

Student Project-Based Learning Outlines

I. Title: Effects of Sunlight

Grade Level: Kindergarten

1. Launch Project: Entry Event & Driving Question (DQ)	2. Build Knowledge Understanding & Skill to answer DQ
3 Present Products that Answer DQ	4. Develop and Revise Products and Answers to DQ

II. *BIG IDEA: How can we protect ourselves and other animals from the affects of the sun?*

III. TASKS:

- A. In the first lesson, students will participate in think- pair-share to share ideas about why it is hot outside. Then, students will participate in an egg on the sidewalk experiment; they will drop an egg in an area of their choice, as well as make observations about what the egg looked like before it was cooked and what the egg looked like after it was cooked. Then, we will read an informational text about the Sun called “The Sun, Our Nearest Star” by Franklyn M. Branley. Last, students will create a three dimensional sun craft and write a sentence explaining that the sun provides energy in the form of heat.
- B. In the second lesson, students will work in groups and use their five senses to become experts on one surface of the earth (water, rock, soil, sand) and predict which material will get the hottest in the sun. First, students will brainstorm where they

can find their surface (e.g. where can you find water on earth?). Then students will use the materials provided to observe their focus surface and draw a picture of their observations. Students will then write words to describe their surface. Each expert group will present their findings to the class. As a class, we will discuss the different properties of each surface and predict which will get the hottest in the sun. Then we will measure the temperature in each surface and chart our results in a class graph. In the third lesson, students will observe different materials to see if they provide shade and record their findings. As a class, we will visit an outside, preset station, with a variety of objects that create shade (e.g. a tree, an open umbrella, a tent), as well as objects that may not create shade (such as a net).

- C. Finally, in the fourth lesson, Students will work in groups to design a structure that provides shade to keep an ice cube from melting. Students will be shown the materials they will use to create their structure and discuss what they think will work to keep the ice cube shaded. Then, they will plan their design and draw a model of the structure they will create. The students will present their ideas to the teacher, then as a team during whole group discussion. Students will use their plan from the design process to help guide their construction of a structure that provides shade to keep an ice cube from melting; the shade they build should cover the ice cube to keep it out of the sunlight. After, students will lift their structure and observe the ice cube. They will then record their findings on the lab sheet provided, draw and color pictures of the results of the experiment. Each group will then be given an opportunity to share their findings with the class. The class will work together to place the structures on a table, least effective to most effective. The teacher will invite the students to look at the structures to identify the characteristics of the more effective structures.

IV. JUSTIFICATION This lesson series integrates all of the STEAM disciplines. Students explore the scientific concepts of energy, as well as engineering while they participate in learning more information about the sun and its effects on Earth's surface. Technology will be used in the form of informational (picture and gif based) powerpoints and informational songs and videos about the sun, surfaces of the earth, and engineers. English Language Arts can be seen during read alouds of related texts (e.g. informational texts about the sun) when students are prompted to identify the topic and key details of the text through inquiry based questions. Students will even have an opportunity to explore the Arts as they create a three dimensional craft of the sun and explain their reasoning for making their art. Lastly students gain understanding of the mathematical element of describing objects in the environment using

names of shapes(e.g. the sun is a sphere),as well as the relative position of these objects (e.g. the sun is above the surface). Students may also describe the position of objects using names of shapes as they plan and construct their shade providing structures.

V. STANDARDS: Grade Level and Subject Area: Kindergarten to 5th Science, Social Studies, Language Arts, Mathematics and the Arts

SOCIAL STUDIES:

- K1.1 Follow rules, such as sharing and taking turns, and know the consequences of breaking them.
- K4.1. Determine the relative locations of objects using the terms near/far, left/right, and behind/in front.

ELA/Literacy:

- CCSS.ELA-LITERACY.RI.K.2: With prompting and support, identify the main topic and retell key details of a text.
- CCSS.ELA-LITERACY.RI.K.10: Actively engage in group reading activities with purpose and understanding.

CCSS MATHEMATICS:

- CCSS.MATH.CONTENT.K.G.A.1: Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as *above*, *below*, *beside*, *in front of*, *behind*, and *next to*.

Visual Arts:

- Creative Expression: 2.2 Demonstrate beginning skill in the use of tools and processes, such as the use of scissors, glue, and paper in creating a three-dimensional construction.
- Aesthetic Valuing:4.3 Discuss how and why they made a specific work of art.

