UV Rays

At The Event

Ages: 4 and up

Group Size	Individual
Duration	5 minutes (more time if needed)
Materials/ Equipment	Activity with 1-2 adults: Ultraviolet (UV) beads, pipe cleaners, paper plates or included plastic trays (to hold beads), UV flashlight, batteries for flashlight, tablecloth (optional), hand sanitizer (optional) Extension activity with 3 or more adults: UV beads, pipe cleaners, paper plates or trays (to hold beads), 2 UV flashlights, batteries for flashlights, 3 different SPF of sunscreens (30, 50 and 100 SPF), baggies with zip closure, sharpie marker, tablecloth (optional), hand sanitizer (optional). Optional way to display the UV beads with sunscreen is to place in petri dishes.
Resources	The Risk of Melanoma in Pilots and Cabin Crew: UV Measurements in Flying Airplanes: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4476387/ Why You Should Always Wear Sunscreen on a Flight: https://www.telegraph.co.uk/travel/news/sunscreen-on-planes-skin-cancer-risk/
Objective	Students will create and keep a bracelet or a keychain with UV beads to work as a UV sensor. In the extension activity, students will see the effects of various SPF on UV beads and the impact SPF has on the skin. K-PS3-1: Make observations to determine the effect of sunlight on Earth's surface 1.ESS.1-1: Use observations of the sun, moon and stars to describe patterns that can be predicted 1.ESS.1-2: Make observations at different times of year to relate the amount of daylight to the time of year 5.ESS-1-1: Support an argument that the apparent brightness of the sun and stars is due to their relative distances from the Earth
Preparation	Activity with 1-2 adults: Place UV beads on paper plates or plastic trays to create multiple working stations (estimate 5-10 beads per student). Have pipe cleaners (one per student) and UV flashlight with batteries at the table. Extension activity with 3 or more adults: Prepare as directed above. Also prepare 4 baggies with UV beads (approx. 30 beads per bag). Bag 1 is the control bag (no sunscreen). In bag 2 place a squirt of SPF 30 sunscreen and mix beads around until they are all covered in sunscreen and label the bag. In bag 2, place a squirt of SPF 50 sunscreen until they are all covered and label the bag. In bag 3, place a squirt of SPF 100 sunscreen until they are all covered and label the bag. The optional way to display the beads are to place in a petri dish or in provided plastic trays (paper plates may also be used). Place the bottles of sunscreen on the table with the bags under the corresponding sunscreen (for a visual aid).

Procedure	Ultraviolet (UV) radiation is a type of energy produced by the sun and some artificial sources. UV radiation isn't like the sun's light or heat, which we can see and feel. Your senses cannot detect UV radiation, so you won't notice the damage until it has been done. The UV beads are a type of sensor to detect UV light given off from the sun. The UV beads contain different pigments that change color when exposed to UV light from any source (including the sun). Activity with 1-2 adults: Adults will assist the students to create a UV sensor. Students will place 5-10 beads on a pipe cleaner to create a bracelet or keychain that is a UV sensor. To test, an adult should shine the UV flashlight on the bracelet or keychain to show the students what they have created. Ensure the student is not wearing the bracelet or holding the keychain while shining the light to test. If outdoors, sunshine can also be used to test what they have created. Adults may need to assist the student in tying off the bracelet or keychain. As students are working to create their bracelet or keychain, explain to the students that the sun radiates light to the earth and part of that light consists of invisible UV rays. When these rays reach the skin, they can cause tanning, burning, and other skin damage. Discuss with the students that the skin is an excellent detector of UV radiation/rays. When the rays reach the skin, they can cause tanning, burning, and other skin damage. Explain that even on a cloudy or cool day, UV rays still travel through the clouds and reflect off sand, water, and even concrete. On windy or cool days, we are sometimes unaware that we are developing a sunburn because the breeze or temperature keeps us cool. Most UV is blocked by our Earth's ozone layer and atmosphere, but some still gets through and can be detected. Extension activity with 3 or more adults: Have students make a bracelet or keychain as directed above. In addition, share with them the extension activity. Have additional adults shine the UV flashlight on the control bag and on the 3 prepared bags of UV beads with the sunscreen. Continue this extension activity by asking some of the potential questions below. At the conclusion of the activity, gather the materials and make note of any materials that would need to be ordered for your next event. The bags with the UV beads can be used multiple times. It is recommended that you check the bags with the UV light before the next event to be sure new bags are not needed as sunscreen does expire.
Potential Questions	What happened to the UV beads? What did you expect to happen? How can you protect your skin from UV light? What else can you use besides sunscreen to protect yourself? How can UV light be dangerous? What happens if you stay in the sun too long without skin protection? Do UV rays travel on cloudy and cool days? If the extension activity is used, the following questions can be asked: What differences do you notice between the different SPFs? What does this tell us about the different SPFs? Which SPF do you think would give you the best protection?
Air Force Connection	A study published in JAMA Dermatol discusses the exposure of pilots and cabin crew to UV radiation through airplane windshields. The windshields are typically made of polycarbonate plastic or multilayer composite glass. The measurement revealed that windshields blocked UV-B but allowed UV-A transmission. The study revealed that the pilots flying for 56.6 minutes at 30,000 feet received the same amount of UV-A carcinogenic effective radiation as received in a 20-minute session in a tanning bed. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4476387/ An article written in 2018 by Kim Soo explains why passengers should also always wear sunscreen while on a flight. Pilots are more at risk than cabin crew and passengers because they are not able to pull down a window shade while in flight. https://www.telegraph.co.uk/travel/news/sunscreen-on-planes-skin-cancer-risk/