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Classroom Embedded Assessment [CEA] Title: Siqiniq Gets a Sunburn

a. Targeted Performance Expectation(s)

K-PS3-2. Use tools and materials to design and build a structure that will reduce the warming effect of sunlight on an area. * [Clarification Statement: Examples of structures could include umbrellas, canopies, and tents that minimize the warming effect of the Sun.]

K-2-ETS1-2. Develop a simple sketch, drawing or physical model to illustrate how the shape of the object helps it function as needed to solve a given problem.

Supplemental Information about Targeted Performance Expectation

DCI Progression of learning:

Sunlight warms Earth's surface.*

Some materials block part (or most) of the light from shining through them.*

If sunlight is blocked, then the warming effect of the sunlight is reduced on the area underneath the structure.*

Problems can be solved by creating design solutions using scientific information.

Design solutions can be described and tested.*

Results of testing design solutions can be applied to evaluate how well they solve the problem.*

Adjustments can be made to improve the effectiveness of a design solution.*

Constructing Explanations and **Designing Solutions**

Constructing explanations and designing solutions builds on prior experiences and progresses to the use of evidence and ideas in constructing evidence-based accounts of natural phenomena and designing solutions.

- Use tools and materials provided to design and build a device that solves a specific problem or a solution to a specific problem.

In this formative assessment (FA) students will:

Brainstorm materials and ideas with the teacher to develop a list on the board that they can use as they plan. (constraints – certain materials, time allotment)

Work in small groups to draw designs in their notebooks for possible structures using the available materials.

Discuss with their groups and come to a consensus on a design to build.

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Build the design.

Test the design with their teacher, using a light meter app to see if their structure was successful in blocking light.

Be offered the opportunity to redesign and improve their first attempt.

Cause and Effect

- Events have causes that generate observable patterns.

Structure and Function

- The shape and stability of structures of natural and designed objects are related to their function (s).

In this formative assessment (FA) students will:

- Apply ideas of cause and effect to select materials that will block light.
- Use their knowledge of shape and stability of materials and structures to construct a shade shelter.

Misconceptions

Teacher information to be aware of - A common related misconception is that the earth gets heat from the sun. The sun is actually too far from the earth to heat it directly. Instead, the light from the sun is reflected or absorbed by objects on earth. Absorbed light usually increases the energy in an object, causing the object to heat up. A distinction does not need to be made about this yet with kindergarteners. Sunlight heats things up.

b. Learning Goal(s)

1. Students will draw a design solution in their notebooks (using available materials) that will help reduce the amount of sunlight that reaches Siqiniq.

For subsequent lessons in this engineering sequence:

2. *Students will collaboratively design and build a structure in groups of three to reduce the amount of sunlight that reaches Siqiniq, so that he doesn't get a sunburn.*
3. *Students will collaboratively test their structures to see if they were successful in blocking light and apply the results to any improvements as they redesign.*

c. Instructional Context

This CEA formative assessment would be used toward the end of the unit after the students have learned that sunlight heats a variety of earth materials, and that humans have created structures to help block sunlight and keep things cooler.

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Instructional experiences preceding this CEA:

- Students would have made scientific observations about the effect of sunlight on various materials, such as rock, grass, water, soil, and sand. They would compare the same materials in sunlight and in shade, using a thermometer or another indicator such as a melting ice cube to see that the material is warmer in the sunlight than in the shade.
- Students may have seen how the light of the sun transforms into heat using something like a small solar oven.
- Students would have looked for and experienced examples of ways humans solve the problem of blocking sunlight in the world around them and have listed or drawn shade structures observed, like awnings, park shelters, umbrellas over tables, hats with large brims to block light, etc. They could have tested these shelters to see if they were effective in reducing the warming effects of the sun, in a teacher led experience.
- Students would have had experience drawing a sketch and labeling parts of the model in previous experiences, using an interactive word wall or illustrated word bank.
- Students would have had experiences working in collaborative groups to share their ideas.

d. Student Task/Prompt – see end of document for exact copy of handouts distributed to students

To engage students with the task, read the text of “Siqiniq Gets a Sunburn”. (a polar bear cub in the Artic – an original story written by CEA author Tiffany Tindle. NOTE: “Siqiniq” is the Inuktitut –an Eskimo language – word for “Sun.”)

- **See Student Task Sheets at end for the text of this story.**

After reading and discussing the story, tell students that they are going to design and then build a structure that will protect the polar bear from the sun. The structure must have a roof and walls and prevent light from the sun from shining down on Siqiniq, and a door or opening so he can enter the shelter.

As a group, discuss what is known about how sunlight heats the earth’s surface from previous class experiences. What materials seemed to block sunlight?

List on the whiteboard materials that are available with a small picture of the material drawn beside it, such as paper cups, cardboard, tape, paper plates, aluminum foil, colored paper, glue, plastic wrap, waxed paper, etc. Ask students if there are other materials they might want to use in their structures. Add any materials that the students suggest that are practical and available to the list.

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Individually, students draw a design in their student notebook (see sample page attached at end) and label the material with the word that describes it. The teacher would assist with labeling for those who need help.

In the following lesson -

In small groups, students share their design ideas and discuss them. As a group they decide upon a design solution to build in the next session. This can be drawn on a sheet of paper to submit to the teacher so the teacher can have materials ready for the group for the building session. (This collaborative design and build could be an additional formative assessment.)

e. Success Criteria

Exemplary student response:

An exemplary student response would show a design drawn, using available materials, that meets the criteria established. The structure should have walls, a roof, and a door opening. Materials selected should block much of the light, like cardboard or thick paper. Students will label the materials used in their design, with assistance if necessary.

