Teacher Guide (page 1) & Rubric (pages 2-6) for Module 2 HOA B

Overview

This hands-on project supports key themes from Module 2, applying Lessons A, B, and C in a highly tactile, student-led fermentation system. The Bokashi composting setup brings microbial ecology and systems thinking to life as students engage with waste transformation in real-time.

- **Lesson A** introduced the shift from linear to circular food systems and waste streams. This activity models circularity by showing how food waste can be transformed through anaerobic fermentation into a valuable input (pre-compost).
- In **Lesson B**, students explored microbial diversity and the roles microbes play in decomposition. Bokashi fermentation directly highlights microbial processes, especially the power of beneficial anaerobes in managing food waste and improving soil inputs.
- **Lesson C** moved into composting systems and decision-making. This activity exemplifies one type of composting in depth. It sets up future decisions - like whether, how, and when to apply the pre-compost to soil - and introduces monitoring for pH and leachate as part of system feedback loops.

It also sets the stage for **Module 3** on **soil health**, where students will see how fermented organic matter contributes to soil microbiome dynamics. And it continues themes from **Module 1**, particularly those related to resource circularity and system mapping.

Implementation Notes

- **Timing**: Start this activity after Lesson B. It reinforces microbial concepts while preparing students for Lesson C's system-building.
- **Setup**: Students need airtight buckets, bran inoculant, food scraps, and gloves. A class-wide discussion of setup and safety should precede the project. Teachers should oversee first-time setups to confirm correct layering.
- **Safety**: Though relatively low-risk, Bokashi fermentation is anaerobic and needs careful sealing to prevent odors or mold. Monitor student projects regularly.
- **Monitoring**: Encourage students to log data over a 10-14 day cycle, including smells, pH shifts, liquid runoff (leachate), and decomposition progress. Guide them to observe patterns and theorize why changes happen.
- **Reflection**: After the process is complete, prompt students to analyze the microbial activity observed and to propose real-life applications of bokashi (e.g., in households, farms, or schools). Tie this into local sustainability initiatives or cafeteria waste strategies from **HOA A**.

Rubric for assessment

Use the **Data Collection Worksheet** and students' participation to assess understanding. The worksheet responses will show both their observational skills and conceptual grasp. The rubric below provides criteria for evaluating their performance. You may assign point values (for example, 4 = Exemplary, 3 = Proficient, 2 = Developing, 1 = Beginning) for each category, for a total of up to 20 points. This can be used as a formative assessment or part of a lab/activity grade.

Grading Rubric (Short Version)

Use this quick-reference table to evaluate short-response, short-essay, and design-based answers. See page 7 for the detailed rubric:

Criteria	Exemplary (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginning (1 pt)
Data Collection & Accuracy	Log is complete, consistent, and includes bucket weights, pH readings, leachate volumes, and vivid sensory notes across all phases.	Log is mostly complete; a few entries may be missing or less detailed. Most indicators tracked.	Log is partially complete; some readings missing or inconsistent. Notes are vague.	Log is largely blank or lacks structure; limited to no useful data.
Guiding Questions	Answers are insightful and connect microbial processes to waste reduction. Students explain pH, smell, and leachate trends thoroughly.	Answers are generally accurate, with 1–2 microbial processes explained. At least one trend was identified per observation type.	Answers are brief or vague, with some gaps in understanding. Few microbial connections.	Answers are minimal or incorrect; unclear connection to microbial activity.
Reflection & Analysis	Strong synthesis of results; clear explanation of fermentation stages, microbial roles, and sustainability benefits. Evidence-based recommendations.	Good synthesis; microbial function discussed, and relevant recommendations provided.	Basic analysis; vague or generic reflection. Limited understanding of microbe function or solution logic.	No clear reflection; minimal insight or disconnected ideas.

Systems Thinking & Environmental Connections	Demonstrates clear systems thinking; explicitly links bokashi to nutrient cycling, food waste reduction, soil health, and sustainability practices.	Shows some systems thinking; links bokashi to at least two broader impacts (environmental, economic, or social).	Limited systems thinking; makes one basic connection between bokashi and a broader impact.	No evidence of systems thinking; no connections to broader impacts.
Communication & Presentation	Work is neat, well-organized, and easy to follow; data tables fully complete; responses clearly written; high effort evident.	Work is organized and mostly complete; tables filled in; answers readable; good effort shown.	Work somewhat disorganized or incomplete; some missing labels, unclear explanations, or effort lacking.	Work messy, incomplete, or very hard to follow; minimal effort shown.

Rubric Long Version

1. Data Collection & Accuracy (of Fermentation Logs)

- **Exemplary (4 pts):**
  • All data tables complete with consistent entries (pH, bucket weight, leachate volume, odor/appearance notes).
  • Student documents every observation day; values plausible and aligned with expected fermentation trends.
  • Descriptive language used (e.g., “sweet-sour smell,” “white mycelial film formed,” “pH dropped to 3.5”).
  • Shows keen observation and careful measurement habits.
- **Proficient (3 pts):**
  • Most entries present and accurate with minor gaps (e.g., missed one day or inconsistent units).
  • Student tracks key variables (pH, leachate, odor) but may omit less critical details like texture changes.
  • Demonstrates reliable monitoring of Bokashi process.
- **Developing (2 pts):**
  • Data record incomplete or uneven—some days missing or notes vague (“looks normal,” “smelled bad”).
  • Several entries inaccurate or illogical (pH rising instead of dropping, no pattern in leachate volume).
  • Shows limited care or understanding of measurement importance.
- **Beginning (1 pt):**
  • Few or no usable entries; tables blank or filled randomly.
  • No evidence of active observation or data tracking.
  • Indicates lack of participation or failure to follow project steps.

