Air Cleaning Department

Lesson 2 - Treez Cleanz ze Air!

Essential Questions:

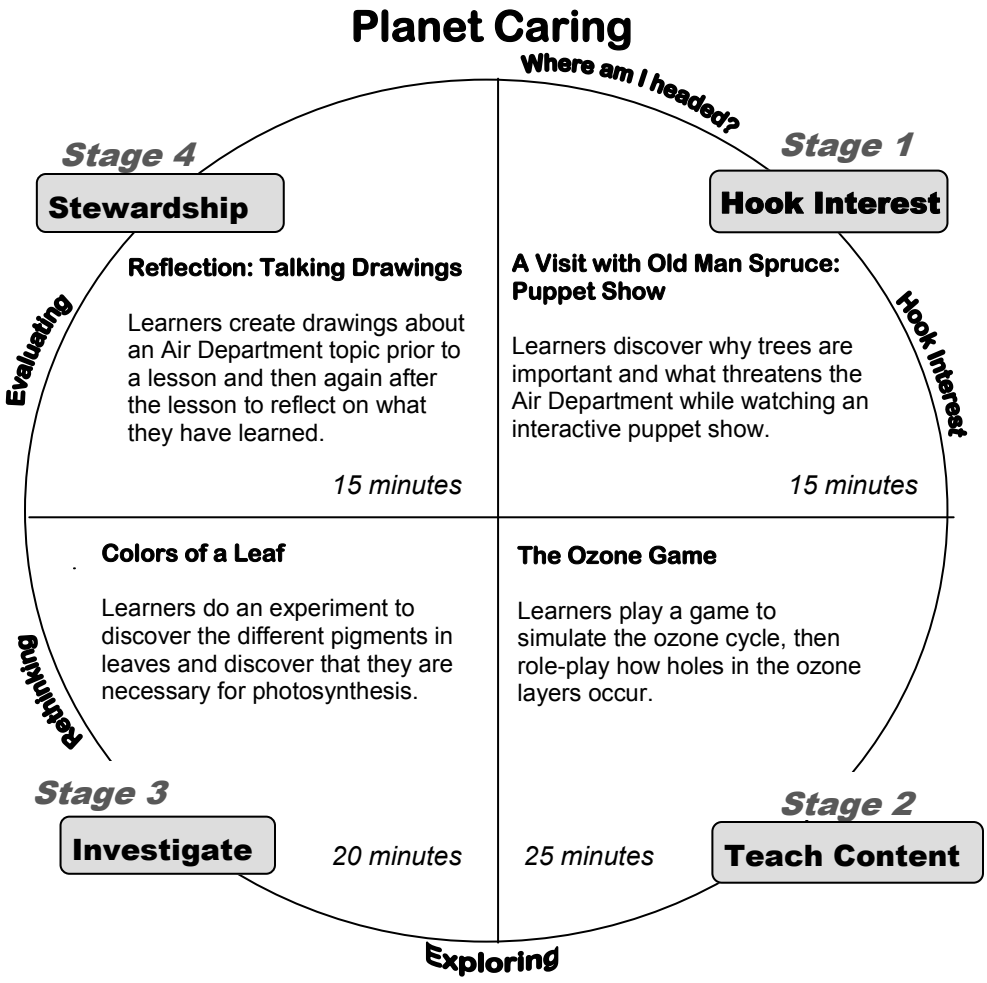
Why are trees important?
What is the difference between good and bad ozone?
What are the different pigments in leaves?

Concepts:

- Trees provide many things for humans and other organisms.
- Plants act as air filters, cleaning the air of harmful chemicals and particulates.
- Man-made pollutants, caused by the energy demands of modern industrial society (automobiles, power plants), currently equal or exceed the amount of natural pollutants entering the atmosphere from all other sources.
- Plants have pigments that are necessary for photosynthesis.

At a Glance:

An interactive puppet show hooks learner interest and concern for the Air Cleaning Department. Learners then role play ozone molecules to understand how ozone is formed and the difference between good and bad ozone. Next, learners do an experiment to extract pigments from leaves and learn how photosynthesis works. The lesson ends with a reflection session as learners draw about what they have learned in the Air Cleaning module.



Objectives

Learners ...

1) describe how green plants and trees help to provide clean air and oxygen.
2) display empathy for workers in the Air Department.
3) name 3 threats that face the Air Cleaning Department.
4) increase motivation to learn more about the Air Cleaning Department.
5) describe how ozone is formed in the stratosphere.
6) name 3 sources of human-induced ODSs and explain how they impact the ozone layer.
7) discover that leaves have several different kinds of pigments that are responsible for the leaf color.
8) summarize how pigments are necessary for photosynthesis.
9) demonstrate how green leaves have more than one pigment.
10) reflect upon what they have learned about the air cleaning eco-service through drawing.

PROCEDURES IN BRIEF: Lesson 2—Treez Cleanz ze Air!

Stage 1. A Visit with Old Man Spruce *Puppet Show*

Do the first part of the Reflection activity prior to starting the rest of this lesson.

