

GROW YOUR PALS PROGRAM GUIDE



THE NATIONAL FFA MENTORING PROGRAM

Sponsored by



LESSON 47

Nature's Air Conditioner: Transpiration

Unit:
PLANT SCIENCE

PRECEPTS

- F. Continuous Improvement
- F3. Use innovative problem-solving strategies



Lesson Type:
Large Group

NATIONAL STANDARDS

NS.K-4.3 Life Science

STUDENT LEARNING OBJECTIVES

As a result of this lesson, the student will ...

1. Define transpiration.
2. Sculpt a model of transpiration.
3. Observe the process of transpiration in leaves.





TIME

Instruction time for this lesson: **45 minutes**.



RESOURCES

Transpiration animation:

<http://techalive.mtu.edu/meec/module01/Transpiration.htm>

Statistics:

<http://ga.water.usgs.gov/edu/watercycletranspiration.html>



TOOLS, EQUIPMENT AND SUPPLIES

- ✓ quart-size resealable plastic bag – 1 per PALS pair
- ✓ several small, clean pebbles – 3 pebbles per PALS pair
- ✓ rubber bands – 2 per PALS pair
- ✓ graduated cylinder
- ✓ PALS.47.AS.A – 1 per PALS pair and one for large group
- ✓ Play-Doh™



KEY TERMS

The following term is presented in this lesson and appears in ***bold italics***:
transpiration

INTEREST APPROACH

Pretend the students have just arrived to Physical Education class, and get them “warmed” up for the lesson by doing jumping jacks. You will be relating the sweating that occurs in a P.E. class to the transpiration that a plant does in nature.



Welcome to P.E. class! We are going to start our class out by doing 20 jumping jacks! Who will lead our class in jumping jacks for today? Let’s count them out together!

How many of you are working up a sweat already? Most likely, you probably aren’t yet, but what if we did five minutes worth of jumping jacks? That’s right, we would start to sweat.

Today we are going to discover how plants “sweat” just like we do!

SUMMARY OF CONTENT AND TEACHING STRATEGIES

OBJECTIVE 1. | Define *transpiration*.



*Tape the mixed-up definition for transpiration at various places around the room. Each group will get three mixed-up sentences (utilize PALS.47.AS.A). After the groups are given time to solve the scramble, get volunteers to put the sentences together in front of the entire class. Give the groups three minutes to put the sentences in the correct order to define the word **transpiration**.*



You may have noticed when you walked into class today that we have many mixed-up words on the wall. As they are, they do not make much sense. However, if we work together, I think we could start to figure out just how plants “sweat.”

You are already divided into your teams. Take 30 seconds and determine who has the most pets. Stand up if you have the most pets. Perfect, you may sit back down. When you hear SOLVE IT, you will come to the front and receive an envelope. This envelope has your puzzle in it. Be the first to finish your sentences to receive first place! There are three sentences. What questions do you have?

SOLVE IT!

Help students along as needed. Give them approximately three minutes to complete the puzzle. The finished puzzle will read:

*“In a process known as **transpiration**, water is constantly evaporating from leaves into the air. Water enters the tree at its roots and moves up through the plant. When the water is released into the air, it leaves a “hole” that the tree fills by taking in more water.”*

Have sentence strips written out with the same breakdown in words as the scramble posted around the room. Select volunteers to unscramble the definition of transpiration as a class. Depending on class size and preference, you may prefer to divide the class into three groups. Give each group a different sentence and then bring the three sentences together at the end.



Sounds like we are ready to check our answers! Let’s have 15 volunteers put our big sentences together at the front of the room! Raise your hand if you want to be one of our lucky volunteers.

*Celebrate with your class on completing the scramble. Explain that, because they worked so hard, you have a special surprise “video” about **transpiration** to share with them.*



Great work team! We are starting to unravel this mystery of “sweating” plants. You worked hard on that last activity, so I figured you would like a reward. Who would like their prize for doing so well? That’s what I thought!

OBJECTIVE 2. | Sculpt a model of *transpiration*.



Go to the website <http://techalive.mtu.edu/meec/module01/Transpiration.htm>. This will show them a short animation about **transpiration** that helps illustrate the sentences we just unscrambled. You may have to play the animation a few times.



