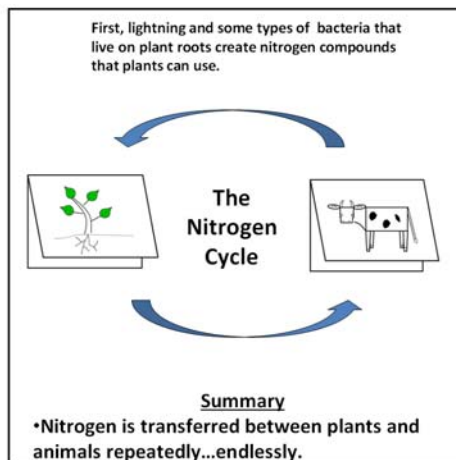


Teacher Notes-“Cycles- Never-Ending Science”

The purpose of this lesson is to help students understand that nature uses cycles to move matter in and out of organisms endlessly. This is a lesson all students will enjoy, since they get to cut, color, and glue as they each create a flapbook.

Instead of using something traditional like the water cycle, we're instead going to use the Nitrogen Cycle because 1. it's new, so students won't have preconceived notions interfering, and 2. it's also simpler to understand than the water cycle.



Materials:

- For the opening water cycle demo: 2 beakers, plastic wrap, rubber band, lamp, ice
- Student Materials (per student): scissors, 2-3 colored pencils (green and 2 others), Student Handout (see last page), glue

Beforehand:

- Visit [Google Images](#) and insert an image of a lightning bolt on slide #5.
- If you're into extremely corny jokes, search for "[cow mooing sound](#)", and insert one onto slide #11. If you'd like to add more "personality" to your cow/bull, add a drawing to the slide that help students understand what we mean by "waste".
- Go through the lesson yourself (a few days before doing this with students) and make one of these flapbooks yourself. You'll be amazed how much better the lesson goes because you've made one yourself.
- Change the wording on the PowerPoint (see last page), if desired.

Procedure:

(Introduction- The Water Cycle)

1. This lesson focuses mainly on the Nitrogen Cycle. But let's begin with the Water Cycle. Have students open their books to a page that summarizes it. Then hold up a beaker of water that's been under a lamp and covered with plastic. Have students apply the steps of the water cycle to it.

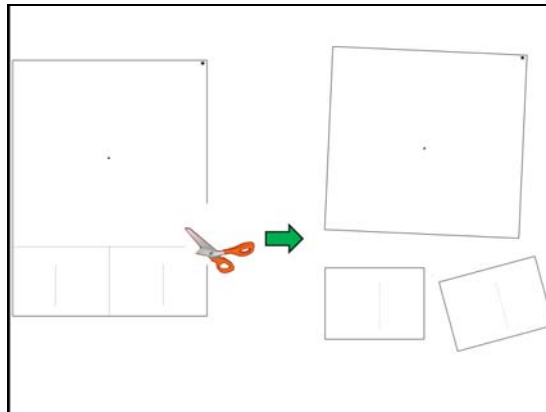
Most students have memorized

the steps, but have trouble applying it to something real.

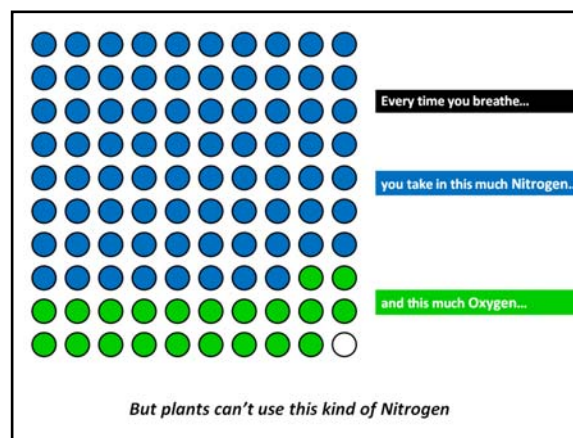
2. After talking about the water cycle in the heated beaker, challenge them with a beaker of ice water. Notice the water on the outside (condensation), and ask where it came from. Most students don't know! You'll need to coach them. Ask what's in between you and them- (air). What's in air? (Oxygen). And...? (Water!) Can you see this water? (No) So it must be very small then.
3. Go back to the heated beaker and notice that both of our beakers are really opposites- one was heated, so the liquid water was becoming a vapor. But here with the cooled beaker the water cycle is moving in the opposite direction- we're starting with water vapor and cooling it back into a liquid. Energy drives the whole thing (see lesson- "Candlelight Journey").
4. If you have a copy of Bill Bryson's book, "A Short History Of Nearly Everything", read pages 167-168 (page 1 of chapter 9 –“The Mighty Atom”) aloud to students. This passage speaks of the durability of atoms, and does an excellent job explaining how small the atomic world is. If you don't own Bill's book, you should buy it. It's one of my most-read and most-used books in my classroom!