NGSS (Next Generation Science Standards)

A. Disciplinary Core Ideas:

- PS3.B: Conservation of Energy and Energy Transfer Sunlight warms Earth's surface. (K-PS3-1),(K-PS3-2)

B. Science and Engineering Practices

- Planning and Carrying Out Investigations: Planning and carrying out investigations to answer questions or test

solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

Make observations (firsthand or from media) to collect data that can be used to make comparisons. (K-PS3-1)

- Constructing Explanations and Designing Solutions

C. Crosscutting Concepts

- Cause and Effect: Events have causes that generate observable patterns. (K-PS3-1),(K-PS3-2)

VI . ENGAGING CONTEXT: We will go outside as a class. I explain to students that now that we are outside, we have a better idea of the weather. (Because we do live in a desert, it is most likely going to be a sunny day.) I will ask students how they feel and can also ask them to touch the pavement. Assuming they respond with “hot”, I will proceed to ask students what they think makes it hot outside. I will tell students that we are going to find out where the hotness comes from by cooking eggs on the sidewalk!

VII. MEASURABLE OBJECTIVES

- A. As student thinking drives this lesson, students can pursue their own inquiry into the affects of sunlight on earth’s surface.
- B. As the culminating activity of this PBL students will create a project or presentation that meets the objective of the Big idea.

VIII. TOTAL TIME:

Launch event-One: Class Periods of 30 minutes;

Building Knowledge: Two Class Periods; 35-40 minutes

Showing Knowledge (Claims and Evidence): Two class periods of 40 minutes

(Students develop and revise products and or performances)

IX. Social Skills and or Habits of Mind to Engage/Assess

<input checked="" type="checkbox"/> Persistence	<input type="checkbox"/> Problem posing
<input type="checkbox"/> Decreasing impulsivity	<input checked="" type="checkbox"/> Drawing on past knowledge
<input type="checkbox"/> Empathic listening	

<p><input checked="" type="checkbox"/> Flexibility in thinking</p> <p><input type="checkbox"/> Metacognitive awareness</p> <p><input type="checkbox"/> Checking for accuracy</p> <p><input checked="" type="checkbox"/> Questioning</p>	<p><input checked="" type="checkbox"/> Application to new situations</p> <p><input type="checkbox"/> Precision of language and thought</p> <p><input type="checkbox"/> Using all the senses</p> <p><input checked="" type="checkbox"/> Ingenuity, originality, insightfulness and creativity</p> <p><input checked="" type="checkbox"/> Inquisitiveness, curiosity</p> <p><input checked="" type="checkbox"/> Enjoyment of problem solving</p>
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IX. Level of Voice Appropriate for Activity:



X. BSCS 5-E Framework

Engage: (Day 1) Students will be engaged in the idea of temperature when they are able to cook an egg on the sidewalk.

- A. **DIRECT INSTRUCTION:** Students will be shown a picture of a thermometer and groups of four students will be formed. Beginning with the checker all roles are assigned to the right (clockwise).

Materials Manager: Carefully holds the egg and is the person to crack it on the floor.

Checker's Tasks : Make sure the time limits are observed. Help others complete their tasks. Let instructor know when your team has completed the lab.

Recorder's Tasks: Carefully observes/records how the egg feels and looks prior to cracking, as well as observes how the egg looks after it is cooked on the ground. Carefully completes the page to represent the results of the trials.

Encourager/Observer' s Task - Coach the team to persevere and stay together while sharing and turn-taking. Notice and record occurrence of team members and teamwork.

Checklists and Rubrics

Students will be completing a formal assessment that will ask them to work as a group to record the results of their egg drop:

- What was the weather like outside before you cooked your egg?
- Did your egg cook?
- What was the weather like outside after you cooked your egg?
- Why did your egg cook?

Students will also be completing a group assessment in which they describe their cooperative learning experience. They will write an x under the appropriate statement that matches their experience.

- I participated. - Yes, sometimes, no
- I listened to others- Yes, sometimes, no
- I solved conflicts reasonably- Yes, sometimes, no

Explore: (Days 2-3) We will use our inquiry skills of predicting (hypothesis testing) comparing and analyzing to understand what the sun affects (four surfaces) and what materials can be used to change the effects.

