



TEXAS COMMISSION ON ENVIRONMENTAL QUALITY Lesson Plans for Teachers

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The Path of Pollution

Purpose

Students will follow the path of pollution from the Chernobyl accident.

Grade Level

- ◆ 7th grade
- ◆ 8th grade

Science TEKS

- | | |
|---------------------|---------------------|
| ◆ 7.2 a, b, c, d, e | ◆ 8.2 a, b, c, d, e |
| ◆ 7.3 a, b, d | ◆ 8.3 a, b, d, |
| ◆ 7.14 a, c | ◆ 8.14 c |

Objective

The student will

- ◆ Name and locate countries where radiation traveled to.
- ◆ Describe how air pollution travels from one area to another.
- ◆ Sequence the travel of radiation in chronological order.

Focus

Ask each student, "What is air pollution?" Write all ideas on the board. Through discussion, arrive at one definition. Divide students into groups to brainstorm things that pollute the air. Have groups take turns recording ideas on an air pollution chart posted in the room.

Materials

- ◆ student copy of Explosion at Chernobyl (located at end of lesson)
- ◆ pencil
- ◆ sticky dots or stickers to mark the map

- ◆ a world map
- ◆ an atlas of encyclopedias
- ◆ map of Europe
- ◆ Pollution Points handout (located at end of lesson)

Background

Most major air pollutants are invisible, although large amounts of them concentrated in areas such as cities can be seen as smog. One often visible air pollutant is particulate matter, especially when the surfaces of buildings and other structures have been exposed to it for long periods of time or when it is present in large amounts. Particulate matter is made up of tiny particles of solid matter and/or droplets of liquid. Natural sources include volcanic ash, pollen, and dust blown by the wind. Coal and oil burned by power plants and industries and diesel fuels burned by many vehicles are the chief sources of man-made particulate pollutants, but not all important sources are large scale. The use of wood in fireplaces and wood-burning stoves also produces significant amounts of particulate matter in localized areas, although the total amounts are much smaller than those from vehicles, power plants, and industries.

Our air does not know any boundaries. Wind can carry pollutants hundreds of miles from their origin. The distance air pollutant's travel depends on how high in the atmosphere they go. If the pollutants don't rise very high, they are deposited close to their source. However, pollutants that are lifted high into the atmosphere may travel thousands of miles before they drop back to Earth. Air does not know local, state, national or international boundaries.

By tracing the movement of radiation released during an accident at the Chernobyl nuclear power plant, students will see how air pollution, like particulate matter, can become a global issue.

Procedure

Students may work individually or in groups. Discuss with the students what air pollution is and how it travels. Pass out the Explosion at Chernobyl information sheet. The students can read and discuss the article.

Using the Pollution Points handout, students will plot the course the radiation took each day. Points should be plotted numerically and in sequence, chronologically. (Be sure to make reference materials available to locate countries.)

Extension

Split the class into two teams. Each team will work together to map the pollution points. Mark Chernobyl's location with a sticker. The mapping will start with someone from the first team reading pollution point location number 1 out loud. He or she will have 40 seconds to find that city on the map and mark it with a sticker. Team members can help the player by giving directional tips, but they cannot point to any specific location. If the team member finds the location point within 40 seconds, that team gets one point. If not, the other team gets a chance to find the correct location. Teams take turns

locating the points until all 29 points have been mapped.

Evaluation

Students may be given a clean map and asked to plot the points independently.

Write answers to questions such as: What other forms of air pollution can you think of?

How is our community affected by air pollution?

Reference

The Path of Pollution modified from Ranger Rick's Nature Scope Series: Pollution: Problems and Solution, 1990

Acknowledgment

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Pollution Points

Day 2 -- April 27

1. Winds blow radioactive cloud northwest over Gdansk, Poland.

Day 3 -- April 28

2. Radioactive cloud reaches Stockholm, Sweden.
3. Radioactive cloud reaches Helsinki, Finland.
4. Radioactive cloud reaches Oslo, Norway.

