EPA POLLUTION PREVENTION

POLLUTION PREVENTION (P2) EDUCATION TOOLBOX
Tools for Helping Teachers Integrate P2 Concepts in the Classroom

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WHAT IS POLLUTION?

Our lifestyles include cars, fast food, disposable items (for example, paper plates and plastic baggies), newspapers, air conditioning, household appliances (for example, microwaves and hairdryers), and many other items that make our lives safer, easier, and more comfortable. Unfortunately, pollution is often a consequence of producing, using, and disposing of these goods. Waste is unwanted or discarded material and when it is released to the environment, it becomes pollution. Pollution is generated by industries, agriculture, businesses, schools, vehicles, and even our homes and if not properly handled, can contaminate our soil, water, and air.

Once pollution is generated, it is generally here to stay. Even if it is properly disposed of, wastes or pollution can migrate into the earth's environmental media, including soil, water, and air. Although these environmental media may seem separate, they interact in ways that are not all ways apparent. The pollutants in each medium can move to or from any other medium. For example, pollution released to the air can fall to the ground and contaminate soil which can leach into aquifers, which are underground sources of water for communities that get their drinking water from wells. When we try to clean up pollution after it is generated, sometimes we just end up moving the pollutant from one medium to another. The scenario below illustrates problems that may occur when pollution is produced. This fact sheet introduces the concept of preventing pollution before it is produced and therefore reducing the need to clean up pollution in the environment.

WHAT IS POLLUTION PREVENTION AND WHY IS IT IMPORTANT?

Instead of trying to clean up pollution after it has been created, pollution prevention (P2) focuses on reducing the generation of pollution and waste by changing or modifying plans, practices, or habits. P2 also includes activities that protect natural resources through conservation or more efficient resource use. Pollution prevention focuses on ways to avoid producing pollution in the first place.

The following P2 concepts are used by many businesses and can also be used at home and school.

- ✔ Changing What You Use - Using nonhazardous or more efficient products (for example, using vinegar and hot water instead of hazardous commercial drain cleaners or purchasing products with less packaging)

- ✔ Changing What You Do - Using more efficient or less wasteful methods (for example, turning off lights when you leave the room)

- ✔ Improving Your Housekeeping - Minimizing spills and leaks (for example, immediately cleaning up outdoor spills before the spill is washed into the storm sewer)

- ✔ Educating Yourself and Others - Learning about and showing others how to think "pollution prevention first" (for example, conducting a survey of your home to identify pollution prevention opportunities)

To understand sources of pollution, it is important to look at the “life cycle” of a product. Life cycle analysis measures the amount of raw materials and energy used and pollution produced from the time of product generation to final disposal. Life cycle analysis is a valuable tool for identifying P2 opportunities.

The following figure represents a hierarchy of waste management practices. The top of the hierarchy represents the best option.

1. Pollution Prevention
2. Reuse
3. Recycling
4. Treatment
5. Disposal

P2- source reduction (the preferred practice)
Reuse - repeated use of products before discarding
Recycling - processing waste for reuse
Treatment - only if necessary; burning or using chemical or physical methods
Disposal - responsibly disposing of waste (that cannot be prevented) in the environment

P2 is the most preferred practice because it is an effective, economical, and efficient way to reduce waste generation and minimize impacts on health and the environment.

HOW CAN POLLUTION PREVENTION HELP YOU?

P2 protects our health and environment by reducing the need to protect ourselves from the harmful effects of pollution. P2 can also conserve natural resources and saves money. For example, your household could conserve valuable resources by using energy-efficient appliances.

Students who participate in P2 activities will learn attitudes and behaviors that build lasting responsibility for a sustainable environment. P2 requires abandoning the "throw it away" mentality and instead thinking critically about the environmental consequence of daily activities and practices. Also, by using the four P2 concepts discussed above, students can develop critical thinking and problem-solving skills that apply to many areas of life.

Many people's jobs include finding ways to prevent pollution,

Including:
scientists
engineers
teachers
technicians
factory workers and managers
health professionals

These jobs present potential careers for students.

With the help of the P2 Pal, the remaining fact sheets in this toolbox show how P2 concepts can be applied to the following environmental issues: household hazardous waste reduction, pesticides reduction, energy conservation, and water pollution prevention and conservation.

LESSON PLAN

This lesson plan provides guidance and activities that will help teachers meet the following goals:

- ✔ Explain life cycle analysis and identify natural resources used and wastes produced during the generation of consumer products
- ✔ Explain P2 and why it is the preferred practice
- ✔ Explain how P2 options can be identified and used to reduce waste and prevent pollution

The preceding pages of this fact sheet contain background information and definitions necessary to implement this lesson-plan, which meets the requirements for the Chicago Academic Standards and Frameworks: 6th grade - state goal 13 CASB. CFS1 and CASC. CFS1.; 7th grade - state goal 11 CAS C. CFS 1., state goal 13 CASB. CFS 1. and 2. and CASC. CFS.1; 8th grade - state goal 13 CASA. CFS 3; CAS :B. CFS 1.; and CAS C.CFS 1.

