MODELING AN ECOSYSTEM

Driving Question

What makes up an agroecosystem and how does it fit in with other ecosystems?

Materials and Equipment

- Oxygen gas sensor [1]
- Carbon dioxide sensor[1]
- Temperature sensor[1]
- pH sensor [1]
- Conductivity sensor[1]
- Weather sensor[1]
- Dissolved Oxygen sensor
- Water quality colorimeter[1] and sample vials
- Plant seeds or seedlings, or moss

- Senor Interface or data logger
- Sensor extension cable
- EcoZone™ System
- Different types of living organisms
- Strong incandescent or full-spectrum fluorescent
- Compost or soil
- Pollution source
- Water, dechlorinated (quantity depends on design)

[1]These are a sample of the sensors for this student-designed activity. Not all are needed for a successful experiment.

Background

In this activity, you will be asked to design 3 individual chambers, which will be interlinked. There are many types of environments you could attempt to emulate including aquatic, decomposition, and agro-ecosystem. You can add living organisms to your design, including plants, fish, and insects and you can use different soil types and organic material in the different chambers.

Procedure

1. Write a brief outline of the procedure you will use to set up the EcoZone chambers and collect data. Include the following information:

   - What are your principle design considerations (what is the goal of your experiment)?

   - What are the independent variables? What are the dependent variables? What are you keeping the same? What parameters will you measure?

   - What are the biotic and abiotic components you are adding to each chamber?

   - Draw a diagram of the experimental setup you will use. Be sure to label the biotic and abiotic materials in each chamber and the sensor or sensors that will be in each chamber.

2. Will the system remain closed? Will you open the system periodically to water plants or feed organisms? How will you account for your influence on the system if it is opened? Use your knowledge about the trophic levels of ecosystems, food webs to design your new world.

3. Add the materials to each chamber. Seal the chambers so they are airtight. **Hint:** One way to be sure that the terrarium is airtight is to exhale several times into the empty chamber to raise the CO_2 level of the air in the terrarium relative to the room air. Then seal the terrarium and monitor the CO_2 level for several minutes with a carbon dioxide gas sensor. After the reading stabilizes, the level should not drop. If it does, you probably have a leak. Once you have learned how to make the terrarium airtight.

4. Insert the sensors and begin collecting data. Collect data for at regular intervals such as once a week for 6 weeks or longer. **Note:** Take detailed notes about the status of your chambers, including the live organisms, daily. Do not wait for an organism to begin dying to intervene – you can manipulate the chambers as you see fit during the experiment as long as it is properly documented. Before you introduce fish or any other animal or insect make sure your Eco-Zone system is stable in terms of its oxygen, CO_2 and temperature.

5. Create a table below that displays data you feel is relevant for others to know about the experiment Below the table, add comments regarding the conditions in the chambers throughout the course of the experiment.

6. Consider making a google form or spreadsheet that students use to record their weekly measurements and observations. Here is list of possible parameters you could record:

Air and water Temperature	Carbon Dioxide gas (ppm)
Soil and water pH	Turbidity
DO (dissolved Oxygen)	Odor scale 1-5
Water Conductivity	Aquatic Fauna (live or dead)
Oxygen Gas (%)	Terrestrial Fauna

Analysis & Questions

1. Describe any significant changes you observed in the chambers during the course of the experiment

2. Agricultural farming typically requires fertilizer to be added to the soil to ensure high quality crops. Rain and runoff wash excess fertilizers into local waterways. Based on your experience, what type of positive and negative consequences could result from this runoff?

3. What parameter changed the most over the time you observed? What is the significance of this?

4. Which ecosystem provided the most CO2? Which one water? Which one oxygen?