LEARN ABOUT NUCLEAR WEAPONS

Radiation is a Verb — The Contamination Game

Teacher Tools

A classroom with a blackboard is ideal, as chalk and erasers are used to explain the invisibility of radiation. If there is no dust to be found, generate your own, using dirt or sand.

Aim

- To learn about the unique nature of radioactive materials
- To imagine the verb like qualities of invisible radioactivity
- To think critically about radioactive contamination

Motivation

In accordance with the recommendations of the United Nations Study on Disarmament and Non Proliferation Education, students should be encouraged to think critically, and to use their imagination. Critical thinking about nuclear weapons should also include an overview of the peculiar effects of radiation and the invisible pathways of contamination. Through interactive learning, followed by group discussion, students come to better understand the unique qualities of radioactive contamination.

INTRODUCTION

The fact that radioactive contamination is invisible subverts conventional ways of knowing. What we cannot see poses problems for how we come to 'know' and understand the material world. In order to understand, we need to exercise our imagination, to imagine the invisibility of radiation. Radiation is invisible in that it cannot be seen unless it is mediated through technology, like the clicking of a Geiger counter. The radioactive contamination of communities surrounding the Chernobyl facility is a case in point. To begin a discussion of radioactivity, provide students with a brief history of the Chernobyl nuclear accident.

Brief Review of the Chernobyl Nuclear Power Plant Accident

On Monday, 28 April 1986 workers at a nuclear power station in Sweden detected high levels of radiation, fourteen times higher than 'normal' (May 1989: 280). These readings were confusing because there was no indication that the radioactivity was originating on-site. Other regions in Scandinavia were also registering levels way

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beyond the scale of 'background' radiation. It became apparent that "something, somewhere was releasing huge amounts of radioactivity into the atmosphere" (May 1989: 280). The following day, concerned about the news that massive levels of radiation were coming from an unknown location, a team of US technicians using a surveillance satellite disclosed the source in the Ukraine at the Chernobyl nuclear power plant — a reactor in Block 4 was on fire.

It was on April 26 that the reactor literally exploded due to an accident which ironically occurred during a safety test. After switching off the emergency cooling system, workers at Chernobyl neglected to turn it back on. This human error coupled with other safety violations resulted in the evaporation of the cooling water. Once the water evaporated, a fire erupted in the reactor, showering radioactive debris over a wide area.

The reactor explosion at Chernobyl released "at least a hundred times more radiation into the atmosphere than the atomic bomb dropped on Hiroshima" (Hall 1996: 5). A massive plume of radioactive fallout traveled over a region of 160,000 square kilometers (Roche 1996: 11). Fallout from Chernobyl effected far more than the immediate surrounding area, and was carried by the wind to Belarus and parts of Russia, as well as "large areas of Europe extending through Poland, Austria, Germany, northern Italy, France, the Scandinavian countries, and parts of Britain" (Caldicott 1992: 92). This one accident at one nuclear power station created radioactive refugees, fleeing an invisible poison, which blights the landscape to this day. Rural areas were especially affected and many people who had lived off the land as farmers were moved into cities.

Imagining radioactive contamination

Let's imagine a farmer in the Ukraine who cannot face a life of relocation after the Chernobyl disaster and returns to the radioactive exclusion zone. Although he is unable to see the radioactivity that poisons the land he works and the water he drinks, his knowledge of invisible poison may affect his perception of the material world. He will be able to recognize the effects of radiation *only when they show themselves*: genetic mutations in his vegetables, thyroid cancer in his young granddaughter. Yet in the present, while tilling his field or drawing up water from his well, he cannot see the radiation that he has been warned is there, but his knowledge of it may well twist his perception of what is real in his world: his farm, food, water, or granddaughter.

And who is this Ukrainian farmer to trust in the new world that he inhabits? The news of the Chernobyl disaster arrived first in other countries. The governmental scientists of the former Soviet Union were initially reluctant to disclose radiation levels. Later, areas of high radioactive fallout were separated into zones that varied in degrees of 'safe' and 'unsafe' levels of exposure to radiation.[1] People living in zones 1 and 2 were being

[1] The zones are meant to demarcate the levels of radioactive fallout around Chernobyl. The range is from zone 1 to zone 4 with zone 1 being the area of the highest levels of radiation. Zone 1 comprises the immediate area, it is an evacuation zone and is defined as any region containing a higher level of radiation than zone 2. Zone 2 is defined by having an average dose of "three curies of strontium, twenty-five of cesium and 0.1 of plutonium per square kilometer" (Cheney 1995: 44). Zone 3 is defined by having an average dose of "0.15 curies of strontium, five of cesium and 0.1 of plutonium [per square kilometer], with dosage exceeding 100 millirem per year" (Cheney 1995: 44). Zone 4 is defined by having an average dose

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relocated, while people from zone 3 'had the right' to be relocated. Farming and commercial agriculture has been banned in zones 2 and 3. But what did these numbers really mean, and who made them up?

Independent, non-governmental scientists warn of great dangers. But the old farmer knows nothing of science and cannot bear the thought of dying away from his land, his once-community. So, with a different and haunting new perspective on the material world, he stays where he has always lived.

DIRECTIONS

Step One: Classroom Ethics

Begin by establishing 'classroom ethics' so that students can feel safe to speak about their feelings and opinions. Have students brainstorm a list of classroom ethics by asking them: What are some things that we each need to feel a part of the classroom community? Write their ideas on the board. Examples include:

- Respect each other.
- Only one person speaks at a time.
- Listen to each other.
- Everyone has a right to their own opinion.

