



Benefits of Indoor Plants

Grades: 3-5

Subjects: Science, Math, Health

Time: Two 30- 40 minutes sessions



* **Standards:** Students will ...

Science Standard 5: Understand the structure and function of cells and organisms.

Benchmark # 1: Know the basic needs of plants and animals (e.g., air, water, nutrients, sunlight/food, space/shelter).

Science Standards 6: Understand relationships among organisms and their physical environment.

Benchmark # 1: Know that plants need certain resources for energy and growth (e.g., air, food, water and sunlight).

Science Standard 9: Understand the sources and properties of energy.

Benchmark # 1: Know that the Sun supplies heat and light to the Earth.

Science Standard 12: Understand the nature of scientific inquiry.

Benchmark # 2: Record information collected about the physical world (e.g., in drawings, simple data charts).

Mathematics Standard 4: Understands and applies basic and advanced properties of the concepts of measurement.

Benchmark 2: Selects and uses appropriate tools for given measurement situations (e.g., rulers for length, measuring cups for capacity, protractors for angle).

Benchmark 4: Understands relationships between measures (e.g., between length, perimeter, and area).

Health Standard 2: Know environmental and external factors that affect individual and community health.

Benchmark # 1: Know how the physical environment can impact personal health (e.g., the effects of exposure to air pollution).

Objectives: Students will be able to...

- Identify the basic needs of plants and animals.
- Identify the different parts of plants and the purposes they serve.
- Explain the interdependent relationships between plants and animals (e.g. the exchange of oxygen and carbon dioxide).
- Create charts and diagrams to organize and report information.
- Select and use appropriate tools and units of measurement for given measurement situation.

Materials:

- Yardstick
- Graph paper
- "In and Out" plant diagram worksheet provided below
- Green plant (optional)
- Coloring and writing utensils



Overview: A two year study by NASA and the Associated Landscape Contractors of America has found common houseplants to be beneficial in reducing indoor pollution. Dr. Wolverton, a NASA scientist, recommends at least 1 houseplant for every 100 square feet of indoor space. For optimal cleansing of indoor pollution, 2- 4 medium sized plants are suggested. About a dozen varieties of indoor plants have helped reduce "Sick Building Syndrome." People who suffer from this condition have symptoms of allergic reactions, headaches, fatigue, asthma, nervous system disorders, respiratory and sinus congestion. There are three major sources of indoor pollution: hermetically sealed buildings and heavily glued construction materials and furnishings; poor ventilation; and human emissions such as cosmetics and cigarette smoke. Specific varieties of indoor plants remove and absorb Volatile Organic Compounds (VOC's) from the air around them. For a lists of specific plants see the Extensions section below.

Photosynthesis, an essential process to life on Earth, takes place mainly in the leaves of green plants. It is the process that provides us with food and allows us to maintain appropriate levels of oxygen within the atmosphere. Photosynthesis is a chemical process that changes carbon dioxide, water and nutrients/minerals into simple and complex sugars, using the energy from sunlight. The parts of a typical leaf include the upper and lower epidermis, the mesophyll, the vascular bundles, and the stomata. The upper and lower epidermal cells serve primarily as protection for the leaf. The stomata, holes located in the lower epidermis of leaves, also absorb pollutants in the air. Their main purpose is air exchange, absorbing the carbon dioxide and expelling oxygen as a byproduct. The vascular bundles in a leaf are part of the plant's transportation system, moving water and nutrients, up from the roots and around the plant as needed. The mesophyll cells have chloroplasts, which contain the chlorophyll that captures the sunlight, and this is where the process of photosynthesis takes place.

Kid's Speak: Green plants make their own food. They use water, minerals and other good things found in soil, along with an invisible gas from the air, called carbon dioxide. The green plants soak up the water and minerals from the soil using their roots. The water and minerals move up into plants through tiny tubes that work something like the pipes in a house, letting them flow to the parts of the plants that need them. Animals, including people, breathe in oxygen from the air and exhale carbon dioxide, but too much carbon dioxide in the air is not good. Plants help by recycling it and using the carbon dioxide to make food. Scientists have found that houseplants also help clean harmful pollutants from the air we breathe.

The leaves are where most of the food making is done. The leaves have small holes on the back of them and the carbon dioxide enters the plants through these holes. Once everything is inside the plants, sunlight helps to change them into sugars. The plants use these sugars as food to help them to grow. Once the food is made the plants have oxygen left over that they don't need so they release it into the air. Without plants we would have not have oxygen to breath. We call this food making process *photosynthesis*.

