

Rain Gauge STEM Design Challenge

*A lesson from the New Jersey Agricultural Society
Learning Through Gardening program*

OVERVIEW: Students will work in small groups to design and build a rain gauge they can use to measure how much rain falls on their garden.

OBJECTIVES: The student will be able to:

- Design a rain gauge based on criteria provided.
- Compare multiple rain gauge designs and with a group design a rain gauge based on criteria provided.
- Build the rain gauge with a group based on the design selected.
- Evaluate the group's rain gauge based on the criteria provided.



GRADES: 3-5

INTRODUCTION: Rain is crucial for every garden: rain eliminates the work and cost of watering a garden. Rain gauges help students visualize how much water is necessary for garden plants or how accurate the weather forecasts are. Instead of spending money on commercial rain gauges, give your students this STEM design challenge and have them make their own.

MATERIALS:

a variety of recycled containers with varied shapes: 1-liter and 2-liter plastic bottles, plastic juice bottles, translucent ½-gallon and 1- gallon milk containers or jugs.

Sturdy, waterproof tape such as duct/Duck tape

Rulers

Scissors

Permanent markers

A Rain Gauge Design Challenge Rubric sheet for each student

PROCEDURE:

Divide the students into groups of four. Distribute the design challenge rubric sheets. Explain and review the criteria with the class and answer questions. Explain and review the challenge rules and the time schedule. Tell students that you will be observing their progress and reminding them to stick to the challenge criteria, rules, and time requirements.

CRITERIA:

Your rain gauge must be at least 6 inches tall.

The top of your rain gauge must be at least 3 inches wide.

Your rain gauge must have measuring marks on the side to measure the water.

Your must be able to empty water from you rain gauge.

(In this challenge, students must discover that in order for the rain gauge to be three inches wide, they must cut the top off their chosen container, turn it over, and insert it into the container like a funnel. As plastic can be difficult to cut, the teacher should have a small knife on hand. When the groups realize they must cut the container, the teacher can poke a hole in the container, and then the students can continue to cut carefully with scissors.)

CHALLENGE RULES:

- Listen carefully to ideas from everyone on your team. Decide on the best design before you begin to build.
- You may only use the materials provided. You do not have to use all the materials provided.
- You must build your rain gauge in the time provided.
- You may use additional tools such as scissors and rulers.

TIME SCHEDULE:

Teacher will set a timer and notify students when to move on to the next step.

- 5 minutes for each student to sketch his/her own design.
- 5 minutes to brainstorm ideas as a group.
- 10 minutes to plan out the design.
- 20 minutes to create the product (the rain gauge).
- 10 minutes to reflect. How can we improve the design? What worked well? What did not work well?

EXTENSIONS:

Ask students to research the typical rain trends for New Jersey:

- What is the usual annual rainfall for New Jersey?
- Which are the rainiest months?
- How much rain typically falls during one rainfall?
- How much rain falls in extreme storms, such as hurricanes or nor'easters?

See Learning Through Gardening's lesson "How to Measure Rain" for a list of New Jersey rainfall fun facts.

Have students compare the amount of rain that falls in their garden to the amount that is forecast. Are the forecasts mostly accurate?

New Jersey Learning Standards:

Science: 3-5:ETS1.A,B,C

NAME _____

RAIN GAUGE DESIGN CHALLENGE RUBRIC

Today your challenge is to design and build a rain gauge that can measure the rain that falls on our garden. You will have 40 minutes to complete this project.

- CRITERIA: Your rain gauge must be at least 6 inches tall.
- Your rain gauge must be at least 3 inches wide.
- Your rain gauge must have measuring marks on the side to measure the water.
- You must be able to empty water from your rain gauge.



CHALLENGE RULES:

- Listen carefully to ideas from everyone on your team. Decide on the best design before you begin to build.
- You may only use the materials provided.
- You must build your rain gauge in the time provided.
- You may use additional tools such as scissors and rulers.

To evaluate your rain gauge, circle how you met each specification below.

 CRITERIA	3	2	1
My rain gauge is at least 6 inches tall.	Yes!	Almost	Not really
My rain gauge is at least 3 inches wide.	Yes!	Almost	Not really
My rain gauge has measuring marks on the side.	Yes!	Some	Not really
I can easily empty water from my rain gauge.	Yes!	Slightly difficult	Not really
Original and creative	Impressive design	Unique design	Interesting design
Used materials on list only	Yes!	Some	Used a material not on the list