Health Physics Society
Specialists in Radiation Safety

Elementary Class Introduction to Radiation

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Elementary students will have difficulty understanding the concept of alpha, beta, and gamma radiation, especially if they cannot sense them. However, they can see light so this can be used as a substitute for, and an introduction to, other radiation.

The following are suggestions. (This is written by someone who has not taught elementary school except for a few classroom visitations. So, take these as suggestions; you can modify these based on your experience and training.)

Background radiation

Ask students about the sun's radiation:
What kind is it? They most likely will say it is (visible) light, but some may have heard about ultraviolet (UV) and infrared (IR) light also. If they do not mention these, quiz them about the bad part of sunlight (UV) and the kind of light some restaurants use to keep food warm (IR).

Is the sun's radiation always present? They may respond that the sun does not shine at night or it is less on cloudy days.

How can we make our own light radiation? Expect answers such as light bulbs, flashlights, fires, etc.

Can we have light that is not steady? If they understand the concept, they will say turn the light on and off or put something in front of it.

Now a demonstration is in order. Turn a flashlight on and off quickly so the students see short bits of light. Then ask:

Can we count the number of flashes? Of course!

How can you tell that flashlight is flashing? They can see the flashes. Explain that an eye is a form of a detector, something that can measure the presence of light.

Explain that there are certain kinds of radiation that come from the sun and stars (cosmic radiation) and some kinds of radiation that come from the rocks and soil. (Including the fact that radiation also comes from our own body may be something you want to avoid at this stage.) These radiations come individually, not as a steady stream—much like the flashes of light. However, we cannot sense these radiations, so we need a special detector. This is called a Geiger counter.

Some students may have heard of Geiger counters and they may have heard that the Ninja Turtles mutated into their crime-fighting form by continuous exposure to radiation in a sewer and that the Hulk originated by an exposure to a "Gamma Bomb" that irradiated him with "highly charged radioactive particles." Some may have seen TV programs, notably "The Simpsons," that involve radiation with various results: glow in the dark, super-human powers, etc. So, we can assume that some, if not all, K-4 students have had some contact with radiation topics. However, in your discussion you should note that these are fictional stories and exposure to radiation does not do the things depicted in these stories. You can use this background to introduce the concept of invisible radiation. You may even call them alpha, beta, and gamma, but no details about each are necessary at this time.

Now, you can proceed with the activity on radiation detection and radiation background, modifying it to match the level of your students.

Absorption

Again, light can be used to introduce the concept of absorption of radiation. Equipment needed includes plate glass (or a glass bottle, or Plexiglas), paper, cardboard, wood, etc.

Questions to ask:
What kinds of material allow light to pass through them and what kinds stop it? They should come up with glass (or plastic) as transparent and many (cardboard, wood, steel, etc.) that stop light.

Experimentation: Allow the students to design an experiment to verify what they answered. Give them the material and a flashlight and have them conduct their experiment. Their results will depend on how they define "light passing through." If they just look at the "backside" of the paper they get one result, but if they put a second piece of paper behind the first to see if they see any light on the second piece of paper, they may get a different result.

Will one piece of paper stop all the light? If they look at the "backside" of the paper, they will see light. In this case their eyes are the detector. They may also see light projected on a second piece of paper behind the first.

How many pieces of paper will stop all the light? Now they can add pieces of paper until they cannot see any light on the "backside." This may take about 10 pieces of paper, depending on the brightness of the light, the brightness of the room, and the thickness of the paper. A possible extension of the experiment would be to investigate these variables.

Now, you can proceed with the activity on radiation absorption, modifying it to match the level of your students.

Half-life

This concept may be too advanced for elementary students to completely comprehend. However, you may want to do the coin flip (or M&M's toss) as an exercise in probability.