Rainflower

STUDENT FIELD GUIDE

Setup, Data Collection and Reporting

Everything you need to install your rain collector, measure rain the standard way, report your results, and analyze your data — written step by step.

GRADES 9–12 | BANGLADESH | STUDENT FIELD RESEARCH

Measure carefully. Report honestly. Learn from local rain.

1. Equipment you need

Use the same equipment and the same method for the entire experiment. Changing containers or methods in the middle makes your data impossible to compare.

- One clean plastic container with straight, vertical sides
- A ruler marked in millimeters (mm)
- A permanent marker
- A stable base or holder so the container cannot tip
- A small bubble level, if you have one
- A phone or camera, if available
- A notebook or our online reporting tool

Choosing the right container

The best container is shaped like a cylinder: round, with straight vertical sides, and the same width from top to bottom. The top rim must be smooth and level. A straight-sided food-storage container works well.

Feature	Required?	Why it matters
Straight vertical sides	Yes	Depth of water = rainfall in mm, with no extra math
Round opening, at least 10 cm across	Yes	A wider opening catches a fairer sample of rain
At least 15–20 cm deep	Yes	Prevents overflow in heavy monsoon rain
Smooth, level rim	Yes	A chipped or tilted rim catches the wrong amount
No cracks, holes, or lids	Yes	Leaks and covers change the measurement

DO NOT USE A bottle with a narrow neck, curved or sloping sides, a funnel, cracks, holes, or a lid. A cut soft-drink bottle is usually a poor choice because its sides curve near the bottom.

Preparing the container

1. Wash and rinse the container. Remove any lid.
2. Measure the inside diameter of the opening in centimeters and write it down.
3. Write your station ID on the outside with the permanent marker.
4. Use this same container for the whole experiment. If it breaks, tell your coordinator before replacing it.

2. Choosing the location

The opening must receive rain directly from the sky — nothing above it, nothing splashing into it. Choose an open spot where nearby objects cannot block rain or add extra water.

A good location…

- Has a clear, open view of the sky.
- Is away from roof edges, gutters, and drainpipes.
- Is away from overhanging branches.
- Is away from walls, fences, and balconies.
- Cannot receive water from sprinklers, taps, or tanks.
- Cannot be reached by floodwater.
- Is safe from disturbance by people and animals.
- Lets the container sit level and secure.

The distance test

Nearby walls, buildings, and trees can block rain or splash water. Use this simple rule:

> **RULE OF THUMB** Place the collector at least **twice as far** from an obstruction as the obstruction rises above the collector.

Example: a wall rises **2 meters** above your collector → keep the collector at least **2 × 2 = 4 meters** away from that wall.

Never place the collector…

- Under the edge of a roof, or anywhere roof water can drip or flow in.
- On a roof surface where water flows across into it.
- Directly below a tree.
- Beside a wall that sheds or splashes water.
- In a low spot where floodwater could reach it.

> **IMPORTANT** Water from a roof, tree, wall, pipe, or flooded surface is runoff — not rainfall. If runoff can enter your collector, the location is invalid.

Installing and registering your station

1. Secure the container so it cannot tip or blow over.
2. Make the opening perfectly horizontal — check with a bubble level or a careful eye. A tilted opening collects the wrong amount.
3. Keep the rim high enough that splashing ground water cannot enter.
4. Photograph the collector and its surroundings, facing north, south, east, and west if possible.
5. Register your station: student or team ID, school, village or town, union, upazila, district, approximate coordinates, container diameter and height, height of the opening above ground, nearest obstruction and its distance, and the installation date.
6. After registration, do not move the collector. If it must move, report the new location to your coordinator.

3. Daily measurement and reset

Check the collector every day at the same time. We recommend 8:00 AM Bangladesh time. Each reading represents all the rain that fell since the previous reset.

> **WHY DAILY?** You submit reports weekly, but you must measure and empty the collector every day. Water left sitting for a week can evaporate, overflow, collect insects and leaves, or be disturbed — all of which ruin the measurement.

