ETS1.C)
(Each standard is a student performance expectation that includes all three dimensions of science.)
This is an engineering standard.

Assessment Format: Printed

Phenomenon	
A child enters his garden and notices several plants and vegetables have been partially eaten.  https://www.pennlive.com/gardening/2017/08/how_to_keep_animals_from_eatin.html	**Proficient Student Explanation** Students define the problem as deer are eating the food in the garden. They will design and evaluate possible solutions.
Cluster Task Statement	
Use the information below to design and communicate how the child might solve the problem.	
Supporting Information	
A child enters his garden and notices several plants and vegetables have been partially eaten. 	

https://www.pennlive.com/gardening/2017/08/how_to_keep_animals_from_eatin.h

Cluster Questions

Gather:
Cluster Question # 1
Question Type: Multi Select
Addresses:
x____ DCI - (ESS3.C) Living things depend on their environment to survive and can change it.
x____ SEP - Asking Questions
x____ CCC - Cause and Effect
Answer:
What do nearby animals eat?
What plants are being eaten in the garden?

Question 1

What questions would be helpful to ask to find out what is eating the plants? Check two things that would be helpful to know.

Question 1 What questions would be helpful to ask to find out what is eating the plants? Check two things that would be helpful to know.			
1 What do nearby animals eat? ☐	2 What are my garden gloves made out of? ☐	3 Which garden tools were used? ☐	4 What plants are being eaten in the garden? ☐

Gather:
Cluster Question # 2
Question Type: Multiple Choice
Addresses:
x____ DCI - (ESS3.C) Living things depend on their environment to survive and can change it.
x____ SEP - Define the problem
x____ CCC - Cause and Effect
Answer:
Deer

Question 2

Use the information below to determine what animal is eating the plants in the garden. Circle the animal in the table that is eating the plants.

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Use the information below to determine what animal is eating the plants in the garden. Circle the animal in the table that is eating the plants.

Figure 1: Picture of the plant being eaten.

https://www.gardenlive.com/gardening/2017/08/how_to_keep_animals_from_eatin.html

Table 1: Animals nearby and what they eat.

Deer	Cat	Racoon
		
 Tomatoes	 Mice	 Strawberries
 Leaves	 Milk	 Nuts
 Mushrooms	 Fish	 Insects

Reason:

Cluster Question # 3

Question Type: Multiple choice

Addresses:

x____ DCI - (ESS3.C, ETS1.A)

Living things depend on their environment to survive and can change it. Define the problem.

x____ SEP - Define the problem

x____ CCC - Cause and effect

Answer:

Deers are eating the tomatoes in the garden.

Question 3

Which sentence best describes the child's problem in the garden?

	Question 3 Which sentence best describes the child's problem in the garden? Deer  https://www.publicdomainpictures.net/en/view-image.php?image=77628&picture=deer-clipart Deer are eating the tomatoes in the garden. ☐ Cat  https://pixabay.com/illustrations/cat-kitty-animal-cute-vector-2326119/ Cats are eating the tomatoes in the garden. ☐ Racoon  https://commons.wikimedia.org/wiki/File:Racoon_(PSF).png Racoons are eating the tomatoes in the garden. ☐
Communicate: Cluster Question # 4 Question Type: Multi Select Addresses: x____ DCI - (ESS3.C, ETS1.B) Living things depend on their environment to survive and can change it. Developing possible solutions. x____ SEP - Design a solution x____ CCC - Cause and effect Answer: Build a fence around the garden. Use a device that makes sound to scare away the animal.	**Question 4** What two solutions would best stop the animals from eating the tomatoes? **Question 4** What two solutions would best stop the animal from eating the tomatoes? Build a fence around the garden.  ☐ Grow more tomatoes.  ☐ Dig a large hole.  ☐ Use a device that makes a loud sound to scare away the animal.  ☐
Communicate: Cluster Question # 5 Question Type: Multiple Choice Addresses: x____ DCI - (ESS3.C, ETS1.A, ETS1.C) Living things depend on	**Question 5** How will the child know if the solution he chose worked?

their environment to survive and can change it. Defining the problem. Optimizing the solution. x____ SEP - Design a solution x____ CCC - Cause and effect Answer: Animals stop eating the tomatoes.	**Question 5** How will the child know if the solution he chose worked? 1 More tomatoes disappear. ☐ 2 Animals stop eating the tomatoes. ☐ 3 Animals start eating the corn in the garden. ☐

Proficiency Scale

Proficient Student Explanation:
Students define the problem as deer are eating the food in the garden. They will design and evaluate possible solutions.

