



# VB BEADS

JUSTIN TAYLOR

## SOLAR LESSON

Time Frame:	Standards:
30 – 60 minutes  1 <sup>st</sup> Grade	<b>1.S.1.2.1</b> Make observations, collect data, and use data. <b>1.S.1.4.1</b> Make and record observations <b>1.S.1.7.1</b> Demonstrate cooperation and interaction skills. <b>1.S.5.1.1</b> Identify the characteristics of local natural environments.
Objectives:	
SWBAT observe the affects of the sunlight on objects and how we can protect ourselves.	
Background Information:	
<p><b>How does it work?</b></p> <p>The UV Beads contain different pigments that change color when exposed to ultraviolet light from any source including the sun. The beads are all white in visible light. In UV light, depending on the pigment added to each bead, you will see different colors. Each bead will change color about 50,000 times before the pigment will no longer respond to UV light.</p> <p>The term "light" is often used as a generic word to describe many different forms of light such as incandescent light, fluorescent light, or sunlight, for instance. However, not all light is made up of the same energy. Using Energy Beads, you will be able to uncover an invisible form of light energy called ultraviolet light. None of the energy in the ultraviolet region of the light spectrum is visible to the naked eye. Just as there are many different colors of wavelengths in the visible spectrum (red, yellow, green, blue...), so are there many wavelengths of ultraviolet light.</p> <p>First, there is long wave ultraviolet light (300 to 400 nanometers), which most of us recognize as "black light" the light that is often used to make decorations glow in discos and theatrical productions. Long wave UV passes easily through plastic and glass.</p> <p>Short wave ultraviolet light (100 to 300 nm) is used to kill bacteria, hasten chemical reactions (as a catalyst), and is also valuable in the identification of certain fluorescent minerals. Unlike long wave UV, the short wave UV cannot pass through ordinary glass nor most plastics. The shortest wavelengths cannot even travel very far through the air before being absorbed by oxygen molecules as they are converted into ozone.</p>	

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UV Beads are the perfect tool for understanding how solar radiation can be harmful and to recognize preventative measures that can be taken to reduce the risks associated with exposure to sunlight. When you expose bare skin to sunlight, your skin will either burn or tan (which doctors warn is still not healthy for your body). UV radiation wavelengths are short enough to break chemical bonds in your skin tissue and with over prolonged exposure, your skin may wrinkle or skin cancer may appear. These responses by your skin are a signal that the cells under your skin are being assaulted by UV radiation.

Information from Steve Spangler. Website listed below.

### Materials:

- Color Changing UV Beads
- Zipper-lock Bags
- Leather Cord
- Sunscreen All different levels of SPF

### Procedure:

#### Sun Screen Test

With all of the SPF (Sun Protection Factor) numbers available, we want to know what SPF lotion really works best at keeping out the sun's harmful UV rays. Start by collecting various strengths of sunscreen (SPF 4, 15 and 50, for example). Since the UV Color-Changing Beads are very sensitive to changes in UV energy, you can use the beads to determine the blocking potential of the sunscreen. Place the beads in a [zipper-lock bag](#) and apply a layer of sunscreen to the outside of the bag. Use a permanent marker to write the SPF number of the sunscreen you're testing on the outside of the bag. Be sure to set-up one bag without any sunscreen coating for comparison purposes. Expose the beads to direct sunlight for 5 minutes and look for any changes in color.

**The beads will always change color regardless of how good the sunscreen blocks UV - the beads are very sensitive!** The key is to rate the color of the beads on a scale of 1-5, with 5 showing the most color or "burning" and 1 showing the least color. The bag without any sunscreen is an automatic "5". You can also test the difference between new and old sun screen. Sunscreen manufacturers suggest that you throw away old sun screen because it does not block out harmful UV light. Do your tests support this claim?

**Here's what our teachers discovered...** SPF 4 did not do well at all (got the worst rating of 5). SPF 15 did a little better with a rating of 3 (still not blocking the harmful UV rays very well). SPF 30 was the best blocker and received the best rating of 1. Our teachers also tested tanning oils (even cooking oil) and all of them did very little to block any UV

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(rating of 5 on our UV blocker scale). Shortening was rated a 5 and olive oil was rated a 4. SPF 4 doesn't do much at all, while 15 and 30 do about the same. The cooking fats didn't do much at all, which showed us that even though the shortening is thick and opaque, it sure doesn't block UV rays.

### *Additional Tests*

#### **Light Test**

Place a handful of UV beads near a fluorescent light. Do any of the beads change color? Can you get a sun burn or a tan by sitting next to a fluorescent light?

#### **Black Light**

"Black light" (long wave ultraviolet light) can also be used to change the color of the beads. You can purchase a [black light](#) at many specialty stores or hardware stores that have a large section of light bulbs. Steve Spangler Science also sells them. Sometimes those high intensity lights (mercury vapor) found in a gymnasium emit just enough UV light to make the beads barely change color.

#### **Cloudy Day**

Test to see if the beads change color on cloudy day. If they change color, then you can see why doctors warn people to wear sunscreen even on a cloudy day. Observe how well the beads change color when exposed to sun light at different times of the day. According to your data, what time of day does the sun give off its most intense UV light?

#### **Sunglasses**

Test the ability of your sunglasses to block out ultraviolet light by covering a few beads with the lens of your sunglasses. If the bead do not change color, your sunglasses block out harmful ultraviolet light from your eyes. If not, you paid too much for that UV coating!

#### **UV Filters**

Test a variety of glass and plastic containers to determine which materials block out UV light. Place different transparent filters between a UV light source and the beads. Try eyeglasses and UV absorbing window film. You will find that the front windshield of most automobiles absorbs UV radiation. Usually the side windows do not have this built-in protection.

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#### Make a UV Bead Bracelet

Thread a few beads onto a piece of [leather rawhide or string](#) to make a bracelet. Remember to stay away from any door or windows where ultra-violet light could come into the room. When you're finished, cover the bracelet with your hand and walk outside into the sunlight. Don't take your eyes off the beads as you expose them to sunlight. Like magic the beads change from white to a rainbow of colors.

#### Assessment:

Assessment is observational. Are the students able to follow directions and observe the difference between the sunscreens?

#### Additional Content:

None

#### References:

Steve Spangler is an educator and scientist from the Colorado area for more information on him, please visit <http://www.stevespanglerscience.com/who-is-steve-spangler.html>

For more information on this experiment visit <http://www.stevespanglerscience.com/experiment/00000118>

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