

Science Inquiry Lesson - Finalized

*Do Plants Need Sunlight?*

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TD 513: Teaching Elementary and Middle School Science

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## Lesson: Do Plants Need Sunlight?

Purpose: To determine if plants need sunlight in order to grow and what happens to them if they do not get sunlight. *Some students may have a misconception that sunlight is part of a plant's food. In reality, a plant needs sunlight (along with water and carbon dioxide) in order to produce its own food.*

Lesson Objective: By the end of the lesson, students will understand that plants need sunlight in order to survive. Students will also gain experience in using science process skills (generating questions based on observations, making predictions, researching, investigating, presenting findings, and formulating conclusions).

Inquiry Question: What effect does the lack of sunlight have on the growth of plants?

Target Learning Group: Fourth Grade

Approximate Time Involved:

Teacher Preparation: One hour to gather plants and other materials and to review lesson. *(note: If teacher does not have plants available, it may take longer.)*

Student Involvement: 45 minutes on day 1; 10 minutes daily for the next 4 days; 40 minutes on day 6: 10 for recording; 10 for discussing; 20 for preparing teaching lesson; 125 minutes total. *(note: If students teach to another class, then add another 55 minutes—45 for day 1 and 10 for a discussion on the last day.)*

Science Content Background Information:

- Plants' basic needs are water, air, light, and energy.
- Plants are living things that can usually produce their own food, reproduce, and are rarely able to move around. Many are green and have a substance called chlorophyll. Examples are vines, shrubs, flowers, trees, and grasses.
- Sunlight is light that comes from the sun.
- Plants need sunlight in order to make chlorophyll.
- Chlorophyll is the chemical that makes plants green.
- If plants do not get sunlight, they cannot produce chlorophyll and they will lose their green color and eventually die.
- When sunlight falls on the leaves of a plant, it is the chlorophyll that captures and stores the energy for future use.
- Note that some plants are not green, although they do have chlorophyll. In colorful plants like coleus or purpleleaf plum, the chlorophyll's color is masked or hidden by other pigments.
- The process where plants take in carbon dioxide, water, and sunlight (which is needed to make chlorophyll) to produce their own food is called photosynthesis. *(Photosynthesis is not the focus of this activity, but this may be a good time to briefly introduce this complex process.)*

References:

Buzzle. (2000-2012, 2013). *Photosynthesis for kids*. Retrieved February 11, 2013, from Buzzle.com's website: <http://www.buzzle.com/articles/photosynthesis-for-kids.html>

Family & Social Services Administration, Indiana Government. *Poisonous plants and safe plants*. Retrieved February 11, 2013, from <http://www.in.gov/fssa/files/PoisonousPlants.pdf>

Michigan Reach Out! (2012, January 6). *Do Plants Need Sunlight?* Retrieved February 10, 2013, from Michigan Reach Out's website:

<http://www.reachoutmichigan.org/funexperiments/agesubject/lessons/sunlight.html#vocab>

#### Attention Deficit-Hyperactivity Disorder Background Information:

Attention Deficit-Hyperactivity Disorder (ADHD) is a controversial, but prevalent disorder. High inattention levels, avoiding tasks that need concentration, being highly distractible, and not fixing careless mistakes are typical symptoms of someone suffering from ADHD. Fidgeting, difficulty performing quietly, excessive talking, and impulsivity are behaviors often seen in the classroom. More boys than girls (3:1 ratio) have been diagnosed with ADHD. Boys tend to show hyperactive signs; girls are usually more withdrawn. The disorder cause is medically thought to be neurological and the most common treatment is through the use of prescription drugs.

To help the ADHD student in the classroom, accommodations can be made. The selected accommodations will depend on what works best for that student. Possible accommodations include: minimize distractions, allow extra time, review directions in advance, give full attention to student, clearly label items or equipment, provide manipulative materials when possible, provide a reader if needed, get student feedback, encourage use of a daily assignment book, keep instructions simple, provide visual and verbal instructions, and provide clear and consistent transitions between activities.

#### Reference:

Stefanich, G.P. (2001). *Science teaching in inclusive classrooms: models & applications*. Cedar Falls, IA: Woolverton.

