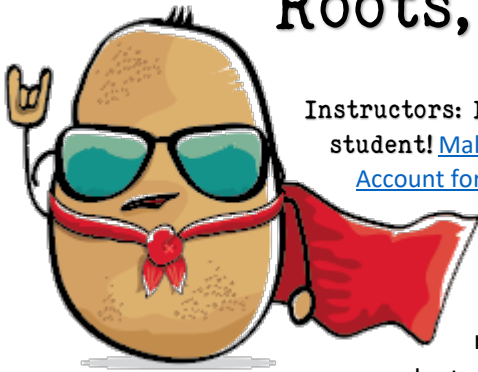


Roots, Shoots, and Stems!



Instructors: Don't forget to make an Achievory account for each student! [Make your account for the Achievory in English](#) or [Make your Account for the Achievory in Spanish](#)

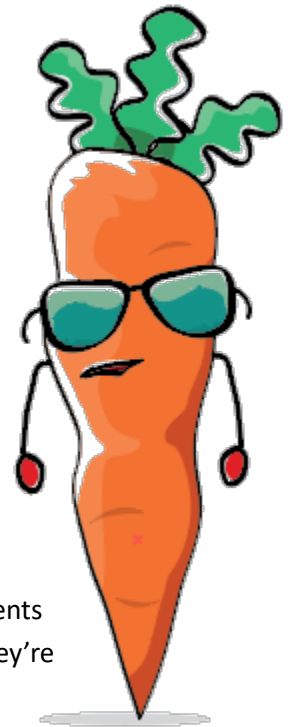
Objective: Students will design and test a root system that helps a plant stay put and understand how root and stem systems work to move water throughout plants, etc. They'll understand transpiration, respiration, precipitation, and other parts of the water cycle. They'll explore cohesion and adhesion and other properties of water.

Grade Span: 3-5, with tips and resources for modifying for other grade levels included.

Subjects: Science

Lesson: Use the Achievory's lesson [Make a Root System](#). In this design challenge, students are going to design and test different root systems that can withstand different forces. They're going to bury their root systems in the sand and see how much force it takes to pull each one out of the ground. Try to build the strongest roots possible!

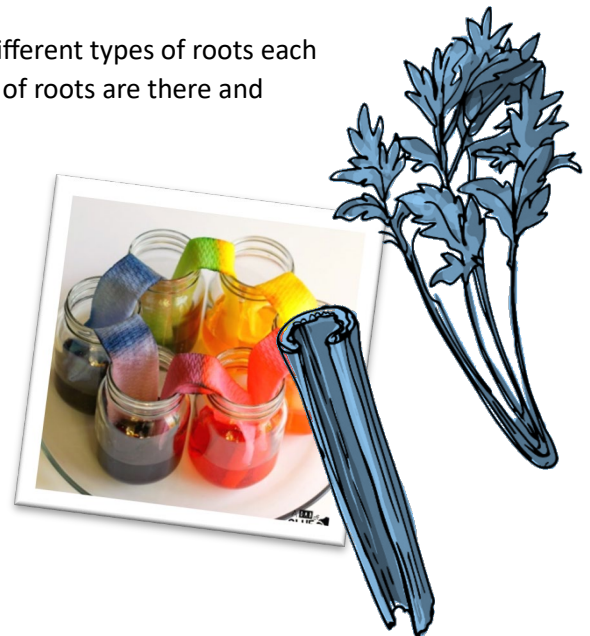
Additional Resources: Incorporate elements of the American Farm Bureau Foundation for Agriculture's [Purple Plow: Roots Rule! Puzzler](#). Roots are an important part of a plant that anchor the plant and are responsible for the uptake of water. They promote soil health by preventing erosion and creating beneficial microbial communities.



But a root is not just a root. There are different types of roots each performing a different task. What types of roots are there and what do they do? Do a little research and see what information you can find out about roots. Hint: there are three primary types of roots.

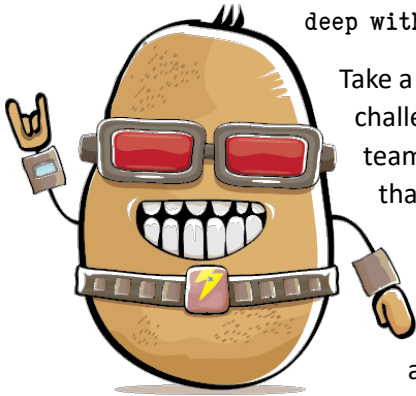
Go through the [Engineering Design Process](#) PDF with students and the [other resources](#) like the Engineering Design Rubric, Supply List and Budget, and the Task Card.

Implement the projects on pages 10-29 of [There's No Place Like Home](#) from Spark Innovations. Go from root to tip with water as it defies gravity and then watch it walk! Catch your breath (and a



plant's) before you discover that the world's largest river is up in the sky (and it flies!) Stalk some science and follow the clues to solve the mystery of what transpired in the celery!

Take it farther! Expand on this lesson and dig deep with additional resources such as:



Take a Purple Plow Challenge like [Save the Soil!](#) With the challenge of losing over 3 billion tons of fertile topsoil each year, your team has been selected to design a prototype and construct a system that will reduce topsoil erosion.

Complete the rest of the projects in Spark Innovations [There's No Place Like Home](#) unit. Students go on a discovery journey (and keep a discovery journal) as we learn about the power of the 'thin blue line' on our world (where the atmosphere is so thin, we could walk to where the oxygen starts to run out.) They follow the wind and discover that everything is connected from the smallest forms of life to the world's largest rainforest. And we've barely gotten started, there's even more to do! So come on in! Dive deep and learn more about our Earth--one of the most unique places in the universe!



Like plants, humans have roots too. Ours help form our family tree. Guide students through The Achivery's 9-10 lesson: [Exploring our roots for self-discovery](#). How can a shift in perspective – sometimes in the form of learning more about the people who raised us – help us understand who we are and where we might be headed?

Use the Student Portal Resource PBS Kids game: [Feed the Fidgits!](#)

Design a farm that uses fish, pipes, and water to grow food for the Fidgits!

Connect with the Achivery's [Water All Life Depends on It](#). Learn how water supports all known life, including animal, plant and human life, by caring for seeds over a 6-day period through daily watering and observations. You will get an opportunity to record your observations in drawings and writing. Your experiment and observations will further connect you to the understanding that water is a necessary ingredient for supporting and sustaining all known life, including plant life.

The Scientific Method isn't only for plants! Explore the Achivery's [Applying the Scientific Method to Basketball](#). Learn how to apply the scientific method to test a hypothesis through sports.