Scoring Rubric

Criteria	2	1	0
Drawing of the shelter design uses available materials	Yes, materials used are on the available class list	Some of the materials are things that are available for use	No, the materials used do not appear to be things available or no drawing is completed
Drawing of the shelter has a wall, roof, and door opening	Yes, walls, roof and door opening are present	Two of the criteria are met (i.e. roof and door but no walls)	Wall, roof and doorway not included, or only one of these elements is shown or no drawing is completed
Drawing uses materials that would block sunlight (shows understanding of the	Student selects materials that would block sunlight for their structure	Student selects some materials that block light but has large holes in top of structure or	Materials selected would not block light or no drawing is completed

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cause and effect nature of materials chosen)		some materials that light will go through	
Drawing has materials labeled, or student can describe what materials are used	Student labels or describes materials shown in their drawing	Student can label or describe some of the materials shown in their drawing	No labels are added, and student cannot tell what the materials are in the drawing or no drawing is completed

f. Next Instructional Steps

If the student doesn't have a 2 on drawing the shelter design with available materials-

- Assemble examples of the materials that are listed and label the object with the word on sentence strips. Allow the student to show you their ideas and assemble a quick prototype of the design. Start the sketch from the roof material down, or the assist the child with a rough sketch of walls and roof and let them tell you what material they will use. Make dot letters for the labels and students can trace the dots to label the materials.
- Assist the student with comparing their drawing with the available list. Help them note materials used in the drawing that are not available. Discuss what could be substituted for those materials.

If the student doesn't have a 2 on including a doorway, roof and walls in the design-

- Use a checklist to help students find the missing element and add it to the drawing.

- Roof - ✓
- Walls - ✓
- Door - ✓

- This idea could be reinforced with students kinesthetically building a small structure with playdough, folded paper, etc.

If the student has not received a 2 on using materials that block sunlight-

- Test a variety of materials (perhaps a baggy of squares of foil, cardboard, paper, waxed paper, etc.) outdoors at recess and see what creates the best shade.
- Observe and discuss materials used to build roofs, awnings, etc. Can you see through those materials? If you can see through a material will it create a good, shady spot for Siqiniq?

If the student has not received a 2 on drawing or describing the materials in their drawing;

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- Assemble a set of the available materials and ask students to point to the material they are using. Assist them in learning the name of the material and then the teacher may write the name to label the drawing using dot letters.

Extensions

For extension of these concepts, students may engage in a new challenge, building shade structures for a gecko made with paper, with UV beads glued to the back of the paper gecko. Students would place UV beads in the direct Sun outside as a way to identify what happens to them if no shade (they turn from white to a color). Once the gecko is placed in the structure outside, students can count the beads that change color from the sunlight to get quantifiable data on how well the structure provides shade. This would help them have data to serve as evidence to show if their redesigned structure was more or less effective in blocking sunlight and its warming effects.

g. Student Work Samples

NOTE: Student faces omitted from photos for privacy. Teacher is checking the structure using light meter on her smart phone (images A and B) and/or putting a stuffed polar bear into the structure to enact the scene and use of the door (images C and D).



Image A



Image B

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Image C



Image D

h. Reflection and Revision

None submitted.

NOTE: Student handout pages begin on next page

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Siqiniq Gets a Sunburn

Once upon a time a little polar bear named Siqiniq lived with his mother and father in a very happy place in the Arctic. Siqiniq was a very happy polar bear but he had one small problem. He had no hair! His mother called him a “late bloomer”. “You will have your fur one day,” his mother said.

Siqiniq was born in the winter in the Arctic. It was dark and gloomy and sometimes the winter made his mother sad. She decided to name her cub Siqiniq which means “sun”. Even if it were dark outside she would always have her sweet little sunshine in Siqiniq.

Siqiniq grew all winter long and still had no fur to speak of. But he was still a very happy little cub. He had his friends, Yura the seal and Kallik the penguin to play with. The three friends spent the dark days playing hide and seek and pretending to be great fish hunters. It was a good time to live in the Arctic.

One day, Siqiniq woke to a bright light streaming in his window. He asked what the strange glow was outside. His father said, “It is the sun! It is spring and the sun is beginning to shine!”

The sun! Siqiniq was excited! He had never seen the sun! He quickly found his friends and they decided to play their favorite hide and seek game. But something happened. When they tried to hide, the sun shone brightly in the sky and they could see one another. Not only could they see one another, Siqiniq was not his usual polar bear white! He had turned pink! What was happening?

“I know what it is!” said Yura. “The scientists that take pictures of me on the beach tell me not to lie there too long or I will get a sunburn. You have a sunburn!”

“Yes, yes!” said Kallik “You do not have fur! You are not protected from the sun. You have a sunburn!”

“Oh!” cried Siqiniq. “What can I do? I will have to stay in my cave all day and not be able to play with you!”

Kallik said, “We will help you. We will make something to protect you from the sun.”

“Yes” said Yura. “Something we can take with us wherever we go to play! I will ask the scientists to help us build something to protect you from the sun!”

Student task: Design and build a structure that will protect the polar bear from the sun. The structure must have a roof, walls and a door. It should prevent most light from the sun entering the structure.

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How can you design a structure to help Siqiniq stay out of the sun?

Draw your idea. Label the materials.

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Check your work.



Did you include a roof? _____

Did you include walls? _____

Did you include a door? _____

