

PUZZLERS

#11 | ROOTS RULE



Puzzle

Build a root system that can hold a pencil in place.

Standards & Connections

NGSS.3-5-ETS1, NGSS.MS-ETS1

Background:

Roots anchor the plant and are responsible for the uptake of water. They promote soil health by preventing erosion and creating beneficial microbial communities. Shallow roots can access bands of fertilizer like Nitrogen and Phosphorus. Deep roots can forage for water during times of drought, and channels made through the soil by roots allow water to infiltrate deep down. Vertical roots, like taproots, can punch through hardpans that limit growth.ⁱ

Suggested Materials:

Pencils, tape, pipe cleaners, scissors



IDENTIFY

Share the background information with the students, then share the puzzle to be solved. Determine constraints (e.g., time allotted, space, materials provided, etc.) and divide students into small groups.



IMAGINE

Ask a series of questions to help students brainstorm solutions to the puzzle. Encourage students to list all ideas – don't hold back! Before moving on, make sure each group selects a solution that fits within the constraints.

Ask: How can you can solve this puzzle? Which of your ideas can you build a prototype for given the constraints?



DESIGN

Students diagram the prototype, identify the materials needed to build the prototype, and write out the steps to take. Students describe the expected outcomes.

Ask: What steps will you take to create your solution? What do you expect your solution to look like and be able to do?



CREATE

Students follow their design plan and build their prototypes. Monitor their progress and remind them about how much time they have.



TEST & IMPROVE

Students evaluate their creation and compare it with the expected outcomes. Students seek areas of improvement and make changes where needed.



SHARE

Students share their solution to the puzzle and communicate lessons learned.

Ask: What was your biggest takeaway? What would you do differently?

Additional Resources:

For more background information on this topic, please visit www.purpleplow.org.



Experiment trying to “root” heavier items. Have a competition to see who can support the heaviest item!

¹York, L. (2018, June 1). Why roots matter to soil, plants and you. Retrieved from <https://www.noble.org/news/publications/ag-news-andviews/2018/june/why-roots-matter-to-soil-plants-and-you>