Module 3: Soil Science and Soil Health
Think-Pair-Share Activity C: Design Minute - Microbe Boosters

Lesson C
Grouping: Pairs or small groups (3–4)
Time: 25–30 minutes

Materials:
- One worksheet per student (or per pair)
- Chart paper or large sticky notes for group sketches
- Markers or colored pencils
- Optional: printed SDG icons or slide reference

Objective:
Students will learn how soil management practices (cover crops, mulch, compost, reduced tillage, vermicompost, biochar) influence microbial activity and measurable soil health indicators (e.g., infiltration, aggregate stability, respiration, bulk density, pH). They will connect these changes to ecosystem services and global sustainability goals (SDGs). Students will evaluate trade-offs, propose a management practice, and defend their design with reasoning and evidence.

Instructions:
1. Each student team selects one soil management practice.
2. On the worksheet/chart paper, sketch or note:
   - The practice chosen
   - Predicted changes in one or more soil indicators
   - The ecosystem service most affected
   - The related SDG(s)
3. Teams participate in a gallery walk, leaving comments/questions on others' designs.
4. Each group defends their design in a short share-out.
5. As a class, synthesize patterns, trade-offs, and connections between soil biology, ecosystem services, and SDGs.

Your Task:
Your task is to design a Microbe Booster Map showing how one soil management practice shifts a soil health indicator and supports an ecosystem service. Then, link your design to a relevant SDG and defend your reasoning.

Step 1: Team Design Minute (Group Work)
Pick ONE practice: Cover crop | Mulch | Compost | Reduced till | Vermicompost | Biochar

Fill in the table:

Practice Chosen	Indicator Prediction ($\uparrow$ / $\downarrow$ / $\leftrightarrow$)	Ecosystem Service Impact	SDG Match

Step 2: Sketch It Out
Draw a quick diagram showing how your practice changes the indicator (arrows up/down, microbes, roots, water movement, etc.).

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Step 3: Gallery Walk (Class Interaction)
- Post your group's sketch.
- Rotate to 2–3 other groups. On sticky notes, add:
    - One thing you agree with.
    - One thing you'd tweak or question.

Notes:

Step 4: Share & Defend (Mini-Presentations)
One group member gives a 1-minute defense:
- Why did you pick this practice?

- How will it affect microbial activity and soil indicators?

- Which SDG does it connect to and why?

Reflection
1. Which practices had the biggest predicted effects on microbial activity?

2. Did different teams connect the same practice to different SDGs? What does that show?

3. What trade-offs came up (e.g., high C:N slows decomposition but builds stable aggregates)?

4. If you were advising a farmer, which combination of practices would you recommend, and why?

Skills You'll Use:
- Systems thinking (linking soil indicators → ecosystem services → SDGs)
- Evidence-based reasoning (using NRCS test data + lesson knowledge)
- Visual modeling (sketches & indicator arrows)
- Collaboration & synthesis (gallery walk + group defense)

Example:
Our team chose biochar. We predicted bulk density ↓ and infiltration ↑, since biochar improves pore space. The ecosystem service is cleaner runoff and better water filtration. We linked it to SDG 6: Clean Water and Sanitation. We defended this by noting that stable carbon in biochar also supports SDG 13 (Climate Action). Other groups added that biochar also affects respiration, showing there are multiple valid connections.