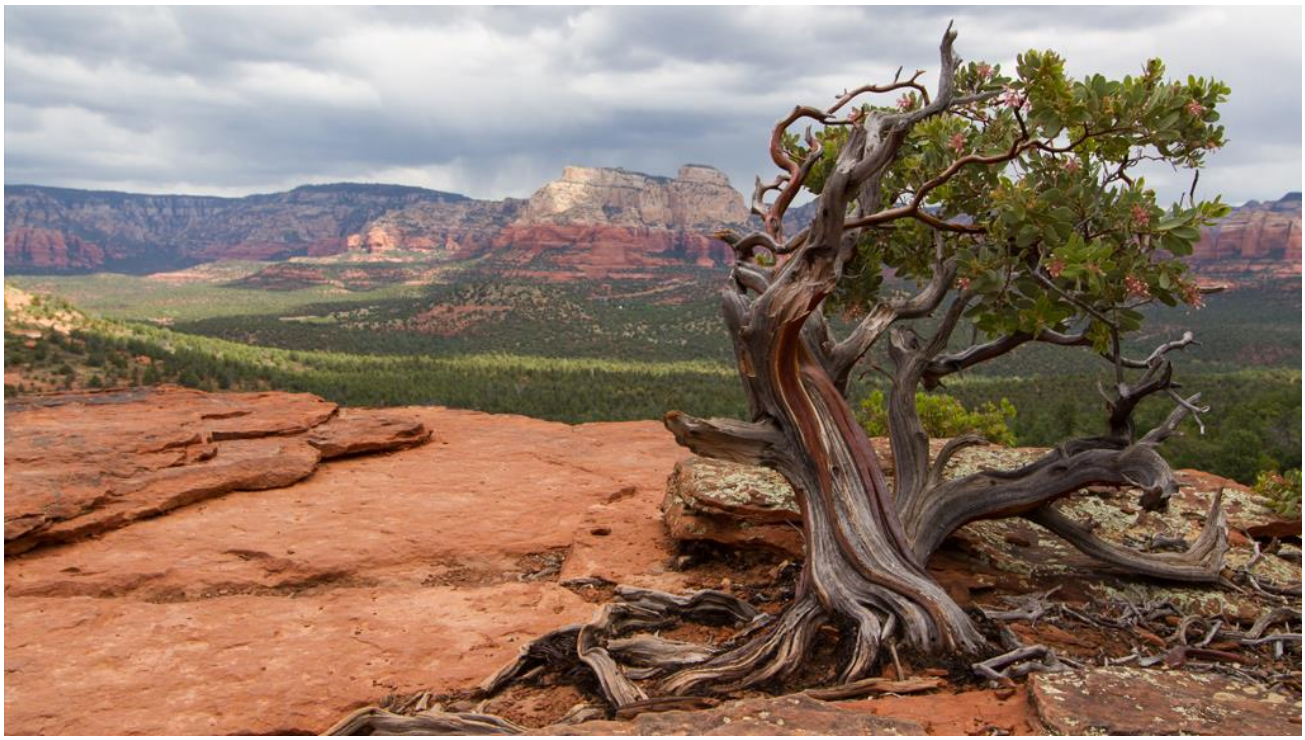
How Can Plants Break Rocks?



Welcome to NSTA's Daily Do

Teachers and families across the country are facing a new reality of providing opportunities for students to ***do*** science through distance and home learning. The **Daily Do** is one of the ways NSTA is supporting teachers and families with this endeavor. Each weekday, NSTA will share a sensemaking task teachers and families can use to engage their students in authentic, relevant science learning. We encourage families to make time for family science learning (science is a social process!) and are dedicated to helping students and their families find balance between learning science and the day-to-day responsibilities they have to stay healthy and safe.