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:** Describe a possible solution to a specific problem.	**SEP:** Define the problem. Generate and/or compare multiple solutions to a problem	**SEP:** Extends beyond proficient in any way.
CCC: Does not meet the minimum standard to receive a 2.	**CCC:** With support, identify observable patterns to describe the causes of events. With guidance, designs simple tests to gather evidence to support or refute ideas about causes.	**CCC:** Identify observable patterns to describe the causes of events. Designs simple tests to gather evidence to support or refute ideas about causes.	**CCC:** Extends beyond proficient in any way.
DCI: Does not meet the minimum standard to receive a 2.	**DCI:** Plants and animals (including humans) depend on the land, water, and air to live and grow.	**DCI:** Plants and animals (including humans) depend on the land, water, and air to live and grow. They in turn can	**DCI:** Extends beyond proficient in any way.

		change their environment (e.g., the shape of land, the flow of water)	

(Student Facing Format on following page)

Student Assessment

Name _____Date_____

Stimulus

A child enters his garden and notices several plants and vegetables have been partially eaten.

https://www.pennlive.com/gardening/2017/08/how_to_keep_animals_from_eatin.html

Your Task

Use the information below to design and communicate how the child might solve the problem.

Question 1

What questions would be helpful to ask to find out what is eating the plants? Check two things that would be helpful to know.

1	2	3	4
What do nearby animals eat? ☐	What are my garden gloves made out of? ☐	Which garden tools were used? ☐	What plants are being eaten in the garden? ☐

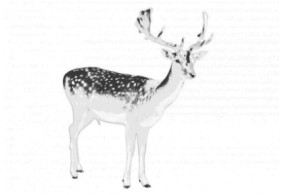
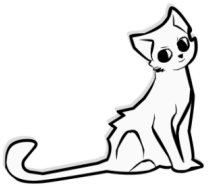
Question 2

Use the information below to determine what animal is eating the plants in the garden. Circle the animal in the table that is eating the plants.

Figure 1: Picture of the plant being eaten.

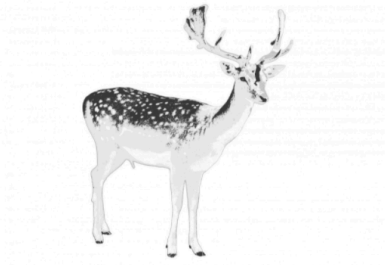
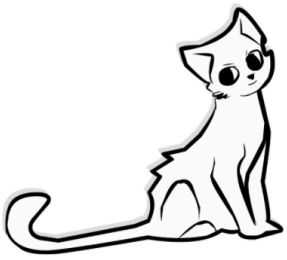
https://www.pennlive.com/gardening/2017/08/how_to_keep_animals_from_eatin.html

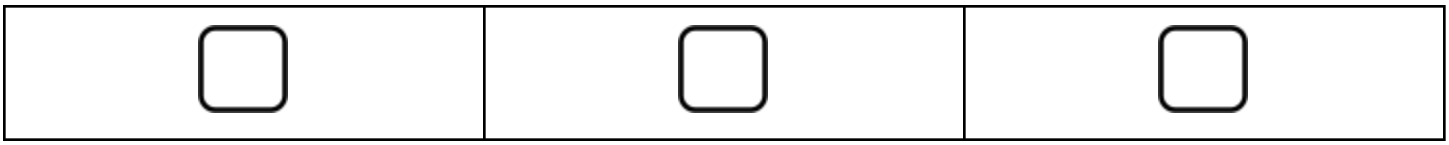
Table 1: Animals nearby and what they eat.

Deer	Cat	Racoon
 https://www.publicdomainpictures.net/en/view-image.php?image=77628&picture=deer-clipart	 https://pixabay.com/illustrations/cat-kitty-animal-cute-vector-2326119/	 https://commons.wikimedia.org/wiki/File:Racoon_(PSF).png
 Tomatoes  Leaves  Mushrooms https://publicdomainvectors.org/en/free-clipart/Tomato-line-art-vector-graphics/24534.html	 Mice  Milk  Fish	 Strawberries  Nuts  Insects

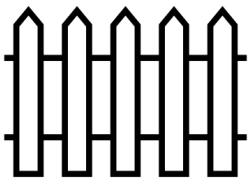
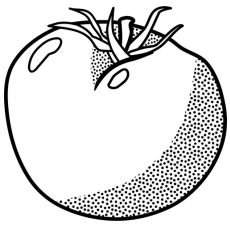
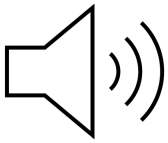
Question 3

Which sentence best describes the child's problem in the garden?

Deer	Cat	Racoon
 https://www.publicdomainpictures.net/en/view-image.php?image=77628&picture=deer-clipart	 https://pixabay.com/illustrations/cat-kitty-animal-cute-vector-2326119/	 https://commons.wikimedia.org/wiki/File:Racoon_(PSF).png
Deer are eating the tomatoes in the garden.	Cats are eating the tomatoes in the garden.	Racoons are eating the tomatoes in the garden.



Question 4
What two solutions would best stop the animal from eating the tomatoes?

Build a fence around the garden.	Grow more tomatoes.	Dig a large hole.	Use a device that makes a loud sound to scare away the animal.
			
☐	☐	☐	☐

Question 5
How will the child know if the solution he chose worked?

1 More tomatoes disappear.	2 Animals stop eating the tomatoes.	3 Animals start eating the corn in the garden.
☐	☐	☐