Day 4 -- April 29

5. Radiation continues moving north through Scandinavia and reaches Trondheim, Norway.
6. Radiation detected in Copenhagen, Denmark.
7. Winds carry radioactive cloud to Prague, Czechoslovakia.

Day 5 -- April 30

8. Cloud moves over Munich, West Germany.
9. High amounts of radioactive particles wash out when it rains in Vienna, Austria.
10. Radioactive cloud reaches Geneva, Switzerland.

Day 6 -- May 1

11. Cloud travels to Rome, Italy.
12. Radioactive cloud reaches Budapest, Hungary.
13. Winds carry radioactive cloud to Zagreb, Yugoslavia.
14. Radiation detected in Paris, France.
15. Radioactive cloud reaches Tromso, Norway.

Day 7 --May 2

16. Small amounts of radiation measured near Reykjavik, Iceland.
17. Radiation reaches Bucharest, Romania.
18. Winds carry radioactive particles into Brussels, Belgium.
19. Radioactive cloud moves over London, England. High amounts of radiation wash out when it rains north of London.
20. Radioactive cloud detected in Sofia, Bulgaria.

Day 8 May 3

21. Radioactive cloud reaches Glasgow, Scotland.
22. Winds carry radioactive cloud to Athens, Greece.
23. Radioactive particles detected in Ankara, Turkey.

Day 9 -- May 4

24. Radiation reaches Beirut, Lebanon.

Day 10 -- May 5

25. Radiation detected in Damascus, Syria.

Day 11 -- May 6

26. Radioactive particles reach Kuwait, the capitol of Kuwait.

27. Radioactive cloud moves over Xian, China.

Day 12 --May 7

28. Radioactive particles reach Tokyo, Japan

Day 18 --May 13

29. Slight amount of radiation detected in Richland, Washington, in the United States.

The Explosion at Chernobyl

The Big Blast

On April 26, 1986, at 1:23 a.m., Chernobyl became the site of the world's worst nuclear power plant accident. Operators were shutting down one of the reactors for maintenance when the power suddenly surged and the reactor exploded. The blast blew the reactor apart and sent radioactive gases and particles as high as three miles into the atmosphere. Two plant workers were killed by the explosion. Twenty-nine others later died from radiation exposure. Within days, more than 120,000 people were evacuated from an 18-mile radius around the plant. As fires inside the reactor burned, helicopters dumped tons of lead, sand, and other minerals on the flames. Despite these efforts, the fires burned for 10 days after the blast, continuing to release radioactive pollutants into the air.

Where It Went

The explosion resulted in a huge cloud that soon split into two parts. One part of the cloud moved northwest toward Poland and Scandinavia, and then southwest across central Europe. The other part of the cloud moved east across Asia, over Japan and the North Pacific, and eventually reached western North America. And as the reactor continued to burn, it released radiation that moved south and west of the plant. But scientists believe that in most cases, the amounts of radiation deposited outside the Soviet Union were relatively low. Effects of the Explosion The first few weeks following the Chernobyl blast were filled with confusion. Some European countries ordered the destruction of millions of dollars worth of contaminated produce, milk, and livestock. But in other nearby European countries, people were told that there was no danger and that it was safe to consume these products. Farmers suffered huge financial losses when countries in other parts of the world refused to import produce from Europe. A significant portion of the released radioactive material has a very long half-life, i.e., it will be around for a very long time, thousands of years. Radiation, even at low levels, can increase incidence of cancer. Particularly sensitive are the effects on the digestive system, blood pressure, and the heart. The explosion also strained relations between the Soviet Union and other nations. Many countries were angered by the Soviet Union's delay in reporting the accidents. Officials announced it on April 29. Chernobyl's Legacy The damaged reactor at Chernobyl now stands entombed in thick layers of concrete and steel, while the other reactors at the same plant are again producing energy. But the disaster is still taking its toll. Some scientists predict that within the next few decades, thousands of people who were exposed to the radiation could develop cancer.