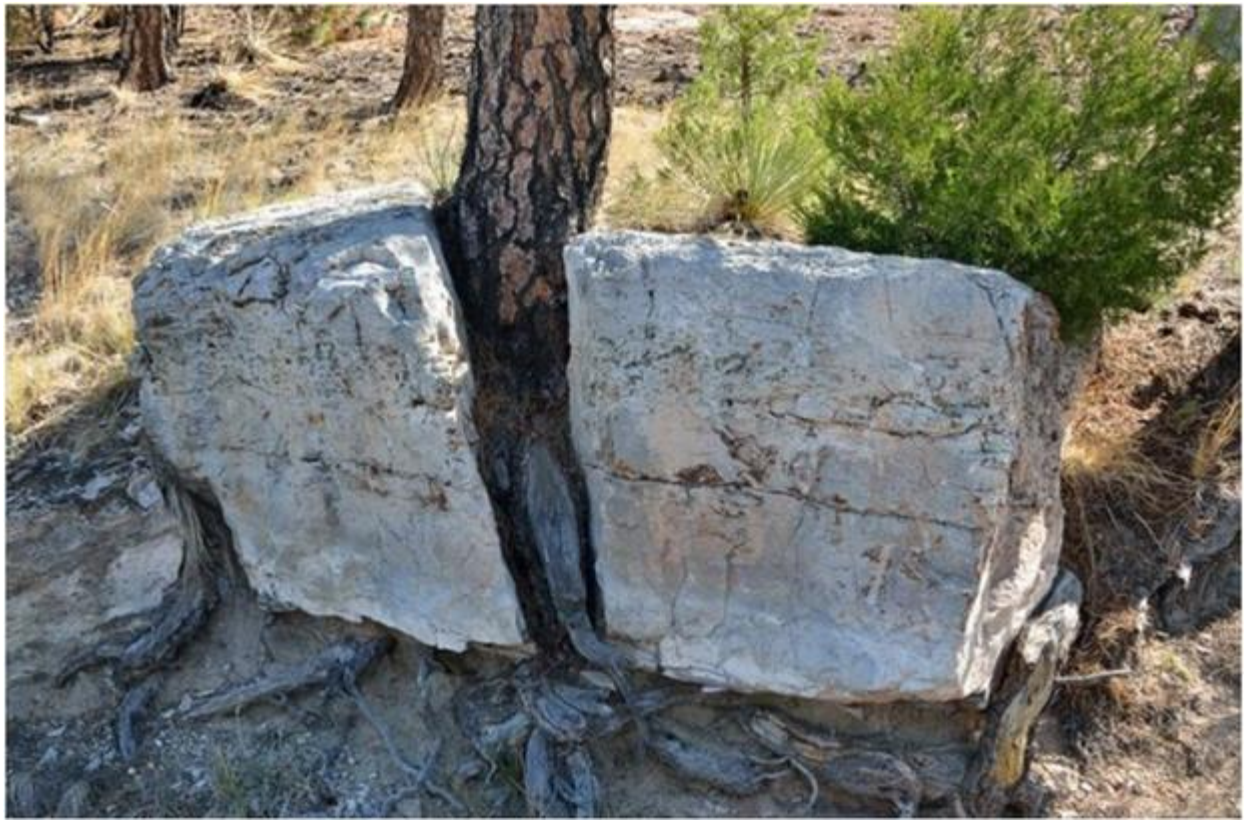
What is Sensemaking?

Sensemaking is actively trying to figure out how the world works (science) or how to design solutions to problems (engineering). Students ***do*** science and engineering through the science and engineering practices. Engaging in these practices necessitates students be part of a learning community to be able to share ideas, evaluate competing ideas, give and receive critique, and reach consensus. Whether this community of learners is made up of classmates or family members, students and adults build and refine science and engineering knowledge together.

Introduction

No matter where you live, you've probably noticed plants growing in surprising places. You might think, "What is that plant doing here?" But in today's task, we ask, "What is that plant doing here?" How can plant, especially tiny plants we can accidentally crush with a misstep, break rocks apart?

Today's task, How can plants break rocks?, students and their families embark on a summer-long investigation and use the thinking tools of patterns and cause and effect to make sense of the science idea plants break rocks into smaller pieces and these smaller pieces can become part of the local soil or be transported someplace else (eroded).



Plant Breaks Rock!

Share the above photograph with students. Ask them to individually make and record observations. You might tell students if an observation makes them think of a question, write the question using a different color pen or pencil next to that observation. (Observations and questions different colors.)

Ask students to share their observations in small groups. You might use the following protocol:

1. Speaker shares one observation.
2. Listeners circle or check-mark the same observation on their own list (It's OK if the observation is not on their list.)
3. Speaker passes the turn to the student on their right.
4. Continue around the circle until students have no new observations to share.
5. Identify the observation(s) common to the group and one observation that only one or two of the group members recorded.

