

Grade 5

Theme: Winogradsky Columns – Soil & Water Microbial Ecosystems (The Secret World of Microbes)

Time: 2 sessions × 45 minutes

Learning Objectives

- Identify microbes as diverse living organisms present in soil and water.
- Understand that different microbes perform different roles in nature (decomposers, producers, recyclers).
- Observe how environmental conditions (light, oxygen, nutrients) influence microbial growth.
- Develop long-term observation, recording, and scientific drawing skills.

Lesson Plan

Note to the Teacher

This lesson introduces students to **microbial ecosystems** using the classic Winogradsky column. Unlike short experiments, this activity unfolds over several weeks, helping students understand that microbial life develops slowly and in layers. It reinforces ideas of **decomposition, nutrient cycling, and ecological balance**, while encouraging patience, observation, and curiosity. Variations in soil source and food material make each group's column unique.

Hook Activity (5 minutes)

Quick True/False Quiz: *Germs – Friends or Foes?*

Statement	Answer
All microbes are harmful	False
Some microbes help us make food	True
Microbes can live inside our bodies	True
Microbes can only live in dirty places	False
Microbes help plants grow	True

Briefly discuss how microbes can be both helpful and harmful.

Creative Warm-up Activity

Microbe Detective Sketch (5 minutes)

Instructions:

Give each student a blank sheet of paper.

Prompt:

“If you had a super microscope, what would your imaginary microbe look like? Draw it with as many details as possible – shapes, colours, tentacles, eyes, or patterns.”

Students share 1–2 drawings voluntarily.

Main Activity: Building Winogradsky Columns

Materials Needed (Per Group)

- Transparent bottles or jars
 - Soil sample (~1 cup) and water
 - Pond or lake water (~200 ml, optional)
 - Egg yolk (sulfur source)
 - Shredded paper or dry leaves (carbon source)
 - Crushed chalk or eggshells (calcium carbonate)
 - Thin slices of fruits / vegetable peels (optional variations)
 - Plastic wrap and rubber bands
 - Markers and labels
 - Gloves
 - Observation notebooks or charts
 - Agar stick (nutrient agar solidified in long tube/pipette)
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Sample Collection Locations

- Garden soil
- Agricultural field
- Cow shed
- Kitchen backyard
- Compost area
- Pond water

Sampling Instructions

- Collect approximately **1 cup of soil** from each location.
- Collect **~200 ml pond water** in clean bottles.
- Label all samples with:

- Group name
- Location
- Date

Safety Tip: Students must wear gloves and avoid direct contact with pond water.

Teacher Demonstration & Assembly Steps

1. Divide students into groups of **maximum 5**.
2. Demonstrate mixing soil with shredded paper, egg yolk, chalk, and water to form a **milkshake-like consistency**.
3. Pour the mixture to fill **half the jar**.
4. Add mostly plain soil above, leaving a small column of water and air at the top.

Incubation & Placement

- Place jars in **indirect sunlight**.
- Optional comparison:
 - One column in light
 - One column in dark
- Ask students to observe both sides of the same column.

Observation Diary Setup My Microbial World Journal

Student Name: _____

Group Name: _____

Sample Location: _____

Date of Setup: _____

Winogradsky Column Observation Table

Week	Date	Top Layer (Colour & Changes)	Middle Layer	Bottom Layer	Smell	Other Notes
1						
2						
3						
4						
5						

Observation Tips for Students

- Do not shake or open the jar.
- Observe carefully:
 - **Colours:** green, purple, black, white, yellow, brown
 - **Smells:** earthy, sour, rotten egg, none
 - **Structures:** bubbles, layers, filaments, cloudy zones
- Draw sketches when possible.
- Record changes weekly

Research questions based on winogradsky column:

1. When we sealed the jar, did we trap **mud** inside—or did we trap **life**? What makes you think so?
2. Why do you think the layers stay separate instead of mixing like soup, even though everything is inside one jar?
3. What do you think the microbes are doing with the **egg yolk and leaves** we added—are they eating, building, or changing them?
4. If your Winogradsky column was a **city**, where would the richest neighbourhood be—top, middle, or bottom? Why?
5. Do you think microbes fight over food or share it?
6. Could the Earth itself be one giant Winogradsky column?
7. What questions do you now have that you never thought about before building this jar?