Begin the lesson by introducing a P2 journal concept to students. Explain that this journal will be their responsibility for the whole project and that they should write down ideas, notes from class, and homework assignments in this journal.

WHAT IS POLLUTION?

Ask the students to answer the question "What is pollution?" Ask students to name some waste-generating activities and then come up with ideas about how this waste becomes pollution (for example, changing the oil in your car and dumping the used oil down the storm sewer).

Explain that soil, air, and water are environmental media and they are connected. Explain that when waste becomes pollution, it can be transferred between environmental media and humans can be exposed to it. Review the scenario on page 1 that shows the problem of pollution transfer between media.

Based on the information provided, explain how products we buy and use have a history before and after we use them. Explain the concept of life cycle analysis to the students. Ask students to conduct a life cycle analysis of a chocolate chip cookie. Students should name the materials needed to make chocolate chip cookies (such as milk, chocolate chips, flour, and eggs). Ask the students what resources are needed to make the cookies. What sorts of energy (for example, electricity for refrigerating eggs and butter and gas for cooking) or water (for example, water to clean dishes) usage can occur? What wastes are produced to make the cookies (for example, shipping milk to grocery stores generates large amounts of packaging)?

Activity No. 1- What Was My Life?

Objectives: Students should understand that the "life" of all consumer products has three phases: production, use, and disposal. Students should be able to identify sources of waste in the life of a product. This critical thinking activity will aid students in evaluating their product buying, using, and disposal habits so that they can identify ways to reduce waste and prevent pollution.

Time Length: About 20 minutes

Materials Needed: An empty can of hairspray with an added insect killer label (for the activity, pretend the can is half-full)

Activity: Arrange students in a horseshoe. The object of the activity is to share with the class something about the life cycle of an item. Students on the left side of the horseshoe represent the can being produced; students in the middle represent the can being used; and students on the right side represent the can being disposed. Hand the "half-full" can of insect killer to a student in the center of the horseshoe. The first

speaker may start with something like "I am being used to kill a roach in the kitchen." After the use of the can has been discussed, pass the can to the production speakers who may say something like "Before I go to someone's house, materials such as steel and plastic are bought by the factory to put me together." After the production of the can has been discussed, pass the can to the disposal speakers who may say something like "I am being thrown into the garbage and am headed for a landfill." Conclude the trip around the horseshoe with a discussion on raw materials (for example, metal, plastic, hazardous insect killer) used; wastes produced during the production and use of the can; and pollution that may result from the improper disposal of the half-full can.

WHAT IS POLLUTION PREVENTION AND WHY IS IT IMPORTANT?

Based on the information and waste hierarchy provided, define P2 and discuss why it is the preferred approach to deal with wastes we generate everyday. Clarify that although P2 is the most preferable option, reuse and recycling should also be considered.

Explain the four concepts of pollution prevention and provide examples related to every day life (for example, using a ceramic mug or glass instead of a disposable cup). Emphasize that students should ask themselves "Do I really need this?" or "Is there a less wasteful way to do this?"

HOW CAN POLLUTION PREVENTION HELP YOU?

Based on the information provided, discuss P2 benefits such as cost savings and decreased pollution clean up. Emphasize that P2 not only protects the environment but also our health by reducing our exposure to pollution.

Ask students to name careers that may include P2. Emphasize that a variety of jobs can include P2. For example, a bagger at a grocery store can use fewer bags, a factory worker can use less toxic cleaners to clean parts, an office worker can use both sides of a sheet of paper before recycling it, or a laboratory technician can clean up a spill before it reaches a floor drain.

Activity No. 2 - Making Biscuits

Objectives: Students should be able to identify sources of waste and P2 opportunities to address these sources.

Time Length: 30 minutes

Materials Needed: Flour, water, egg (optional), round cookie cuter, knife, rolling pin, measuring cup, bowl, spoon, apron, baking sheet, and newspaper

Activity: Explain to the class that you are a bakery worker at a bakery that specializes in making biscuits. (Another option is to explain the baker role to one student before class and have that student make the biscuits). However, the bakery has been losing money because it is too wasteful.

Spread out the newspaper to work over and put on the apron. Mix the flour, water, and egg together in the mixing bowl. Try to be messy and spill things. Look at the directions but throw them out. Be imprecise about the measurements. Roll out the dough and press the cookie cutter into the dough. Cut off the edges with the knife and throw away the waste.

Pretend to "cook" the biscuits.

While you are doing this, the class should carefully observe your actions and identify when waste is generated and how it could have been avoided. The students should write their observations in their journals.

During an interactive discussion, have the students discuss wastes they identified and ways to reduce the waste (for example, better housekeeping by spilling less, following directions, using only the right amount of raw materials, recycling the dough that is cut off from the edges, and making square biscuits instead of round ones).

METHOD OF EVALUATION/ASSIGNMENT

Have students answer the following questions in their journals.

- ✔ Why is P2 important to me?
- ✔ How can I get my family to think about reducing and preventing pollution in our home?
- ✔ How can my class reduce waste in the classroom?