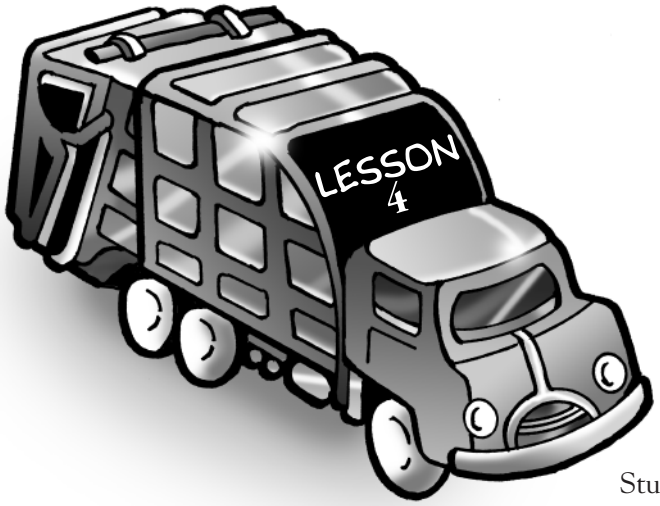


(post-tour)

CYCLES

CONCEPTS:

Students will learn:

- everything people make, use, and discard comes from natural resources
- most products made by people don't have to be thrown away and can be kept in a cycle through reusing and recycling

Activity Overview:

Students will:

- classify objects according to the natural resources from which they were made
- work in groups to show the process from natural resource to product
- present their findings to the class
- plan ways to recycle

Vocabulary:

- cycle
- life cycle
- natural resources
- pollution

Time Requirement:

- From 1 to 2 hours, depending on time to prepare and present reports and to make recycling plans

Materials:

☐ A sign for each of the following natural resources: plants, animals, minerals, fossil fuels

☐ One or more objects made from each of the above natural resources (e.g., cotton t-shirt or paper bag, leather belt or wool sock, aluminum can or glass jar, plastic bag or polyester shirt)

☐ Transparency of "Papermaking: One Way or a Cycle?"

☐ "Where Does Your Trash Go?" poster

Preparation:

☐ Read the "Background Information" at the end of this lesson.

☐ Ask students to bring to class one object that was going to be discarded.

☐ Bring in a few objects (from various resource bases) for those students who do not bring in objects.

☐ Make or have students make a sign for each natural resource base (plants, animals, minerals, fossil fuels) and put the signs up around the classroom

☐ Make a transparency of "Papermaking: One Way or a Cycle?"

PROCEDURES

I. CATEGORIZE OBJECTS BY NATURAL RESOURCE BASE

(approximately 10-15 minutes)

*(**Note:** The day before beginning this lesson, be sure to ask students to bring to class one object that was going to be discarded. Encourage students to be inventive so that everyone does not bring in a soda can or chip bag!)*

A. Ask each student to share the item that he or she brought to class, identifying it if necessary and explaining why the object was going to be thrown away. Have each student place the object next to the sign indicating the main natural resource from which this object was made.

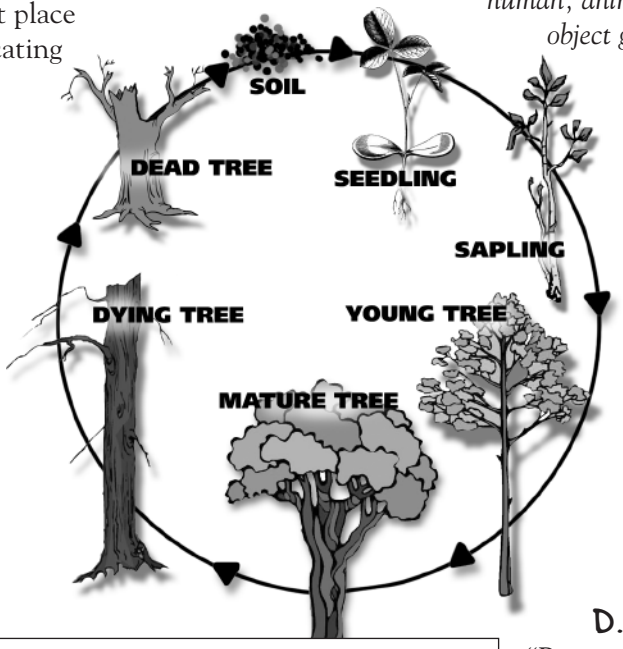
B. For any natural resource category that does not have any objects representing it, share items you have brought in and have students categorize them.

