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Unit Plan: Worm Systems (Grade 1) Teacher: Molly Temple, Palms Elementary, Los Angeles

Context & Background

SNAPSHOT:

This is a mini unit inside of a larger semester-long study of the rot cycle. This unit specifically focuses on the learning about worms and the building of a worm bin.

- Content: Worms
- Action: Observation and study of worms in compost bin. Students will observe and take notes on the worms.
- Assessment: Culminating poster project on the rot cycle using vocabulary words that were part of the unit.

What came before:

- Content: rot cycle, composting, and related vocabulary (Decompose, Soil, Compost, Rot)
- Action: Starting a compost bin in our school garden
- Action: Observing and recording the decay that is taking place in the compost bin

What comes after this unit:

1. Poster project assessment is also a prewriting activity for developing skills for writing "how-to" books.
2. Will lead to: Next unit that focuses on the growing and life cycle + the planning when we and planting a garden at school

Prior knowledge for student to tap:

- Gardens, nature, and rotting
- Foundational systems background:
 - Cycles
 - Connections
 - Parts of a whole

Essential questions:

- What impact do worms have on the rot cycle? On human life?
- What would happen without worms?
- How can we [as first graders] help our soil?
- Why is it important that we help our soil?



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Standards & Goals

Related Systems Principles:

- Systems have cycles
- Every whole has parts. Every part is a whole

Related Next Generation Science Standards:

- **LS1.A:** Structure and Function–
 - All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow.
- **LS1.B:** Growth and Development of Organisms–
 - Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

Related Common Core State Standards

- **ELA: RI1:** Ask and answer questions about key details in a text.
- **ELA: RI4:** Ask and answer questions to help determine or clarify the meaning of words and phrases in a text.
- **ELA: RI7:** Use the illustrations and details in a text to describe its key ideas.
- **ELA: W3:** Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.
- **ELA: SL1:** Participate in collaborative conversations with diverse partners about grade 1 topics and texts with peers and adults in small and larger groups.
 - Follow agreed-upon rules for discussions (e.g., listening to others with care, speaking one at a time about the topics and texts under discussion).
 - Build on others' talk in conversations by responding to the comments of others through multiple exchanges.
 - Ask questions to clear up any confusion about the topics and texts under discussion.

Related UN Sustainable Development Goals

- **Goal #12:** Responsible Consumption and Production
- **Goal #13:** Climate Action
- **Goal #15:** Life on Land

Other Goals

- **Collaboration:** Work with one another on a common task.
- **Metacognition:** Students will be able to use a hands-on experience to reflect on a process and recall that process
- **Oral Communication:** Students will be able to explain and defend their thinking.



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Materials & Resources

For compost bin:

1. [Worm Factory Worm Bin](#) from Nature's Footprint (Donated by Donor's Choose)
2. Coconut coir, soil, and shredded newsprint
3. Live red wiggler worms (available online)
4. Leftover lettuce and spinach (recycled from school lunches)

Other materials:

1. Camera, printer, LED projector, laptop or smartphone
2. Poster paper, glue, markers, pens, pencils

Media used & titles

1. [Wiggling Worms at Work](#) by Wendy Pfeffer (or similar book about worms)
2. Directions on "Worm Factory" box
3. SciShowKids Video, "[Worms are Wonderful](#)"
4. [Teacher-made Padlet](#) with additional resources:

Other: Raised garden beds, hose, soil, and small shovel

Instruction

Lesson 1

Tapping prior knowledge & building new knowledge

Day 1: Interactive Read Aloud

1. Preparation–
 - Post goal on board: "Students will be able to name 2 new things they learned and 1 question about worms."
 - Prepare Systems Chart on chart paper or white board: "Worms" at the center.
2. Read aloud of [Wiggling Worms at Work](#) or similar book.
3. Gather students on carpet or floor.
4. Ask students prior knowledge questions—in this case about the parts of compost (a previous lesson and activity). Click [HERE](#) for kid-friendly information about compost.
5. Read the book with think aloud stops and time for kids to process via Turn and Talk strategy (Approx. 20 minutes). Guiding questions:
 - What do you already know about worms?
 - Why do we need worms? Why are worms important?
 - What do worms do?
 - What are the parts of a worm? (Add to "Worms" Systems Chart)



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- Worms are part of what other systems? (Add to “Worms” Systems Chart)