Once a list is drawn, review it together with the students, and have them agree to these guidelines for the duration of the class period in order to build a respectful environment.

Step Two: Web on radioactive contamination

Write 'radioactive contamination' on the board and circle it. Ask the students to say ANYTHING they think of when they hear the words: radioactive contamination. Draw a line from the circle to connect each idea to the central theme (see "example web" below). Write down everything students report, to affirm their knowledge. This will help the class to outline basic information about nuclear weapons, and can also serve to correct any false assumptions.

Some questions teachers can ask to stimulate students' ideas include:

- What is radiation? What is radioactive contamination?
- What does it look like?
- What makes radioactive contamination different than other types of contamination?

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of "0.02 curies of strontium, one of cesium and 0.01 of plutonium per square kilometer, with a dosage not exceeding 100 millirem per year" (Cheney 1995: 44). It must be noted that these are approximate levels which may be higher and in different concentrations than indicated here.

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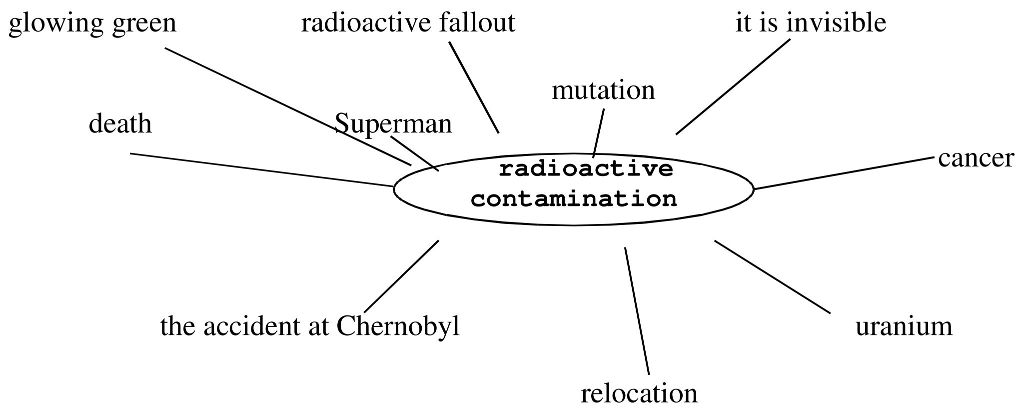
Here is an example of a web on nuclear weapons:



Step Three: methodology/overview of each lesson topic
After the web exercise tell students the story of the imaginary Ukrainian farmer, cited above. Use this or another story of radioactive refuges, emphasizing the point that people fled their homes due to an invisible poison.

Step Four: describe the lesson and play (!)
Albert Einstein, great inventor, Nobel laureate and anti-war advocate, said “Imagination is more important than knowledge.” Because it is difficult to comprehend contaminating qualities of radiation, we need to apply our imagination and understand how radiation is a verb, because *what is contaminated is also contaminating.*

Set up the game by asking for 4 volunteers. Two will go out of the room, while the other two stay. Ask each pair to discuss how radiation could be a verb — BECAUSE *what is contaminated, also becomes contaminating*. Illustrate this by taking a chalk eraser and spreading dust on your hands. Pretend the eraser is contaminated with radioactivity. Hold it in your hands and get chalk on your fingers. Pretend that this is contamination. One person has the chalk the other does not. Invite the two other students in to the classroom. Shake hands. Give them a congratulatory pat on the back. Of the normal everyday physical interactions, have the students watch and identify the spread of the pretend radiation. After the brief roleplay, ask for volunteers to describe who was contaminated and who was not. And have them identify the pathway of the contamination. For example, *it was when Omar, who had the eraser, shook Nicole’s hand. He then invited her to sit down, putting his hand on the chair. She later got up from the chair by placing her hand where Omar’s had been, etc…* Repeat with another four students and after a few roleplays, ask the students to share any thoughts or feelings about what they have learned. To conduct the conversation in a participatory manner, use a fishbowl.

Step Five: Take Action
After the roleplay, it is time about action. Ask students to stand up, get them moving around the room to release some energy. Ask the students what we, as a society, need to learn about identifying invisible poisons. They might formulate their ideas by writing

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story about what they learned, making a collage from magazines and newspaper clippings or initiating a letter writing campaign to political leaders about the importance of understanding radioactive contamination. How can we better understand it? Should we be working with something we find so difficult to control? Or what would you want to say to the imaginary farmer living near Chernobyl?

If students are really motivated they may want to get involved in a grassroots project to purchase radiation monitors for people living in the fallout region of Chernobyl. The VIOLA Project buys radiation monitors and teaches members of the local community how to use them so they can be better informed about their environment. If community members are aware of radioactive hot spots they will know not to plant gardens there and may develop decontamination plots, for example, by planting dwarf sunflowers which can extract some radioactive elements from the soil. Knowledge is power, and this local project has empowered many people by giving them the technology to better understand radioactive contamination.

Through bake sales or penny banks students can raise money to help buy hand held radiation monitors through support of the VIOLA Project.

For more information see
http://www.livingearthgatherings.org/novozybkov_reports_info.html
http://www.joannamacy.net/html/elmdance.html

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