II. DISCUSS CYCLES

(approximately 10-15 minutes)

A. Ask students the following questions:

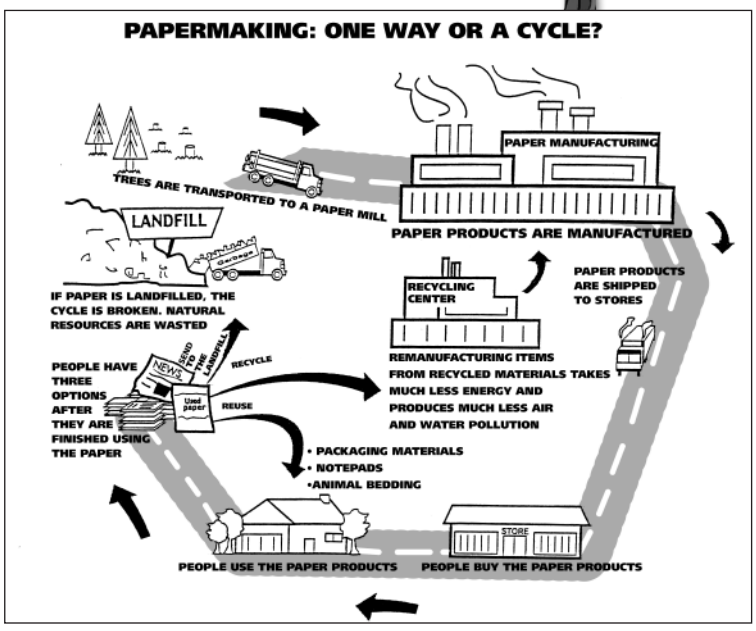
1. **What is a cycle?**
   (a series of events that occur over and over again)
2. **What are some cycles that exist in nature?**
   (the seasons, the water cycle, the nitrogen cycle)
3. ***What is a "life cycle"?***
   (the stages that either a living being – human, animal, plant – or a manufactured object goes through)



B. Have students describe and/or draw the life cycle of a tree (See example.)

C. From the objects placed in the "plant" natural resource category, choose a paper product that would likely be thrown in the trash. Ask students to describe and/or draw the life cycle of this product.

D. Project the transparency "Papermaking: One Way or a Cycle?" Point out the various steps and ask students how this cycle is different from the life cycle of a tree. *(The life cycle of a tree goes on and on, whereas the papermaking cycle may not be a cycle at all if the item is thrown away.)*



III. EXAMINE LIFE CYCLES OF VARIOUS OBJECTS

(approximately 30-60 minutes)

A. Choose one discarded object (e.g., a leather belt) and tell students that they are going to examine the life cycle of this item by answering the following questions:

(Note: Sample answers are shown for a leather belt.)

1. **From what natural resource was this item made and is this resource renewable or non-renewable?**
   (Leather comes from an animal, specifically a cow, which is renewable since more cows can be made.)

2. **If the natural resource was once living (i.e., a plant or animal) what natural resources did this living thing use when it was alive?**
   (air, water, soil, and plants, which also used air, water, and minerals.)

3. **What natural resources were used to make this product?**
   (water, fossil fuel)

4. **Might any pollution be caused during the manufacturing process?**
   (Yes, burning fossil fuel can pollute the air. And the chemicals that are used in the process of tanning the leather can pollute water or other parts of the environment.)

5. **Were any natural resources used to transport the raw materials to the manufacturing plant and then the product to the market?**
   (Yes, fossil fuel, which makes gasoline, is used to run the vehicles which are used for transportation.)

6. **How will this product be used once it is purchased?**
   (A belt will likely be used as an article of clothing.)

7. **How long will this item be used before it is discarded?** *(perhaps one or two years – until it wears out, or no longer fits, or goes out of style)*

8. **Then what will happen to the item?**
   (It may go into the trash can and then to the landfill, which ends the life of the item. It may be given to someone who can use it.)

9. **Could this item be reused?** *(Yes. If it is still in good shape, it could be given to someone or donated to a thrift shop; or it could, perhaps, be used for another purpose, such as a tie-down.)*

10. **Could this item be recycled?** *(probably not)*

B. Divide students into groups based on the natural resource categories. If groups are too large, split them into two. Explain to students that they are going to analyze the life cycle of an item in their category and present their findings to the rest of the class. Have students follow the steps below:

1. Select an item in their category.

2. Use the questions above as well as any other questions they think important.

3. Determine all the natural resources used to make this item. (Older students can also determine effects on the environment – air, water, land – as well as the costs involved to manufacture this item.)