(Main Activity-The Nitrogen Cycle)

- Moving into the nitrogen cycle, have students cut their handout on all the dotted lines, as shown here, and on the PowerPoint. That leaves us with one large square and 2 smaller ones.



- On the next slide we want students to understand that there is a difference between the nitrogen we commonly breathe in, which is not usable to plants, and the kinds of nitrogen compounds plants can use. To make that point, we have 100 circles. They represent what you breathe in. 78% is nitrogen. 21% is oxygen, and the rest is argon, carbon dioxide, water vapor, and other trace things.

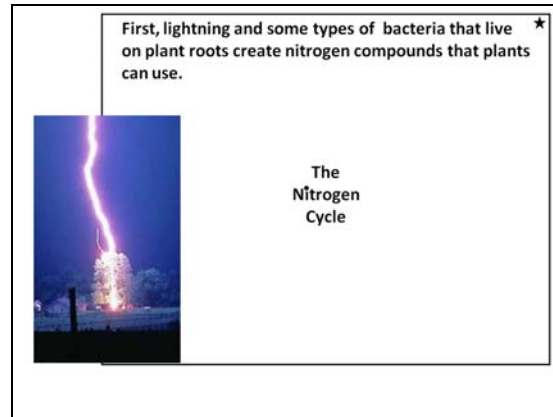


Here's an analogy about plants and nitrogen that students might understand- you're under water holding your breath. After a minute, you need more air and are just about ready to come back up when you realize, "Silly me, there's all kinds of oxygen in the water around me!". Well, it's true that there is oxygen dissolved into the water, but it's not usable to you. Plants must have nitrogen, but not in the form that's abundant in the air.

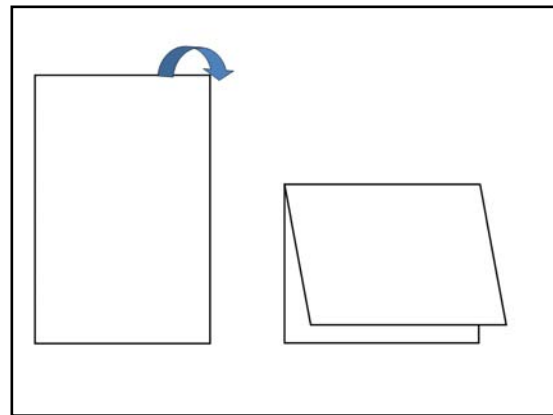
7. Let's set up the big square of paper. First, orient it so the star is in the upper-right.

Next, have students copy the title. The dot in the center of their handout serves as the dot of the "i" in Nitrogen, to help them stay centered.

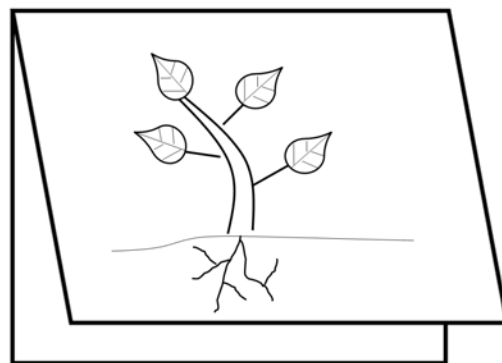
Last, we'll copy the statement shown onto the very top of their paper- "First, lightning and some types of bacteria...".



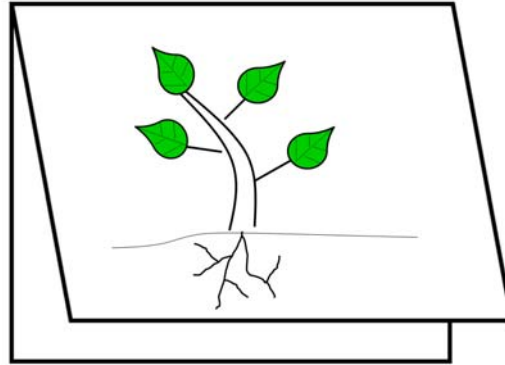
8. Now take one of the smaller squares and fold it in half as shown (over the solid line on it). Pick one up and show students how to do this.