5 groups of 22 students

Explain: (Day 3) As students complete the launch and inquiry activities, they share their ideas about the Earth's surface and the effects of different materials on them based off of their prior knowledge and observations.

Extend/Elaborate: (Day 4) In small groups and in the final performance students have opportunities to extend their knowledge and to elaborate on their ideas. Students will use their knowledge to design and create a shade providing structure. After, students will present their structure to the class and provide an explanation as to how their structure worked/didn't work, and one improvement they would be able to make.

XI. Materials List


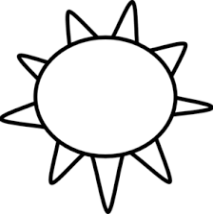
- Day 1 :
 - 4-5 Eggs
 - "The Sun, Our Nearest Star" by Franklyn M. Branley
 - Laptop (for Powerpoint)
 - red, orange, and yellow pieces of tissue paper (different sizes)
 - Group and individual Assessments (Worksheets)
- Day 2:


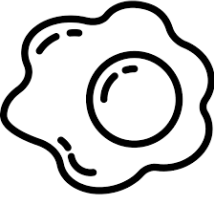

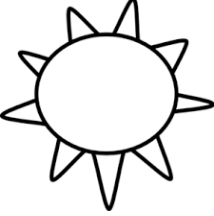
- 4 Clear plastic cups
- ½ cup of water, soil, sand, and rocks
- wax paper
- 4 droppers
- 4 small Magnifying glasses
- 4 small Poster boards
- Group Assessment (Worksheets)
- Day 3:
 - Laptop (for powerpoint on shade)
 - umbrella
 - tent
 - net
 - tree
 - Assessments (Worksheets)
- Day 4:
 - pencils
 - crayons
 - Paper for sketching plans
 - Black construction paper (9x12)
 - White construction paper (9x12)
 - Popsicle sticks/Tongue depressors
 - Masking tape
 - Group Assessment (Worksheet)
- Day 5:
 - Paper for sketching plans
 - Black construction paper (9x12)
 - White construction paper (9x12)
 - Popsicle sticks/Tongue depressors
 - Masking tape
 - Group Assessment (Worksheets)

Evaluate: (Assess):

There are both formative and summative ways to assess learning in this engaged learning PBL:

Launch: Color the picture that answers the question. After looking at your answers write about why you think the egg cooked.

<p>What was the weather like outside before you cooked your egg?</p>		
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Did your egg cook?		
What was the weather like outside after you cooked your egg?		

Why did your egg cook?

Explore/Explain: Students will complete a journal that will be all about energy. Each day, they will receive a worksheet that they will add to their created journal. Students will draw picture of their original predictions and observations.

The journal pages will be checked daily using this checklist:

	Yes	No
Student recorded their observations.		
Student colored their picture.		
Student described/explained their observations		

Final Product: (Visual Presentations of their engineered structure.)

	<p style="text-align: center;">3 Awesome ★ ★ ★</p>	<p style="text-align: center;">2 Almost There ★ ★</p>	<p style="text-align: center;">1 Not Yet ★</p>
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Volume	Group speaks loud enough for the entire class to hear 100% of the time.	Group speaks loud enough for the entire class to hear for 50% of the time.	Group does not speak loud enough for the entire class to hear at all.
Eye contact	Group is looking at the audience, for 100% of the presentation.	Group is looking at the audience, for 50% of the presentation.	Group is looking away from the audience, for 100% of the presentation.
Content	Group explains the materials they used to create their structure and explains one thing that worked well, as well as one thing they could improve.	Group explains the materials they used to create their structure or they explain one thing that worked well, and one thing they could improve.	Group does not explain the materials they used to create their structure, not do they explain one thing that worked well, and one thing they could improve.

Individual information detailing student learning takeaways from the Launch activity:

Students should take away the idea that heat can affect things on Earth.

Criteria:

1. Does it include a driving question in any of the identified disciplines?
2. Does it include at least three new science vocabulary words?
3. Does it propose the development of a project--students/unit plan-teachers?
4. Does it show evidence that all team members were involved?

Formative Assessment of Non-Cognitive Factors: Self Assessment Using the Habits of Mind Check Sheet and Write-up Form (Google Docs).

Children's Literature that Supports the PBL:

“The Sun, Our Nearest Star” by Franklyn M. Branley

“Sun! One in a Billion” by Stacy McAnulty