



Air Cleaning Department

Lesson 3—Investigating the Air Cleaning Department!

Essential Questions:

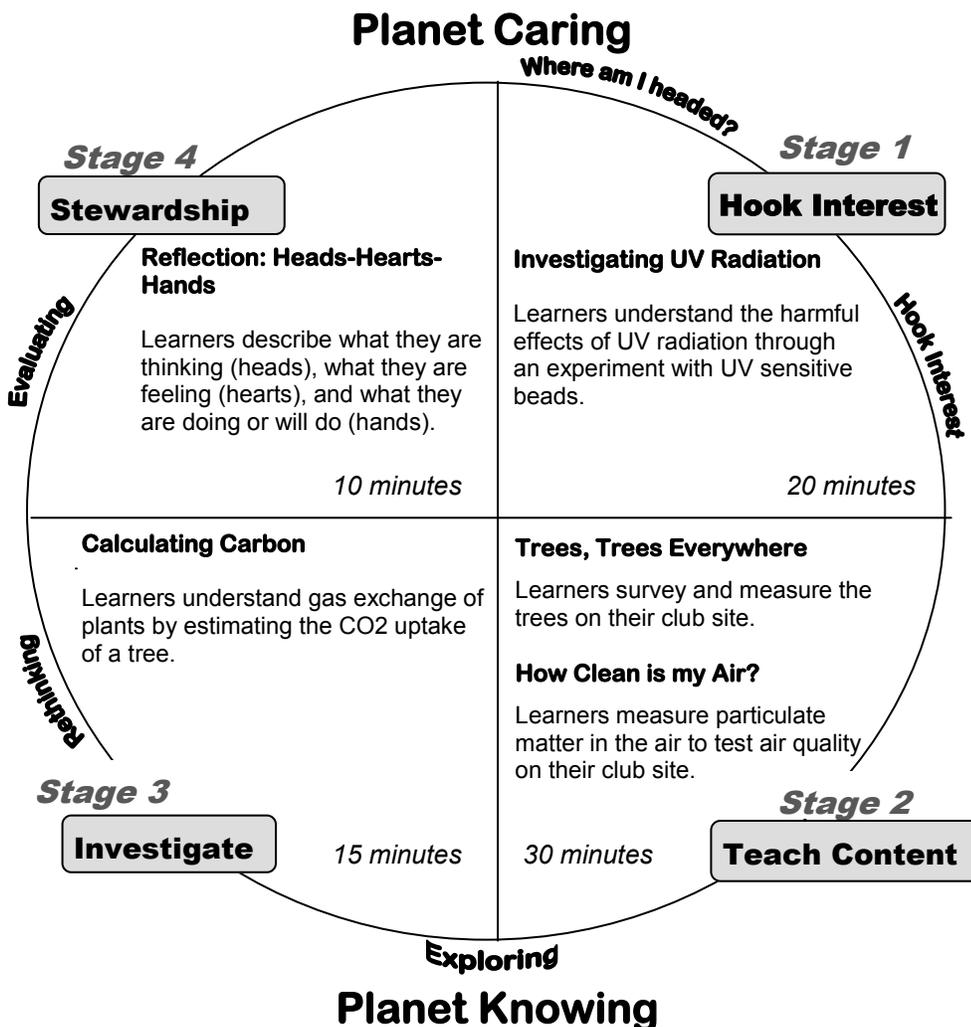
What are the harmful affects of UV radiation and how can humans protect themselves?
Why are trees important for good air quality?

At a Glance:

Learners start their investigation exploring ultra-violet (UV) radiation by participating in an UV sensitive bead experiment. A tree survey and air quality test are part of the Standards Checks data collection for this lesson. Next, learners calculate carbon dioxide uptake of a tree, then estimate their carbon input into the environment. To conclude the lesson, learners reflect on what they are thinking, feeling, and what they can do to help the Air Cleaning Department.

Concepts:

- Ultra-violet radiation can be damaging to humans and plants.
- 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.



Objectives

Learners ...

- 1) explain how solar radiation can be harmful.
- 2) recognize preventive measures that can be taken to reduce the risks associated with exposure to solar radiation.
- 3) count the number of hardwood and softwood trees.
- 4) measure the circumference of the 3 largest trees.
- 5) identify the largest tree (by species or common name).
- 6) collect data on the number of trees, amount of particulate matter and ozone in the air, and wind patterns on the club site.
- 7) formulate questions about the interactions between the air cleaning department and the social systems and features of the club site.
- 8) estimate the CO₂ uptake of a tree to better understand gas exchange of plants.
- 9) reflect upon and draw what they have learned about the air cleaning eco-service.

PROCEDURES IN BRIEF: Lesson 3—Investigating the Air Cleaning Department!