Procedure:

1. Ask learners what trees provide for us. As they respond, record their answers on the board. Have learners work in groups to categorize the answers into groups. Have learners share their groups. You may need to prompt them to include the eight things mentioned in the puppet show (shade, food, clean air, houses, medicines, paper, oxygen, habitat). Tell them that Old Man Spruce would like to visit to tell them what it is like being a tree.
2. Assemble the learners in front of the puppet theater.
3. Perform the puppet show. Two puppeteers will be needed for this puppet show.

Supplies

- **Script**: *A Visit with Old Man Spruce*
- **Puppets**
  - Foreco
  - Old Man Spruce
  - Malcolm Chipmunk
  - Tree One
  - Tree Two
- **Props**
  - Medicine bottle
  - Piece of wood
  - Paper
  - Stick with berries on it

Follow up with the discussion questions:
What do trees give us?
What work did the trees do?
What were some of the problems that Old Man Spruce and his workers faced?

Stage 2. The Ozone Game

Procedure: *In Depth activity, see full write-up*

Part 1: The Oxygen-Ozone Cycle Game

1. Give a brief overview of the Oxygen-Ozone Cycle.
2. Pick 2-4 learners to be sun rays.
3. Ask the rest of the learners who are not sun rays to partner up. Groups of 2 will hold hands or link arms, making oxygen molecules (O_2).
4. Learners who are sun rays touch/tag an oxygen molecule to split it.
5. When split, each learner of the split oxygen molecule must join another group of 2. They will link arms with the oxygen molecule to make a group of 3. These groups now become ozone molecules (O_3).
6. To show the cyclical nature of ozone, you may make the addition of oxygen atoms recombining with an ozone molecule then splitting into 2 oxygen atoms (see manual write-up) .

Supplies

- chalk
- ozone cycle diagram

Part 2: Hole in the Ozone

1. Pick 3 learners to be sun rays and 3 learners to be ODSs. The rest of the learners will join up in groups of 3 to make ozone molecules.
2. Have the ozone molecules form a wall, representing the ozone layer. The sun rays will be behind the ozone and the ODSs will be in front.
3. The ODSs will touch an ozone molecule, splitting an oxygen atom from the ozone molecule, eliminating the ozone molecule completely.
4. The single atomic oxygen must now find another single oxygen atom to combine with (= O_2) or an ozone molecule to recombine with and then split into 2 oxygen molecules ($O + O_3 \rightarrow 2\ O_2$).
5. This splitting and recombining decreases the protective ozone, allowing harmful UV rays to pass through and reach Earth's surface.
6. Once there is a hole in the ozone layer, the UV rays can get through.
7. Allow the shifting of atoms and molecules and reduction of ozone until all the sun rays have reached Earth. Discuss ozone depletion issues.

Stage 3. Colors of a Leaf

Procedure:

1. Gather appropriate leaves from the forest.
2. Give each group a strip of chromatography paper. The length of the strip depends upon the size of the cup used for the experiment. The strip should be about two centimeters shorter than the cup.
3. Approximately two centimeters from the bottom of the paper strip, draw a line with pencil across the width of the paper.
4. Lay the leaf over the bottom of the paper strip where the pencil line appears.
5. With the popsicle stick, rub the leaf until the color of the leaf makes a clear line over the pencil line. A dark line of green is good. It is important that the children try to make a straight narrow line when they rub.
6. Tape the paper strip to the popsicle stick so that the paper hangs straight when the popsicle stick is flat.
7. Fill the plastic cup to a depth of about one cm. with alcohol.
8. Place the paper strip into the cup. Be sure that the strip does not touch the sides of the cup. Also, be sure that the alcohol contacts the paper, but does not touch the line with the plant extract. The paper will absorb the alcohol.
9. Leave the strips for about ten minutes. You may want to start on the second part of the Reflection activity while waiting.
10. Check to see if the pigments have separated. Check every five minutes until the pigments have moved about 3/4 of the distance up the paper strip. Discuss what you see.

Supplies

- sturdy plastic cups
- popsicle sticks
- alcohol
- chromatography paper
- pencils
- tape

Stage 4. Talking Drawings *Reflection*

Procedure:

1. Have students close their eyes and think about the Air Cleaning Department. You may guide their thought process to what the Air Department may look like, what it provides us, how we interact with it. This part of the activity should be done at the **beginning** of this lesson (Stage 1-before the puppet show).
2. Go through the activities in this session.
3. At the end of the session, ask the students to elaborate upon their initial drawing by creating a new drawing that incorporates what they learned about the Air Cleaning Department during the session.
4. Have students share their before and after drawings with a partner. Students should discuss the differences between the two depictions of the Air Cleaning Department.
5. Finally, have students respond in writing on the back of their drawings or a separate piece of paper. What do the two drawings tell them about what they learned during the session?

Supplies

- drawing paper
- crayons, colored pencils, or markers
- pencil/pen

Reflection Questions:

- *How did your perceptions of the Air Cleaning Department change with drawing the two pictures? Which picture do you prefer? Why*
- *Can you name some organisms (plants or animals) that are 'Eco-service Workers' in this department? What is their role in this department?*

Complete lesson write-ups are available in the GEN manuals.