#### Grade Level Content Expectations:

##### Process GLCES:

- S.IP.04.12 Generate questions based on observations.
- S.IA.04.13 Communicate and present findings of observations and investigations.
- S.RS.04.11 Demonstrate scientific concepts through various illustrations, performances, models, exhibits, and activities.

##### Content GLCE:

- L.OL.04.15 Determine that plants require air, water, light, and a source of energy and building material for growth and repair.

#### Materials:

- Different types of green plants with healthy green leaves (in pots; 1 per 4 students)
- Paper clips
- Black construction paper
- Scissors
- Cardboard shoe boxes (large enough to fit 1 plant inside)
- Paper grocery bags
- Area to put plants where they can get plenty of sunlight

Safety Considerations: Teach children to never eat any part of an unknown plant. Children should wash hands immediately after activity.

## SCIENCE ACTIVITY

Procedure:

Pre-assessment (and Engage):

Have each student create a foldable “My Investigation Journal” (using 2 sheets of 11” x 18” white paper). **Review directions in advance for creating the foldable with the ADHD student.**

Ask students, “What do you need to grow?” Listen to 3 or 4 responses (food, water, clothing, love, homes, may be some of the responses). Show students the different potted plants. Ask students, “What do these plants need in order to grow?” Have students jot down their thoughts on page 1 of their journals as an individualized pre-assessment about the needs of plants. The discussion of water, air, light, energy will then evolve. **Allow the ADHD student to continue writing if more time is needed as the discussion begins.**

Now, ask students, “What similarities do these plants have?” Again, have students record their guesses on the first page of their journals for pre-assessment purposes. Students may choose to draw a Venn diagram in their journal to help sort out the similarities and differences of the plants. Begin a discussion and listen to several responses. If color is not mentioned, ask students, “What color are the plants and leaves? Are they orange? Are they purple with red stripes?” When it comes out that they are all green, ask students, “Why are most plants green?” “Does their color have anything to do with what they need in order to grow?” Again, students should record their responses to these last two questions on page 1 of their journals. **Allow the ADHD student extra time, if needed, to record responses. Be straight forward with the questions and some undivided time may need to be given to the ADHD student.**

At the end of the lesson on the first day, collect the Investigation Journals and review the students’ responses on page 1 to get an understanding of student prior knowledge (this is not graded).

Explore:

1. Give each group of 4 (or 3) students a plant to study.
2. Have students record quantitative and qualitative observations and draw and color a picture of their plant on page 2 of their journals.
3. On page 3, have students write questions about their plant. (*These are some of the questions that may be formulated: “Why do most plants have green leaves?”, “Does having green leaves have anything to do with how plants get their basic needs met?”, “Will taking away any of the plant’s basic needs cause the leaves to change color?”, “What happens if sunlight is taken away from a plant?”*)
4. Based on prior knowledge, students will make predictions.

**Model usage of journal so that expectations are clear for the ADHD student.**

Explain:

1. Have students go to stations of interest to search for answers to their questions. Students should record what they learn in their journals on page 3.

Station 1: Books about plant life

Station 2: Computers with internet access (with helpful websites posted nearby)

Station 3: Computers with learning program about plant life

Station 4: Life Science periodicals about plant life

**Remind students to work quietly to minimize distractions for the ADHD student.**

2. Have a class discussion about what was discovered in the students’ research. Discussion should lead to the fact that plants need sunlight in order to make chlorophyll. Chlorophyll is

what makes most plants look green and is necessary for storage of the sun's energy for future use.

Elaborate:

1. Place materials on tables (black construction paper, paper clips, scissors, shoe boxes, grocery bags) and ask student teams to create a way to test what happens to a plant when the basic need of sunlight is taken away.
2. Students perform a week-long investigation and record their observations on pages 4 and 5 in their journals. Observations should include daily drawings (with color) and written descriptions. *(Possible investigations may include: covering up a few leaves on the plant with black construction paper and placing the plant in the sunlight; putting a plant inside a shoe box; covering a plant with a paper bag; or covering an area of grass with a shoe box.)* Please remind students to quickly replace the covering over the plant after making an observation. **ADHD students should write in their daily assignment books to help remember to record and draw daily observations for that week. This will help with organizational skills.**
3. At the end of the week, students will remove the coverings (black paper, boxes, or bags) and look at the leaves to see what color they are.
4. Students may elect to put the uncovered plants back in the sunlight for another week to watch if the leaves turn green again. Discuss why this should happen. (Remember, to water the plants as needed.)

