Community in the Classroom Presentation Plan

Lesson Name: Picture-Perfect Solar Energy: Making Photographic Blueprints with the Sun

Presenter(s) Jessy Baker, Charina Choi, Jen Dionne, Prashant Jain, Matt Sheldon, Bryce Sadtler

Grade Level 3 **Standards Connection(s)** Properties of Light and Matter

Abstract:

Your opportunity to tell teachers and kids what's going to be fun and interesting about your visit!

The conversion of energy from one form to another, such as from light to heat or electricity, is an essential and continual part of our lives. For example, solar cells use light to generate electricity and plants use light energy to make food via chemical reactions. In this presentation, we will demonstrate how light from the sun can be used to produce a chemical reaction. Our presentation will focus on 'cyanotype photography' – a form of printing in which light exposure produces a permanent color change on photographic paper, making a literal 'blue-print.' Students will learn i) how to make their own photographic paper via making a chemical solution and applying it to paper, ii) how light can power a chemical reaction, and iii) how light from the sun can ultimately generate energy or fuel to power our planet.

Vocabulary/Definitions:

3 – 6 important (new) words

Energy comes in a variety of forms (electrical, light, heat, chemical, potential, kinetic) that can be converted from one form to another

Chemical reaction (chemistry) – a process in which the structure of matter undergoes a change

Photochemical reaction (photochemistry) – a chemical process in which light energy is used to change the chemical structure of matter

Solar spectrum – the range of colors of light emitted by the sun, which include ultraviolet, visible, and infrared

Cyanotype – a light sensitive material which undergoes a photochemical reaction, turning blue when exposed to ultraviolet light from the sun

Materials:

What you'll bring with you

Pre-made cyanotype paper: photoactive paper which turns blue when exposed to the sun. The children will use this paper to make a photographic print.

Non-toxic chemicals and glassware to demonstrate how cyanotype paper is made

Assorted materials (stencils, plastic toys, twine, lace, etc) and sticky tape. The children will stick these objects to the cyanotype paper to create their own photographic print to take home.

Classroom Set-up:

Student grouping, Power/Water, A/V, Light/Dark, set-up/clean-up time needed

Black/white board for introduction and vocabulary

We will be taking the class outside for 15-20 minutes to make cyanotype photographic prints.

Sink and counter space to wash and dry the cyanotype prints

Classroom Visit

1. Personal Introduction: **5** **Minutes**

Who are you? What do you want to share with students and why? How will you connect this with students' interests?

We are graduate students and postdoctoral researchers in the chemistry department at UC Berkeley. We have educational backgrounds in chemistry, physics, and engineering. We study how light interacts with novel materials that we synthesize in our laboratory. We are interested in how these materials can harness solar energy.

Topic Introduction: **10** **Minutes**

Big Idea(s), vocabulary, assessing prior knowledge. What questions will you ask to learn from students?

We will begin by discussing different forms of energy and how energy can be converted from one form to another. We will ask the students to identify which aspects of their everyday lives require energy (cars, people, animals, plants, etc) and what forms of energy are used by these objects (fuel, food, light). While humans and animals obtain energy from food, plants use energy from the sun, converting this light into chemical food. We will demonstrate how light can produce a chemical reaction, illustrating the general photochemistry behind such processes as photosynthesis. In our demonstration, sunlight will react with a chemical painted on paper to change its color form yellow to blue. The students will use this photochemistry to make their own prints and photographs.

2. Learning Experience(s): **30** **Minutes**

Demonstrations, hands-on activities, images, games, discussion, writing, measuring… What will you do, what will kids do? Describe in order, including instructions to kids.

The children will make a cyanotype photographic print to see how light energy can be used to do photochemistry. In the classroom, the children will adhere assorted objects, which we provide, onto the cyanotype paper. We will then go outside to expose the prints to sunlight for about 10 minutes, which will turn the exposed areas blue. After returning to the classroom, we will rinse the cyanotypes in water. The undeveloped yellow dye, which was covered by the objects, will wash away, while the exposed blue dye has produced a permanent image on the paper.

3. Wrap-up: Sharing Experiences and Building Connections **10** **Minutes**

Putting the pieces together – how will students share learning, interpret experience, build vocabulary?

We will explain how the photochemical reaction worked to turn the paper blue. We will ask the students to discuss their prints (which parts of the prints turned blue, how dark were different prints). We will discuss the important experimental conditions in making the prints (such as amount of time exposed to the sun and the intensity of light hitting the paper). We will relate this photochemical reaction to other common photochemical processes including photography and photosynthesis.

4. Close: **5** **Minutes**

How can kids learn more? Thanks and good-bye! Clean-up.

We will give a handout explaining the cyanotype photochemical process and provide websites where the children can learn more about light-energy, including solar energy.

TOTAL 60 Minutes

Follow-up – After Presentation

We would love for the students to write a letter to us describing what they learned during the lesson. They can also ask us any questions about the lecture and demonstration. We will give an email address where the students can ask questions related to the lesson or other science topics.