The daily routine

1. **Inspect before touching.** Look for tilting, damage, overflow, runoff, dirt, or signs the collector was moved.
2. **Note any debris.** If leaves or insects are floating inside, write it down first, then remove them gently.
3. **Measure.** Stand the ruler vertically inside the container until it touches the bottom. Read the water depth in millimeters at eye level — not from above.
4. **Record immediately.** Write the date, time, depth in mm, and any problems. Do not trust your memory.
5. **Photograph if possible.** Show the ruler and the water level before emptying.
6. **Empty completely.** Pour out every drop.
7. **Reset.** Return the container to exactly the same position — clean, level, and secure — ready for the next 24 hours.

Days with no rain

If the container is empty, record **0.0 mm**. Never leave the space blank. A blank means “nobody checked.” A zero means “I checked, and there was no rain.” These are very different scientific statements!

Trace rainfall

If you can see a little moisture but it is too small to measure, record it as **Trace (less than 1 mm)**. Do not write it as 1 mm.

4. Measuring: the math

The main method: depth = rainfall

Because your container has straight vertical sides, the depth of the water is the rainfall. No conversion needed.

Rainfall (mm) = water depth in the container (mm)

Example: the water is 18 mm deep → the rainfall since your last reset was **18 mm**. Always report rainfall in millimeters, never in liters.

Optional method: measuring by volume

If your coordinator asks you to pour the water into a measuring cylinder instead, you can convert the volume to rainfall:

Rainfall (mm) = (Volume in mL × 10) ÷ Opening area in cm²

where Opening area (cm²) = π × (diameter ÷ 2)² and π ≈ 3.1416

Worked example

Your container opening is **12 cm** across, and you collected **226 mL** of water.

1. Radius = 12 ÷ 2 = **6 cm**
2. Opening area = 3.1416 × 6² = 3.1416 × 36 ≈ **113.1 cm²**
3. Rainfall = (226 × 10) ÷ 113.1 = 2260 ÷ 113.1 ≈ **20.0 mm**

STICK TO ONE METHOD Use the same measuring method for the whole experiment unless your coordinator tells you to change.

5. Special situations

The container overflowed

In very heavy rain the container may fill completely. An overflowing container cannot tell you the true rainfall — do not guess.

- Report: **“Overflow — actual rainfall greater than container capacity.”**
- Report the container’s capacity in mm (its inside depth).
- Report the approximate time of the heavy rain, if you know it.
- Mark the observation as incomplete.

You missed the observation time

- Measure as soon as you can.
- Record the actual date and time you measured.
- Record how many hours the reading covers (for example, 30 hours instead of 24).
- Do not present it as a normal 24-hour observation.

The container was disturbed

Mark the observation invalid if any of these happened:

- The container was knocked over or moved significantly.
- Someone added or removed water.
- Floodwater, roof water, or tree runoff entered it.
- The opening was partly blocked.
- You cannot determine what happened.

> **NEVER ESTIMATE** Never replace an invalid or missing measurement with a guess. Report the problem instead — that is what real scientists do.

Extra measurements during a big storm

During a major storm you may measure and empty the container more than once in a day to prevent overflow. Record every reading and every reset time, then add the readings together for the daily total.

6. Data quality: the four labels

Every daily observation gets exactly one quality label. This tells everyone how much to trust the number.

Label	Meaning
Valid	You followed the protocol and know of no problem.
Questionable	The number may be usable, but a minor issue occurred (for example, slight tilt, small debris, or possible splash).
Invalid	The measurement was contaminated, disturbed, lost, or unreliable.
Missing	No observation was made that day.

KEY RULE Invalid and Missing observations must never be entered as zero. Zero is a real measurement that means “I checked and there was no rain.”

7. Your weekly report

At the end of each week, submit one report containing your station check, your seven daily entries, and a weekly summary. Here is everything the report asks for.

A. Station check

1. Did you use the registered container all week? (Yes/No)
2. Did the container stay in its registered location? (Yes/No)
3. Was the opening level all week? (Yes/No/Not sure)
4. Did anything around the station change — new construction, growing branches, moved equipment? (Yes/No — describe if Yes)
5. Upload one current photo of your collector.

