

## Project 2.4 Mystery Beads Teacher Notes

### Introduction

Playing outside on a sunny day can be lots of fun. The Sun gives us wonderful light and even warmth as we play. As much as the Sun is something we can enjoy, we also have to be aware that the Sun can be harmful. Do you ever wear sunglasses to protect your eyes from the Sun? Or do you use sunscreen when you are going to be outside? Protecting yourself from the harmful effects of the Sun is important.

The harmful parts of the Sun's rays are called ultraviolet—or UV—rays. Your eyes cannot see UV rays. UV rays can cause sunburns or damage to your eyes. Protecting yourself from UV rays is important.

In this project you will explore mystery beads as you learn more about the Sun.

### Equipment

- Launch Log
- iPad® tablet
- iPad Apps:
  - Canvas by Instructure
- UV Beads (5 per student)
- Pipe cleaners (1 per student)
- UV Flashlight
- Optional materials for testing UV Beads:
  - Hair dryer
  - Lamp (classroom lamp, shop light)

### Procedure

1. Prior to facilitating Project 2.4, the teacher will review the following background information about UV rays:

The Sun gives off ultraviolet (UV) rays that are not visible to human eyes. Some insects, such as bumblebees, can see UV rays. There are actually several types of UV rays, the most dangerous of which are absorbed by the atmosphere. UV rays contribute to the formation of vitamin D by the skin, but the harmful impacts of UV rays include sunburns and cataracts. The ozone layer around the earth gives protection from most UV rays, but some of the harmful UV rays make it through this layer.

Different amounts of UV rays enter the Earth's atmosphere depending upon things like the weather, seasons, altitude, latitude, and even damage to the ozone layer. Reflection from sand, snow, or water can also impact UV exposure.

UV exposure varies with the seasons and also with the time of day. The Environmental Protection Agency (EPA) recommends avoiding Sun exposure between the hours of 10:00 AM and 4:00 PM. Local weather services often report the UV Index for your area, especially in the summer months. You may also find the index for your area from the EPA. The scale used by the EPA is as follows:

UV Index	Level of Risk from Unprotected Exposure to Sunlight
11+	Extreme
8-10	Very High
6-7	High
3-5	Moderate

Source: [http://www.epa.gov/sunwise/kids/kids\\_uvindex.html](http://www.epa.gov/sunwise/kids/kids_uvindex.html)

2. Guide students to access Project 2.4 Mystery Beads using the Canvas app on a tablet. Read and discuss the introduction with your students.
3. Because UV rays are not visible to the naked eye, students may have trouble understanding this concept. To provide a visible demonstration, UV beads and a UV flashlight will be used in this activity.
4. Distribute 5 mystery beads (UV beads) and a pipe cleaner to each student. Guide students to create a UV bracelet by adding 5 beads to the pipe cleaner.
5. After creating their mystery bead bracelets, have student draw a picture of their beads in their Launch Log. They should describe the color of the beads.
6. After creating their sketches, guide students to use inquiry skills to observe any noticeable changes to the beads in different situations.
  - Have students expose their beads to sources of heat (hair dryer or rubbing with their hands to “warm” the beads) and light (classroom light, a lamp, or a shop light). The beads should not change color due to heat or light.
  - Optional: After experimenting with sources of heat or light, use a UV flashlight as a demonstration of how UV rays can bring out the colors. A UV flashlight serves as a demonstration of how the UV exposure from the Sun (invisible) can have a visible impact on the beads.
  - To demonstrate UV exposure from the Sun, have students observe the impact of the Sun on their UV beads. It is suggested that students make observations at different times of the day to determine if there is a difference in the result.
  - Guide students to understand that the beads change colors when exposed to UV rays.
  - Have students record their observations of the beads in sunlight in their Launch Log, including a picture and a description of how the beads changed.

7. To provide a quick way for students to determine how much risk they have for UV exposure, allow them to conduct a shadow test at different times during the day. If your shadow is taller than you, UV exposure is most likely low. This happens during early morning or late afternoon hours. If your shadow is shorter than you, the chance of UV exposure is higher. This occurs during the middle of the day.
8. As students prepare to solve the design problem for this module, guide them to consider ways that they can be protected from UV rays (Clothing, hats, sunscreen, covered or shady areas). To build understanding of how the UV rays can be blocked, you may perform the following demonstration:
  - Allow students to observe how sunlight from a window can pass through a piece of glass from a picture frame or a piece of plastic wrap.
  - Block the sunlight using a book, a piece of clothing, or any other object. Seeing a shadow would indicate that the Sun has been blocked. The students may wish to observe if a shadow keeps the beads from changing colors when shaded from the Sun.

### **Conclusion Questions for Discussion**

1. How did your beads change in sunlight? Why do you think they changed?
2. How can you protect your skin from UV rays from the Sun?