Day 2: Interactive Video Viewing

1. Preparation--Post goal on board: “Students will be able to name 2 new things they learned and 1 question about worms that was different from the book yesterday.”
2. Watch SciShowKids video (Approx. 15 minutes): “[Worms are Wonderful](#)”: Pause periodically for teacher modeled think aloud, and time for students to process via Turn and Talk strategy
3. Guiding questions:
 - What do you already know about worms?
 - Why do we need worms? Why are worms important?
 - What do worms do?
 - What are the parts of a worm? (Add to “Worms” Systems Chart)
 - Worms are part of what other systems? (Add to “Worms” Systems Chart)

Systems Thinking Tie-in (Distinctions):

Ask students, “How is the information from the video similar and different from the information in the book?” Chart as a Venn Diagram

Day 3: Reinforce Learning and Ask New Questions

4. Preparation--Post goal on board: “Students will be able to remember what they learned about worms and ask questions they still have about worms.”
5. Stand Up, Hand Up, Pair Up activity (Approx. 5 minutes): Have students review what they learned about worms. If necessary use sentence starters: “Worms are..., Worms have..., Worms need..., I remember that worms....”
6. Affinity Mapping Activity (Approx. 30 minutes)
 - Provide students access to two different colors of sticky notes. One color is for questions, and one color is for any information they know about worms. (E.g., green is for questions and yellow is for facts)
 - For an allotted amount of time (appropriate for your class) have students write on the sticky notes. One idea per note.
 - In small groups, invite students to come up and place sticky notes on two large posters (prepared beforehand): One poster labeled “questions” and one labeled “facts”.
 - Once the allotted time for posting notes is up, have students move post-its around on each poster—grouping similar post-its together. (E.g., “worms eat lettuce” and “worms eat rotten food” may be grouped together)
 - Teacher stands by the posters and assists with reading notes that may be difficult to read and helps direct students
 - After all sticky notes have been grouped, have students return to the carpet



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- Ask students to look at the sticky notes and decide on titles for each category (E.g., "What worms eat") (Questions are saved for answering during another lesson)

Systems Thinking Tie-in

Affinity mapping is a protocol that aids students in making distinctions (Cabrera & Colosi 2012). This kind of categorizing is a crucial step in systems thinking. It will lead students to notice relationships between different pieces of learning content and steps in the learning process. Students are using information learned to create their own knowledge and connect it to others.

Lesson 2

Building Worm Bins

1. Preparation–

- Teacher reads directions for assembling Worm Factory Worm Bin and assembles its parts.
- Have the Affinity Map from the previous lesson posted on board. Open lesson with review of each category (Approx. 5 minutes).
- Note: Prepare to take a set of process photos as students engage in steps 3-7. Sets
- of these photos will be used for the next lesson (Lesson 3)

2. Worm bin construction (Approx. 30 minutes):

- In small groups, have students mix coconut coir, soil, and shredded paper together. Have selected students spray or lightly water the mixture.
- Put the mixture in the first worm tray.
- Have students add worms.
- Each student places a piece of leftover food on top of the soil mixture and worms.
- Cover the bin.

3. In their journals, students draw pictures of what they did (Approx. 10 minutes).

Systems Thinking Tie-in (Part / Whole and Relationships):

Have students reflect on the part-whole relationships in this hands-on activity: e.g., the Worm Box is made of parts that work together, each individual tray is made up of parts that work together, and the relationships between the parts.



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Lesson 3

Sequence Poster Assessment on Building Worm Bins

1. Preparation–
 - Post goal on board: “Students will be able to use pictures to tell how we built our worm bin. Students will be able to label the different parts using vocabulary words.
 - Print sets of photos from previous lesson showing the worm bin building process
 - Post one set on the whiteboard or a wall. It’s important to post these out of chronological order.
 - Print enough additional sets for students to use in an activity in groups of 2 to 3.
 - Place these additional sets into envelopes with the photos in random order.
2. Use a partner sharing protocol (such as “turn and talk”, “mix and mingle”, or “line up”) to have students share what they remember from building the worm bin. If necessary, use sentence stems: “I remember..., First..., Next..., Then..., Last...” (Approx. 5 minutes).
3. Picture Walk– (Approx. 10 minutes)
 - Using process photos posted on the whiteboard or wall, ask students to walk up and investigate the visual evidence from the previous lesson.
 - Ask students to look at the pictures, remember the process they followed, and comment on what they notice.
 - As students call out words they remember, write them on the board as a “word bank”.
4. Sequence Poster Assessment– (Approx. 30 minutes)
 - Materials-- One envelope per group with pictures from the day before, a glue stick, writing utensil of their choice, and a large poster paper.
 - Divide students into work groups of 2 or 3 (depending on class this may be strategic or random partnerships).
 - Directions. In their small groups, students should–
 - Arrange the pictures in the correct chronological order
 - Discuss and decide upon a plan for how to present their photos on the poster paper (this provides opportunity for interesting discussion).
 - Teacher monitors the room asking guiding questions (shown below).
 - Students in their groups glue the pictures in order and label them. They may use words from the “word bank” to help them out and they must correctly use at least one of the following: compost, decompose, soil, or rot in their labels.
 - Students should write sentences below using temporal words such as: First, Next, Then, and Last.
5. Small Group Share: Pairs of students group with another pair of students. They take turns sharing their posters. Groups give one another feedback using the sentence starters: “I really like when you..., I want to know more about..., Maybe you can try...” (Approx. 3 minutes).
6. Whole Group Share: One pair of students is chosen to share with the entire class. The class gives them feedback using the above sentence starters (Approx. 5 minutes).