B. Daily entries (one per day)

Question	Answer type
Observation date and time	Date, time
Did you personally check the container?	Yes / No
Measured rainfall	Number, in mm
Was there measurable rain?	Yes / No / Trace
Was the container emptied and reset correctly?	Yes / No
Was the container level and secure?	Yes / No / Not sure
Did it overflow?	Yes / No
Was it disturbed or knocked over?	Yes / No
Could runoff (roof, tree, wall) have entered?	Yes / No / Not sure
Were leaves, insects, or dirt inside?	Yes / No
Measurement photo	Image (if available)
Quality label	Valid / Questionable / Invalid / Missing
Explain any problem	Short text (required if not Valid)

C. Weekly summary

1. Total valid rainfall for the week (mm).
2. Number of days with measurable rain, and number of zero-rain days.
3. Highest daily rainfall, and the date it occurred.
4. Any missed, questionable, or invalid observations?

5. Any overflow, strong wind, flooding, or severe weather?
6. Did you see flooding or waterlogging in your neighborhood? Where and when?
7. Your confidence in this week's data: High / Medium / Low — and why.
8. Confirm: "I measured and reported the rainfall honestly and did not estimate missing measurements."

8. Analyzing your data

Weekly total

Weekly rainfall (mm) = sum of all valid daily measurements

Questionable readings are listed separately. Invalid and missing readings are never added to the total.

Averages and percentages

Average per rainy day = Total weekly rainfall ÷ Number of rainy days

Rainy-day percentage = (Number of rainy days ÷ 7) × 100

Weekly change = This week's total − Last week's total

Worked example

Suppose your valid daily readings were: 0, 12, 0, 25, 8, 0, 5 (mm).

- Weekly total = 12 + 25 + 8 + 5 = **50 mm**
- Rainy days = **4** ⟶ average per rainy day = 50 ÷ 4 = **12.5 mm**
- Rainy-day percentage = (4 ÷ 7) × 100 ≈ **57%**
- Wettest day = 25 mm ⟶ share of the week = (25 ÷ 50) × 100 = **50%**

How much water could a roof collect?

Here is where your measurement becomes practical. Because 1 mm of rain on 1 m² equals about 1 liter:

Theoretical water (liters) = Rainfall (mm) × Roof area (m²)

Collectable water (liters) = Theoretical water × Efficiency

Worked example

- This week's rainfall: **60 mm**. Roof area: **100 m²**.
- Theoretical water = 60 × 100 = **6,000 liters**
- At 80% collection efficiency: 6,000 × 0.80 = **4,800 liters**

Real systems collect less than the theoretical amount because of splashing, leaks, dirt, evaporation, and first-flush losses. That is why we multiply by an efficiency factor.

Questions to think about each week

- Did most of the rain fall in one big event, or spread across several days?
- Was the rain light and continuous, or short and intense?
- How does this week compare with last week?

- Did nearby stations report similar rainfall? What might explain differences?
- Did heavy rainfall match flooding or waterlogging you saw nearby?
- What measurement problems could have affected your results?

9. Safety

SAFETY RULES Never climb onto roofs, trees, walls, or unsafe structures to place or check a collector. Never go outside during lightning, dangerous wind, or flooding — wait until it is safe, even if it means recording a longer observation period. Ask an adult for help whenever you need it.

10. Quick checklists

Setup checklist (once)

- ☐ Straight-sided container, ≥10 cm opening, ≥15 cm deep, no cracks or lid
- ☐ Inside diameter measured and recorded
- ☐ Open-sky location — passed the distance test
- ☐ Container secured and level
- ☐ Photos taken; station registered

Daily checklist

- ☐ Checked at the standard time (8:00 AM)
- ☐ Inspected before touching
- ☐ Depth read in mm at eye level
- ☐ Result recorded immediately (0.0 on dry days)
- ☐ Photo taken (if possible)
- ☐ Emptied completely and reset level and secure

Weekly checklist

- ☐ Seven daily entries complete (including zeros, traces, and problems)
- ☐ Station check answered; current photo uploaded
- ☐ Weekly summary and confidence level filled in
- ☐ Honesty confirmation ticked

Method references: World Meteorological Organization, Guide to Instruments and Methods of Observation (WMO-No. 8); CoCoRaHS observer training and precipitation measurement guidance.