2. Guiding Questions (Understanding Microbial Processes and Waste Transformation)

- **Exemplary (4 pts):**
  • Responses demonstrate deep grasp of anaerobic fermentation and microbial ecology.
  • Explains pH drop as result of lactic acid production; interprets odors and leachate as indicators of active anaerobes.
  • Connects observations to concepts like “microbes consume simple sugars to stabilize waste and retain nutrients.”
  • Answers show scientific reasoning beyond rote description.
- **Proficient (3 pts):**
  • Explains most major trends correctly (pH drop, odor change, leachate formation).
  • Mentions microbial activity (e.g., “lactic acid bacteria breaking down food”).
  • Some detail missing but core process understood.
- **Developing (2 pts):**
  • Answers brief or partial; mentions smell and pH changes without linking to microbes.
  • Confuses aerobic and anaerobic decomposition or fails to explain why conditions must be sealed.
- **Beginning (1 pt):**
  • Responses minimal or incorrect (e.g., “it molded because it rotted wrong”).
  • No connection between data and microbial activity; reflects misunderstanding of fermentation process.

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3. Reflection & Analysis (Interpreting Results and Sustainability Benefits)

- **Exemplary (4 pts):**
  • Synthesizes data to describe the three stages of Bokashi (fermentation, stabilization, soil integration).
  • Identifies roles of microbes in odor control, nutrient preservation, and pathogen suppression.
  • Draws evidence-based conclusions about why fermentation differs from rotting.
  • Provides specific recommendations for improvement or real-world application (e.g., school cafeteria waste management).
- **Proficient (3 pts):**
  • Accurately summarizes overall process and benefits (“turns food waste into safe pre-compost”).
  • Shows understanding of microbial function with moderate detail.
  • Reflections clear but less comprehensive.
- **Developing (2 pts):**
  • Gives simple descriptions without analysis (“It smelled bad then got better”).
  • Does not connect results to broader environmental or agronomic benefits.
- **Beginning (1 pt):**
  • No meaningful reflection or incorrect claims (e.g., “the mold ruined it so it failed”).
  • Shows no understanding of Bokashi as a controlled biological process.

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4. Systems Thinking & Environmental Connections

- **Exemplary (4 pts):**
  • Demonstrates clear systems thinking by linking Bokashi to nutrient cycling, soil microbiome health, and waste management.

• References circular economy principles ("food waste → fermentation → soil carbon → new food").
• Connects to broader impacts—climate change mitigation, greenhouse-gas reduction, community food systems.

- **Proficient (3 pts):**
  • Identifies at least two system-level benefits (e.g., reduces landfill use and improves soil).
  • Understands Bokashi as part of a circular waste solution with limited depth.
- **Developing (2 pts):**
  • Makes a basic connection ("helps plants grow") without systemic context.
  • Does not fully relate activity to food-waste cycle or climate issues.
- **Beginning (1 pt):**
  • No connection to larger systems or environmental implications.
  • Treats Bokashi as stand-alone experiment with no real-world link.

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5. Communication & Presentation (of Log and Summary Work)

- **Exemplary (4 pts):**
  • Work is organized, clean, and logically structured. Tables clearly labeled and data plotted neatly.
  • Written responses use complete sentences and scientific vocabulary (pH, anaerobic, lactic acid, fermentation).
  • Shows exceptional effort and attention to detail.
- **Proficient (3 pts):**
  • Work readable and complete; answers mostly clear with minor grammar issues.
  • Tables and labels present but occasionally inconsistent.
- **Developing (2 pts):**
  • Work somewhat disorganized or rushed; sections partially filled or poorly labeled.
  • Effort uneven across components (data fine but reflections thin).
- **Beginning (1 pt):**
  • Disorganized or incomplete submission with multiple missing sections.
  • Shows minimal care or ownership of work.

Teacher Guidance

Use this rubric flexibly depending on class time and student level. For younger or introductory classes, you may weight **Data Collection + Systems Thinking** more heavily (quantitative and conceptual balance).
Provide formative feedback such as "Excellent tracking of pH trends — next time expand on what that means for microbial activity."
Encourage students to connect their logs to local contexts (home, school cafeteria, community garden).
Innovation (e.g., testing different materials or container designs) may earn bonus recognition.

Teacher Assessment Tips

- **Discuss the Rubric Upfront**: Make sure students understand the purpose of data logging and reflection. Encourage them to document "weird smells" and changes, not just numbers.

- **Connect to Lessons A–C**: Ask students: *What makes Bokashi different from aerobic composting? What microbes are likely at work here? How does this prepare material for soil application?*
- **Tie in Other Modules**: Preview **Module 3** on soil health when discussing final compost use. Mention how this connects to **Module 1**'s systems thinking and food cycle models.
- **Encourage Innovation**: Some students may want to design their own bucket or track additional variables (like temperature or time to white mold). Reward initiative.