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7. Hang posters on the classroom walls (or outside the classroom) so that students may refer to them for subsequent lessons and units.

Note: This activity is reflective. It helps students re-live what they did to create the worm bin. When students have a chance to do this, it helps to strengthen the neural pathways, solidifying their abilities to make connections. They are also able to see themselves as an essential part of this process. (The Whole Brain Child, Siegel & Bryson 2011)

Guiding Questions throughout this lesson:

- Why is [this part] important for the worm bins?
- How do these parts work together?
- What if we did not have ____? What would happen?
- What came next?
- What did we do with ____?
- What systems are necessary to make a worm bin?
- What part did humans play in this process?

Ways for students to access & process knowledge

- Kinesthetic:
 - Manipulating photos from the activity, seeing themselves in the photos (Lesson 4)
 - Affinity mapping protocol (Lesson 3)
- Visual:
 - Wiggling Worms at Work as a reference book (Lessons 1 & 2)
 - The SciKids video, "Worms are Wonderful" (Lessons 1 & 2)

Connections to the Universal Design for Learning (UDL)

- Engagement: Foster collaboration and community
 - Students working as a collective community on the affinity map and in small groups for the poster
- Representation: Illustrate through multiple media
 - Kinesthetic: building of the worm bin
 - Tactile: touching of the worms, mixing of the soil
 - Visual: use of pictures from the lesson
 - Auditory: books and videos with spoken information
- Action and Expression: Use multiple media for communication
 - Expressing ideas through "brain dump", pictures, words, and sentences
 - Multiple ways to create poster: choice in direction of poster and decision of how



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So What?

Relevance and immediacy for this learning and this work

- Learning about the importance of our soil has led students to notice that the food we eat and the waste we make is directly connected to the land and soil, which then circles back to the food we eat.
- Students can see that small actions they take, such as composting, feeding worms, tending to the soil have direct impacts on our bodies, school, and world.
- This then links back to the importance of taking actions to halt climate change in age-appropriate ways.
- Applying systems thinking to more deeply explore the rot cycle
 - Part/Whole relationships
 - Micro level: What are the parts of the rot cycle? What are the parts of the worm bin?
 - Macro level: Worms are part of what larger systems? Rot is part of what larger systems?
 - Connections
 - How are worms connected to the soil?
 - How are worms connected to the rot cycle?
 - How are humans connected to worms?
 - How is the rot cycle connected to humans? The world? To climate change?

Levels of importance

- School: This unit will help our class begin working and creating a school garden
- Local: The school garden can be connected to our school's local community garden and learning how a school garden benefits the greater community
- Global: This work is ultimately connected to the Climate Crisis Actions that our class is committed to taking.

Assessments

Formative assessments

- Affinity mapping: gauging what students wrote on sticky notes
- Checking in during peer discussion time
- Noticing students' use of vocabulary throughout lessons

Summative assessment

- Poster of the worm bin process including labels (Described in Lesson 3)



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- Project rubric: Scored on a scale of: Expert (4), Met (3), Almost (2), and Not Yet (1)
Assessment Evidence: Student posters and student reflections during Lesson 3

| Goal | Score | Feedback |
|---|-------|----------|
| I can use pictures to tell how to build a worm bin. | | |
| I can use vocabulary words to label parts of the worm bin system. | | |
| I understand why worms are important to the rot system. | | |

Applications

Next steps:

- Observe and feed the worms.
- Reach out to the school and ask for food waste for the worms. Educate other classes on what kind of food worms like.
- After learning about the rot cycle, and creating rich soil, ask students what we should do next
- Summative assessment of the entire rot cycle unit in the form of teaching posters.