Eco-Fact: We spend over 90 % of our time indoors. According to the Environmental Protection Agency indoor air pollution (which causes allergic reactions and fatigue) is one of the top threats to public health.

Procedure:

Part 1

Understanding Photosynthesis:

1. teacher can create a large version of the *in* and *out* green plant diagram worksheet provided below explain the process of photosynthesis in simple terms. Label the top of the chart on the left hand side with the word *IN*. Continuing to use the left hand side of the chart, shade in the ground or add brown dots around the roots to indicate minerals and nutrients. Then add water as droplets of rain, or perhaps water dripping from a watering can. Finally draw a sketch of someone exhaling, or if you have reached the limits of your artistry, try blowing on the leaves of your diagram to demonstrate where the carbon dioxide is taken into the plant. To complete this part of the diagram draw the sun with rays to illustrate how sunlight



activates the change process.

2. Next describe how photosynthesis helps plants to grow. Explain that as a result of the process plants produce more oxygen than they need and that they release it into the atmosphere, giving us more clean air to breathe. At the top, right hand side of the chart, add the label *OUT*. Add some wavy lines to represent oxygen being released from the plant.

After Making the Green Plant Diagram:

- Distribute "In and Out" plant diagram worksheet provided below. Have students add the labels, symbols, or arrows to the green plant diagrams to show the photosynthesis process.

Part 2

Activity for Determining Number of Plants Needed to Best Filter Indoor Air:

- Explain to students that they will determine the number of houseplants needed to cleanse your classroom of indoor pollutants. Ask students how they can make this determination. Accept response that they will need to first measure size of room. Next students will calculate how many plants are needed to cleanse their classroom based on the rule of at least one plant for every 100 square feet of indoor space
- Using a yardstick, measure and record the dimensions of classroom.

Activity for Younger Students:

- Use graph paper to represent the dimensions and shape of classroom. One space on the graph paper is equal to one square foot of classroom floor space. Draw a square foot on the board or provide a cut-out of a square foot to help students visualize and understand that unit of measure.
- Demonstrate on large graph paper how to count and mark off room representation on graph paper.
- Students can follow steps provided by teacher and mark off room representation on their own graph paper.
- Students will count and color 100 squares to represent one needed plant. Continue procedure using different colored crayons or markers until less than 100 squares remain.
- Discussion questions:
 - What is the least amount of plants needed to clean the air in our classroom?
 - If we wanted to put 2 plants for every 100 square feet how many would we need?
 - If we wanted to put 4 plants for every 100 square feet how many would we need?

Activity for Older Students:

- Remind students of formula to calculate area: length (in feet) x width (in feet) = area (in square feet).
- Divide area by 100 to determine the number of plants needed to best filter air.
- Discussion questions:
 - What is the least amount of plants needed to clean the air in our classroom?
 - If we wanted to put 2 plants for every 100 square feet how many would we need?
 - If we wanted to put 4 plants for every 100 square feet how many would we need?

Adaptations:

- Students can work in pairs to measure classroom dimensions.

Extensions:

- Get green plants to purify the air in your classroom or home.
- Students can research specific plants are best used to remove particular toxins.
- Below are resources for lists of house plants that have been found to eliminate indoor pollutants:
 - Visit www.O2foryou.org for more information on perfect plants for your classroom and home.
 - [Plants that remove pollutants from air](#)



- Click here for more information on the [GEF Green Thumb Challenge and the Adopt-A-Plant for Your Classroom Program](#)

GEF Community: Join the GEF Community online. It only takes a minute. Students can share pictures of measuring their classrooms or their newly adopted houseplant with the GEF Community.

To view full-size lesson plan and print, follow these directions:

1. Click on the image above
2. Click on the small "print" icon at the top left of the lesson
3. Make sure your "Page Scaling" is set to "Fit to Printable Area"
4. Click "OK" and your lesson will be printed!

Click on the second icon from the print button to save your lesson to your computer.

For technical assistance with printing any of the GEF lessons, please contact:

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*All lessons listed on the GEF website have been aligned with the McREL Compendium of Standards and Benchmarks for K-12 Education. GEF curriculum has been developed in accordance with the McREL standards in order to reflect nationwide guidelines for learning, teaching, and assessment, and to provide continuity in the integrity of GEF curricular content from state to state. The decision to utilize McREL's standards was based upon their rigorous and extensive research, as well as their review of standards documents from a variety of professional subject matter organizations in fourteen content areas. Their result is a comprehensive database that represents what many educational institutions and departments believe to be the best standards research accomplished to date. To access the McREL standards database, or for additional information regarding the supporting documentation used in its development, please visit <http://www.mcrel.org>.