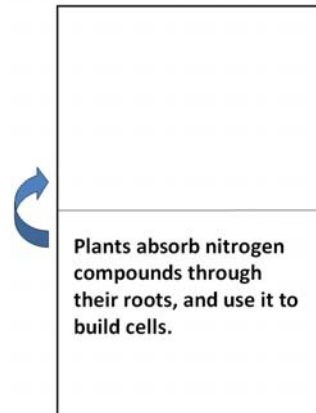
9. With the fold at the top, let's draw a plant on the front side. Click through the series of steps on the PowerPoint.



10. Add color. A little bit really brings a plain white sheet of paper to life.

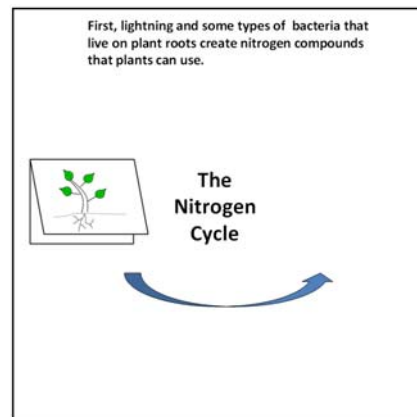


11. Lift the little door (pick one up and show them what you mean!) and let's write this statement inside- "Plants absorb nitrogen..."



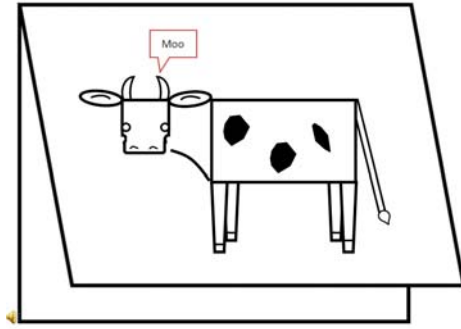
12. Now put ONE drop of glue on the back and place on the big square where shown.

Tell students if they use more than 1 drop of glue that their paper will stick to everyone else's later when they're collected.

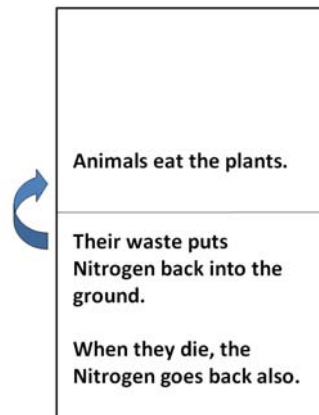


13. Draw an arrow starting below the plant and going to the other side.

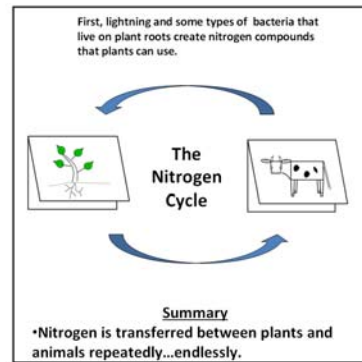
14. We're now going to draw a cow.
Click through the steps to draw it,
piece by piece. Click the speaker
to make a moo (if you inserted a
cow mooing sound).



15. Lift the flap and write the
statements shown- "Animals eat
the plants..."



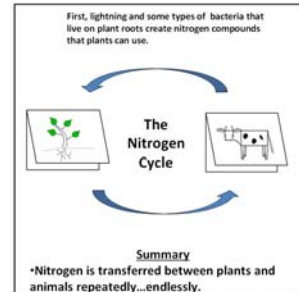
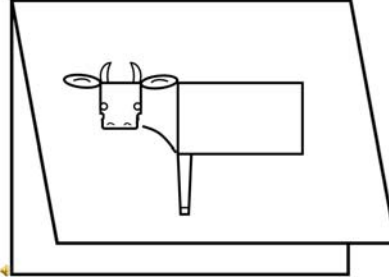
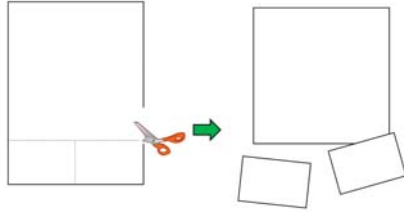
16. Glue down where shown (1 drop
of glue), and put another arrow
over the top from the bull back to
the plant.



17. At the bottom write the summary
statement- "Nitrogen is
transferred..."
18. If the Nitrogen Cycle is
mentioned in your book, this
would be a perfect time to take 10
minutes and read it, or perhaps
tomorrow at the beginning of
class.

Come back and visit InteractiveScienceTeacher.com to upgrade this lesson with:

PowerPoint- lead your students through the lesson click-by-click



Student Handout