4. Show variations in the life cycle, that is:
   - made from raw natural resources vs. made from recycled material
   - going to the landfill vs. being reused or recycled

5. Create presentation materials – posters, models, charts, reports, photographs, videos.

C. When students are prepared, have each group give their presentation. After all groups have presented, discuss their findings, especially the amount of natural resources used to manufacture products and the importance of recycling to save natural resources, money, the environment, space in landfills, etc.

IV. PLAN RECYCLING

(approximately 10-20+ minutes)

A. Display the "Where Does Your Trash Go?" poster. Have students read the information above and below the picture. Have younger students point out all the places their trash comes from (e.g., homes, market, businesses, school, ski resort) and then where it goes. Have older students read the text on the back of the poster to learn more about materials recovery facilities (MRFs) and about waste-by-rail landfills.

B. Remind students that recycling helps keep solid waste out of landfills. If it is not known what items are recycled in your community, have students do research either by calling the city's or county's solid waste department or by going online (city's or county's website or www.earth911.org). Ask students to obtain information about the types of materials that are being collected for recycling and the places items can be recycled (curbside, drop-off centers, etc.).

C. Make recycling plans in whatever areas are appropriate for your class:

- **In students' homes** – Plan how materials can be collected and stored, where they will be collected or taken, etc.
- **At school** – Determine what materials can be recycled, how they will be collected (separate bins?), where they will be collected (in each classroom? in the cafeteria?), how they will be picked up or dropped off, if money will be received for the materials, what any funds can be used for, etc.
- **In the community** – If recycling is not widely practiced in your community, plan how more people can become involved.

EXTENSIONS

- **Visit a recycling plant** – paper, aluminum, glass, plastic – and have students write and illustrate reports about the process.
- **Make recycled paper** (see www.talkabouttrees.org, or search "making recycled paper" online).
- **Research Materials Recovery Facilities,** where materials – from glass bottles to chunks of asphalt – are recovered and recycled. What materials are recovered? How are they recovered and then recycled?
- **Analyze solid waste at home.** What percentage of students' trash is recyclable? Explain that in the United States, 89% of household solid waste is recyclable, but only about 50% is actually recycled.

BACKGROUND INFORMATION

A life cycle is a series of stages through which an object (living or manufactured) passes during its lifetime. Through reusing and recycling, the life cycle of an object can be extended, conserving the natural resources (including energy sources), which would be used to replace this object, and keeping the object out of the landfill.

Recycling saves vast natural resources.

If half of the **paper** used in the world today were recycled, approximately 10 million acres of forest destined for the paper mill could be conserved. At present, however, about three-quarters of used paper is placed in a landfill. According to one estimate, when new paper is made from waste paper instead of trees:

- a large amount of water is conserved
- 30 to 60 percent less energy is used
- 75 to 95 percent fewer air pollutants are produced
- 35 percent fewer water pollutants are added to the environment.

Recycled **glass** is crushed into pellets called cullet.

- For each 10 percent of cullet used, the furnace temperature can be lowered 10 degrees, saving lots of energy.
- Using one ton of recycled glass will save 1.2 tons of raw materials.
- Using 50 percent cullet per batch of glass cuts water consumption in half.
- Using 50 percent cullet reduces air emissions about 14 percent.
- Recycling 50 percent of glass can decrease mining wastes by almost 80 percent.

Recycling **aluminum** produces huge savings.

- It takes 95 percent less energy to produce aluminum from recycled material than from raw materials.
- Producing aluminum from recycled material decreases air pollutants by 95 percent.

Mining iron ore and producing **steel** is energy intensive and polluting. But using scrap instead of raw iron ore to make new steel:

- reduces air pollution by 86 percent
- reduces water pollution by 76 percent
- saves 74 percent in energy use
- saves 40 percent in water use
- reduces the need for raw materials by 90 percent.

Plastics are made from fossil fuels (oil and natural gas). Therefore, recycling plastics saves fossil fuels, a non-renewable resource. Polyethelene terephthalate (PETE) soda bottles and high-density polyethylene (HDPE) milk, juice, laundry detergent, and water containers are most often recycled because each is made from one kind of plastic and is easily identifiable.

- PETE soda bottles are shredded into fibers and woven back into threads to make clothing or to stuff sleeping bags, quilts, and parkas.
- HDPE jugs are shredded and remanufactured to make products such as plastic lumber.

Using less energy, reducing pollution, conserving natural resources, and saving landfill space are all good reasons to extend the life cycle of an object by reusing or recycling it.

PAPERMAKING: ONE WAY OR A CYCLE?