Real World Connections:

For the next week, have the students look for indoor plants in other places (homes, stores, other classrooms, church). Students should keep a small notebook or piece of paper in their pocket so they can record information about the plants they see. Do they look healthy? Are they located in an area where they are getting sunlight? Encourage students to visit a greenhouse and observe how a green house is built (*lots of windows!*).

Post-assessment (Evaluate):

1. Students should have time to review their findings to make final conclusions. Ask students to explain what happened. Students should record their explanations on the last page in their journals. Encourage students to use science terms (sunlight, chlorophyll, energy, carbon dioxide, photosynthesis). *They should understand that if a plant (or leaf) does not get sunlight, it cannot make chlorophyll (which makes the plant turn green). Without chlorophyll the plant is unable to make the food it needs in order to survive. The plant will turn brown and die.* Journals will be collected and comments should be written in them so the students can use them for guidance in the true assessment step (teaching the lesson!).
2. Have students now prepare and teach this same lesson to another fourth grade class (if a fourth grade class is not available, then a fifth or third grade class would work). The children will be excited to share what they have learned and watching students teach is a terrific way to check for understanding. Use the attached assessment rubric to evaluate the student's teaching (and understanding!). This assessment can be compared to the student's pre-assessment to determine student learning. If students still need reinforcement, review activities may be added. *(If teaching to another class is not an option, have each student prepare a lesson to teach to someone at home. Whomever the child teaches to can complete the rubric.)* In one week, the class can share results! **Allow ADHD student to work with a partner, if desired, to help stay on task. Extra time may be needed in the planning stage.**

## *Do Plants Need Sunlight?* Lesson Modifications

The lesson, *Do Plants Need Sunlight?*, developed by Michigan Reach Out, has been modified to incorporate the 5-E learning model (Engage, Explore, Explain, Elaborate, and Evaluate) that we have been studying in class. The goal of this modification is to teach through inquiry which provides a more interesting and rewarding experience for the student. More background information has also been added. Since the target students are in fourth grade, the concept of photosynthesis can be introduced. A few more facts about chlorophyll were also added.

To start off, the engagement (introduction) was changed to become more grabbing. Let's ask students, "What do you need to grow?" A discussion of human needs will lead into a discussion of plant needs. The discussion will then be led into talking about why plants are green. The last question suggested asks, "Does their color have anything to do with what they need in order to grow?" The engagement is hooking the student's curiosity into finding out what the plants' green color has to do with its basic needs (in this case, sunlight). The original lesson asked two questions: "Do plants need sunlight?" and "What happens if plants do not get sunlight?"

The biggest change to the lesson has to do with the actual activity. The Reach Out Lesson simply explains how to carry out the activity. Place the materials on the table and tell the students what to do. The modified lesson begins the activity by having the students make observations about the plant in front of them and recording in their journals (that they will make themselves). They will generate questions about their plants based on the previous engagement session and by looking at their plants. Four stations will be set up in the classroom where students can gather information to answer their questions. A class discussion will be held about what was discovered through the students' research. Students will then be ready and eager to design their own investigation/experiment to test if a plant needs sunlight. Through various materials (I added

cardboard shoe boxes and paper grocery bags to have more variety), they will create their own ways to explore. The students are thinking!

Real world connections were also added for the student to elaborate and connect what was learned in the classroom. Students are asked to take note of indoor plants that they notice in the next week and to try to visit a greenhouse. Grade Level Content Expectations (GLCEs) were also added to make it clear what the student was to learn from this lesson. A safety consideration was also added; teach children not to eat plant parts from an unknown plant.

By rewriting this lesson using the 5-E model, *Do Plants Need Sunlight?*, becomes a richer lesson for our students. Teaching with purpose and excitement is our ultimate goal as teachers.