SRC ☑

A Dating Game

Topic **Resources (Radioactive Decay)**

Objectives
- Represent data from a series of trials.
- Analyze data to identify pattern.
- Restate results in terms of half-life.

Duration 30-40 minutes

Assessment Type Formative

Radioactivity is a natural phenomenon; however, many people think that it only occurs in nuclear power plants or as the result of a nuclear accident. When a radioactive atom decays, radioactive rays are emitted. Nuclear radiation can be a good thing or a bad thing depending on how it is released (used). Students often associate 'half-life' with nuclear power, but do not understand always that it equally applies to other naturally radioactive elements - nor do they associate the dangers of the long-term ramifications of radioactive materials disposal with respect to nuclear waste management.

Set-up

Radioactive decay is the spontaneous transformation of one element into another. The only way this occurs is by changing the number of protons in the nucleus. A nuclear AND radiation accident, as defined by the International Atomic Energy Agency, is "an event that has led to significant consequences to people, the environment or the facility. Examples include lethal effects to individuals, large radioactivity release to the environment, or reactor core melt." The Chernobyl Disaster (1986) is an example of a major nuclear accident; the reactor core was damaged and large amounts of radiation were released.

Assign students to small groups of 2 or 3.

Materials

Per team:

- ☐ Small box, with lid (either cardboard or plastic is fine)
- ☐ 100 black-eyed peas (or any small items with a unique directional mark)

Instructions

1. Mark the box on the inside by putting an 'X' on two of the opposite walls.
2. Place the 'peas' in the box.
3. Secure the lid and shake the box for a specific time, i.e. 10 seconds. *Use the same method and time for later 'shakes'.*
4. Open the box and remove all the peas whose 'eyes' face the marked sides of the box. These represent atoms of the element that have decayed.
5. Record the number of remaining 'atoms' in the box. *Repeat steps 3, 4, and 5 until all the atoms are gone.*
6. Graph the data.

Notes

To change the 'half-life' of the element, mark an 'X' on just one or three sides of the box.

While the overall data will produce an accurate representation of a half-life, individual groups or students may produce a variety of data.

Timesaver! Be sure to use beans or peas with a definite 'eye' so that students can see which way the pea is turned.

Discussion Questions

- Determine the half-life of your element (the point at which only 50 atoms are in the box).
- What is the half-life of your neighbor's element?
- If the number of "decays" were in years (that is, one decay = 100 or 1000 years), what would be the half-life of your radioactive element?
- Why was it important to shake the box for the same specific time each trial?
- What is the average half-life for the class?
- What does 'half-life' mean?
- How is a half-life important to a geologist? How is it important to a medical doctor?
- How is radioactive decay important to the energy industry?

Reality Check! Evaluation

- ☐ Did students accurately graph their data across a series of trials?
  - o Were they able to identify a pattern?
  - o Did they draw a best-fit line?
  - o Did students discuss what the shape of the curve means in terms of their experience?
- ☐ Did students identify and explain similarities or differences among other group results?
- ☐ Were students able to restate their experimental results in terms of radioactive decay, half-life.