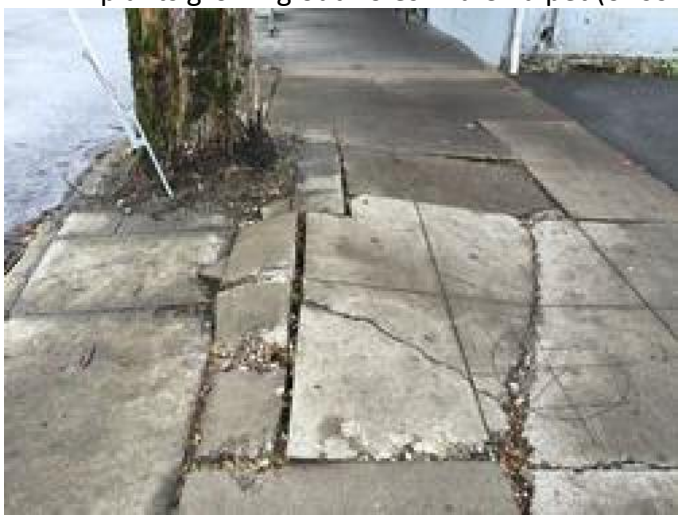
As you walk from group to group, you might say, "We're interested in the *what* right now, not the *why*" if you students have moved from from observations to inferences.
Ask groups to share one common observation and one less common observations among the group members. Students might say,

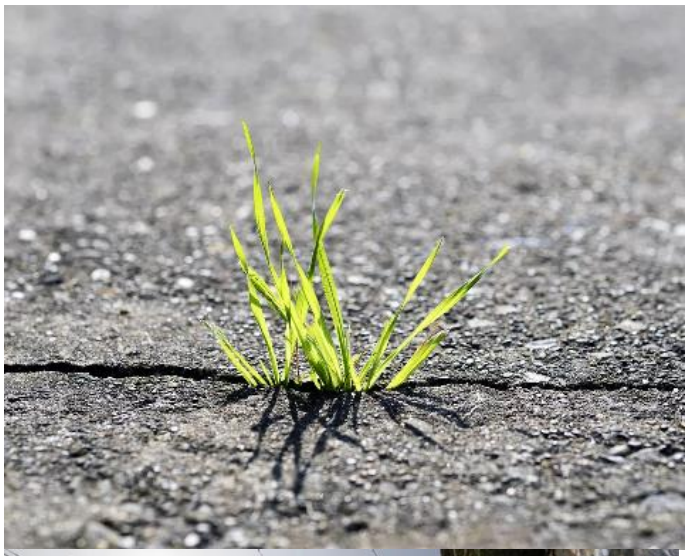
- the rock is split in half
- the tree is growing between the two pieces of rock
- the tree is lifting up the rock
- roots are growing under the rock
- there are small pieces the rock on the ends
- the roots are growing up the sides of the rock
- some of the plants are brown and others are green
- the rock is in the shade

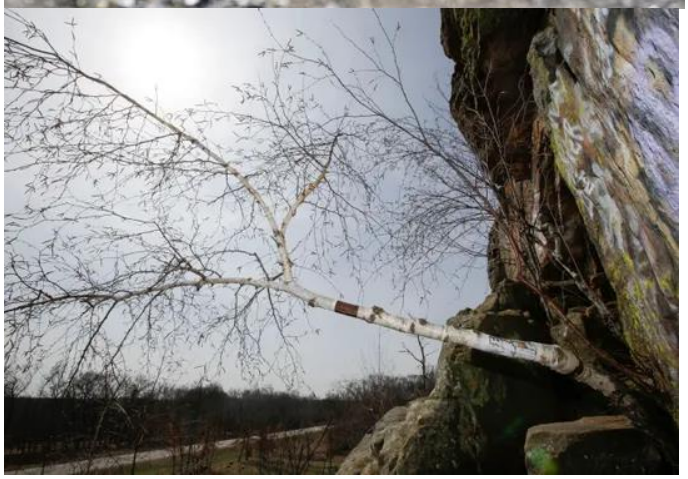
Ask students to continue to record questions as they think of them. Don't ask them to share yet (but if a student does share, record it on a poster, whiteboard, etc. before moving on).

Ask students if they have observed/experienced a related phenomenon. Give them a minute or two to record their experience using words, pictures and/or symbols. Then give students an opportunity to share their experience with their group members. Students in the group might realize they've experienced similar phenomenon as their group members. Make sure to let them know they can add phenomena to their list even after the group has begun sharing (but wait until the speaker has finished sharing). Related phenomenon may include:

- plants growing in cracks in sidewalks, driveways, parking lots, playgrounds
- plant roots breaking sidewalks, driveways, parking lots, playgrounds
- plants/trees growing out of or through rock outcrops (exposed rocks)
- plants growing out holes in a Chia pet (or something similar)







Ask students, "Does this make you think of any new questions?" Ask them to record their questions on their observation list using the question-color pencil or pen.