Our prize is getting to see **transpiration** in action! We will watch this animation and see how the water moves through the plant, and then exits through the leaves. Let’s take a look.

After the video is over, introduce them to creating the process of transpiration using the Michelangelo Moment with Play-Doh™.



That animation was a great tool to help us understand **transpiration** even more. However, there is one more thing that I forgot to mention that was part of your prize. That thing is Play-Doh™! We are going to use the Play-Doh™ to sculpt the process of **transpiration** in leaves.

Pass out the Play-Doh™ and explain the proper procedures you wish for them to follow when using Play-Doh™. It is also helpful to use wax sheets to keep tables and the Play-Doh™ clean. Make the rules fun and interactive.



Now that everyone has Play-Doh™, open the canister and hold your Play-Doh™ in the palm of your hand. Raise that hand high in the air and repeat after me: “I, _____, promise with my whole heart, not to mix Play-Doh™, or put Play-Doh™ on the floor, or anywhere that is not wax paper. Also, I promise not to throw or even eat the Play-Doh™. On my honor, as the most well-behaved student in this class.”

When I say CREATE, you will have five minutes to make the **transpiration** process. What questions are there?

CREATE!



You may need to help them get the creative juices flowing. Replay the animation if necessary, and show off other students’ work.

OBJECTIVE 3. | Observe the process of *transpiration* in leaves.



Introduce the experiment that you will start this class period. You will be working with a real tree or plant that is easily accessible to your class. For this next experiment, you will need one quart-size plastic bag per student, several pebbles per student, and possibly some rubber bands to help secure the bags to the tree. Have all supplies organized and ready to go before class.



Now that we have defined and sculpted ***transpiration***, it is time to work with some real plants. We are going to take a trip outside to conduct an experiment with ***transpiration***. Before we go outside, each group needs to send a representative to me to gather their supplies. Each group will need one plastic bag, several small pebbles (already in it) and two rubber bands.

Go outside with your PALS, to a predetermined tree. Find an average-size leaf for them to wrap and secure their bag around.



When I say TRAVEL, we will stand up and venture outside with our partners. Once outside, we will stand quietly and wait for further instruction. Questions?

TRAVEL!

PALS mentors will provide the following further instructions once the partners are outside.



Let's find an average-size leaf for us to place our bag with pebbles around. Once you have your bag around the leaf you will need to close the bag. You may need to use your rubber bands to help.

For the next part of the experiment, you must wait 24 hours. At the next class period, go back to your tree and collect your bags. You will notice that water has collected in your bags. Be careful not to spill the water. Take the water back inside and measure in a graduated cylinder.



What do you notice about our bags? Yes, there is water in them! Where do you think that water came from? Yes, ***transpiration***.

Let's be very careful as we take our bags with water off the tree. We want to keep all the water inside the bag, so we can measure it when we get inside.

Once inside, measure the water and ask questions about how much water an entire tree might give off in one day. Have them write data on the board, so everyone can see what all the leaves collected.



Carefully pour the water from your bag into your graduated cylinder. Let's read them together and write our answer by our name that is on the board.



How much water do you think an entire tree will give off? Would you guess 40,000 gallons per year, or 1,096 gallons a day? It's true!

How much water does an acre of corn give off? Believe it or not, it gives off 3,000-4,000 gallons per day. Now that's a lot of water!



REVIEW / SUMMARY

For each day, you will need a review. For the first day simply give them a ticket-out-the-door answering a couple of questions.

1. Explain why or why not you think your leaf will create water in the bag?
2. How much water do you think your bag will have?

For the second day, use the Hieroglyphic Moment to have students create an icon to help them remember transpiration in plants. Have them draw their icon on their note card as a ticket-out-the-door.

APPLICATION



Small Group Suggestion: Work in small groups of mentors/PALS giving each group a different kind of tree. Make estimations on which types of trees you think will transpire more. Collect data and compare results.



One-on-One Suggestion: Review with your PALS **transpiration**, using the scramble. Continue with the experiment as with the large group, but on a smaller scale.

**In a process known
as transpiration,
water is constantly
evaporating from
leaves into the air.**

**Water enters the
tree at its roots and
moves up through
the plant. When
water is released**

into the air, it leaves
a “hole” that the
tree fills by taking in
more water.