Stage 1. Investigating UV Radiation

Procedure: Learners may design their own experiment using the UV beads or can follow the following experiment.

1. Distribute three beads and a pipe cleaner to each learner in the group.
2. Let them make the beads and pipe cleaner into a bracelet - do not fasten.
3. Ask each group to take the beads outside and observe what happens.
4. Return inside and let the beads return to a white color - share conclusions.
5. Distribute various sunscreens with varying SPF factors, lotion with no UV protection, and sealable bags to the groups.
6. Each learner's bead bracelet will be a sample. They will all go into the sealable bags.
7. Smear the sunscreen and cream on the outside of the plastic bag. Placing the bags on a tray will make it easier to transport them in and out of the sun.
8. Place all bags in the sun being careful to let only the side of the bags with the creams facing the sunlight.
9. Leave for one minute and check the coloration of the beads by lifting the bag up and looking from the other side. This will decrease the effects of the sunlight on your results. Note the coloration for all samples. Ask learners to write down which were darker and which were lighter.

Supplies

- sunscreens (SPF 5, 20, 40)
- lotion with no UV protection
- UV beads
- string/pipe cleaner
- sealable bags

Stage 2. Trees, Trees Everywhere

Procedure: *In depth activities, see manual for full write-up*

1. Review the tree classification with the learners.
2. Demonstrate the technique for measuring diameter at breast height.
3. Assign a Checkpoint area to each group.
4. Measure distances of the trees from Checkpoints.
5. Use tree identification guide to identify the trees. Make brief notes about the conditions of the trees.
6. Record measurements on data sheets.
7. Divide circumference by 3.14 to get the diameter of each tree.
8. **Tree Walk:** Write the type of tree on the data sheet, then place a check (✓) next to each tree as it is seen on the site.

Supplies

Please see manual write-up for full list of supplies

How Clean is my Air

1. Prepare transparency sheets according to write-up.
2. Ask each learner to tie a piece of string to the strip and coat the strip lightly on one side with petroleum jelly.
3. Suspend the transparency strips in the air by tying them to an object (tree) with the string. Ideally, the strips should be free to move in all directions without rubbing against any surface.
4. After two days, learners will collect the strips, place them on top of a white index card, and cover each strip with clear contact paper.
5. Learners will then compare the strips from each site and select the one from each site that has the most dust on it. They can match the amount of dust on each strip to the gray shade that it most closely resembles on the Air Purification Color Scale, and record those numbers on the master data sheet in the school log.
6. Retain the dust samples for comparison in later years by wrapping in plastic wrap.

Stage 3. Calculating Carbon

Procedure:

1. Start with one tree.
2. How big are the leaves of your tree - tiny, small, medium, large? (See diagrams)
3. How many leaves does your tree have? (Estimate and choose from 20, 200, or 2000).
4. Measure air temperature. Choose between below or above 80 degrees F. (When it's really hot, trees may lose water when they open their stomates to get CO₂, so they may not take in as much CO₂ as on a day that's not so hot. When it's cooler, the rate of photosynthesis is lower, less CO₂ is needed by the plant, so less is taken in.)
5. Measure relative humidity. Choose one number that represents the range in which your measurement falls. (This is the amount of water vapor or water in gas form that is in the air. When it is more humid trees can conduct photosynthesis more efficiently and take in more CO₂. However, when it's really humid, trees reach their limit).
6. Fill in your boxes in the gray column.
7. Add gray boxes together and put the sum in the last gray box.
8. Tell your tree, "Thank you!" (Give it a hug, if you like.)

Supplies

- trees
- calculator
- pencil
- graph paper (optional)

Calculate your daily CO₂ Output

1. Start by reviewing your actions so far in the day.
2. Put a number in the gray box for each activity that applies. (This is different from calculating the tree's score.)
3. Add all the numbers and put the sum in the last gray box.

Stage 4. Heads-Hearts-Hands Reflection

Procedure:

1. Throughout the learning process, ask students to keep notes in a journal or the designated worksheet (provide a few minutes after each activity for reflection, writing, and sharing). To focus their thoughts, have them divide or fold a piece of paper into 3 sections. Label sections as follows:
Heads: what they are thinking
Hearts: what they are feeling
Hands: what they are doing or will do
2. Share feelings and thoughts after each activity within the session, but only have a few learners share at a time.
3. Following the learning session, ask students to review their notes and discuss similarities and differences in what they thought, felt, and did. Discuss possible reasons for differences.

Supplies

- Heads – Hearts – Hands worksheet
- Pencil/pen

Reflection Questions:

- *How did your Heads, Hearts, and Hands descriptions change from the beginning to the end of the Air Cleaning Department session?*
- *Would you prioritize your thoughts, feelings, or actions? Is each equally important?*