Ask students to share their questions with a partner. Then ask each student to choose one question and write it on a sticky note or small square of paper. Create a space (question board) for students to post their questions. Invite one student to stand, share their question, and post it. Ask students with similar questions to post their questions next to it (or nearby). Invite a student who has a different question to stand, share and post it. Continue until all student questions are represented on the question board.

Many students will likely wonder if plants break rocks (as opposed to growing in the spaces between growing rocks). Say, "Many of us are wondering if the plants are breaking the rocks. Does it make sense to investigate this question first?"

Investigation

Materials

rulers
cameras (if available)
science notebook
pencils for drawing

If students are in school, you might identify an area where plants are growing in cracks in the playground, parking lot or sidewalks. Students working from home can work with their families to find an area to study.

Say to students, "I heard many groups talking about small plants they've seen growing in cracks in the sidewalk (playground, driveway, etc.). What data could we collect to find out if these plants are making the crack grow wider or breaking the sidewalk into smaller pieces like many of you observed in the picture of the tree between the rocks? Please turn and share your ideas with a partner."

Ask students to share ideas with the class. The types of data might include *(teacher prompts*)

- the size of the plant *How would we measure the size of the plant?* how tall it is, how many leaves it has
- how big the crack is *How would we measure the size of the crack?* how wide it is, how long it is
- how many broken pieces of sidewalk their are *How might we count them without moving them?* (point to them and count, estimate, take a picture)

As a class, decide what data you will collect. You might create a printed page for data collection that can be cut and pasted into a science notebook which students can use as a scaffold the first time you go out to collect data.

Take students outside to identify their "field areas". You might ask them to find an area as big as their open hand or you can create loops of string with a 15-cm diameter for students to lay on the ground to define the boundary of their field area. Encourage students to sketch their field area even if they are also taking photographs.

Ask students to think about how they will locate the their field area again. You might suggest counting the number of paces from a permanent structure.

Consider returning to the field areas once a week for four to six weeks. As students collect data on subsequent visits, you might ask:

- Is the crack getting wider everywhere or just in one place? What is different about the place it is widening?
- What do you notice is different about the plants from the last time we visited our field areas? (Encourage students to look back to data they previously collected. Ask them to quantify their descriptions when possible.)
- Based on your observations, *how* do you think the growing plant is making the crack wider. (Listen for ideas about forces.)

- The crack you are observing grew X cm and this other students widened by Y cm. What might cause this difference?
- You said there were small pieces of rock here the last time. Where do you think they went? How did they move there?
- You say you see soil in the crack? Where do you think the soil came from?

Reaching Consensus

There are many ways you might transition from the investigation to students making sense of the data they collected.

- Plot crack width data and plant growth over time and compare the data sets. Ask students to make a claim about plants causing rocks to break and support it with evidence from data. Students might use science ideas about forces to reason why the evidence supports the claim. Students might also use the science idea that plants need space to grow to reason why the data supports the claim.
- Ask students to create a model to explain to *how* the plant caused the crack to widen over time. You might scaffold the model by creating three panels and labeling them *start, middle, and end*. As students create their models, ask them what evidence from data are supporting their choices. As you walk from group to group, ask students *how* they think the plants are making the crack wider. How can they represent those ideas on their models? You might ask students to create group consensus models and share them in gallery walk. Student groups could visit at least three other models and use sticky notes to identify one thing they like about another group's model and one question they have about it. You might create a class consensus model or hold a discussion to come to consensus on how plants cause rocks to break.

Return to the question board and ask students which questions the class has answered so far. You could use this investigation to pivot students to questions about erosion (Why aren't the rock pieces here anymore?) and deposition (Where did the rock pieces end up?).

NSTA Collection of Resources for Today's Daily Do

NSTA has created a *How can plants break rocks?* collection of resources to support teachers and families using this task. If you're an NSTA member, you can add this collection to your library by clicking ADD TO MY LIBRARY located near the top of the page (at right in the blue box).

Check Out Previous Daily Dos from NSTA

The NSTA Daily Do is an open educational resource (OER) and can be used by educators and families providing students distance and home science learning. Access the entire collection of NSTA Daily Dos.

Acknowledgment

Image from *You Crack Me Up!* Geocache https://www.geocaching.com/play