

## A Fragile Balance: A Virtual Living Lab

Subject: Life Science

Grades: 5-6

### Section I.

#### 2. Lesson Summary

In this unit, students will explore the balance of the ecosystem and the impact of humans in that system. Students will first discuss, in a large group, what they know about the ecosystem of which they are a part. Students will then explore their own biomes. Then, breaking into smaller groups, students will participate in a computer simulation, collect specimens, and note their findings on a class blog. After using the simulation, students will choose another ecosystem to explore. Using this as a starting point, students will select a related topic and do individual research, collecting information from current events and other credible sources, and returning to their groups, prepare a either a collaborative video project or poster on their findings.

#### 3. Learning Objectives

Students will:

- Demonstrate the dependency between living components and nonliving components in the ecosystem (PA Environment & Ecology Standard 4.6.7.A)
- Explain how change in an ecosystem relates to humans (PA Environment & Ecology Standard 4.6.7.C)
- Compare and contrast different biomes (PA Environment & Ecology Standard 4.6.7.A)
- Identify the environmental impact that waste has on the environment (PA Science & Technology Standard 4.6.7.A)
- Apply models to predict specific results and observations (PA Science & Technology Standard 4.6.7.B)
- Explain the complex, interactive relationships among members of an ecosystem PA Environment & Ecology Standard 4.3.7.B)

#### 4. Computer Functions

- Computer gaming simulation will allow students to participate in experiments that would be otherwise impossible inside the classroom
- Blog will allow students to record their data, and share findings with the rest of the class.
- Spreadsheets will allow students to organize data, graph trends, and predict outcomes.
- News aggregators allow students to access up-to-the-minute real-world data.
- Map software such as Google Earth or Microsoft Virtual Earth allows students to locate the ecosystem they are studying.
- RSS allows students to be instantly updated on data changes in their experiments and research.
- Video allows students to present their findings in a coherent and exciting way, which can be saved and shown to other students, both locally and on the web.

## 5. Specify the Problem

This lesson will try to answer several important questions:

- Why is the balance in an ecosystem so important, and what impact do humans have on that balance?
- What are current examples of this impact?
- What possibilities does this impact cause for the future, both positive and negative?

## 6. Problem Data

Students will collect data from several sources:

- The gaming simulation
- News sites (example: BBC Science and Nature: <http://news.bbc.co.uk/2/hi/science/nature/default.stm>)
- Data collection sites (example: Weather.com and the National Weather Service: <http://www.nws.noaa.gov/>)
- School library
- Personal data collection at home

## 7. Data Manipulation

Students will collect data about their simulation ecosystem, their own ecosystem, and a remote ecosystem using the sources listed above. A daily journal of their data collection will be kept on their blog. Data will be collected on variables such as temperature, humidity, local wildlife, and history of local industry, and will be organized and plotted using spreadsheet software such as Microsoft Excel. By relating the graphs and current events, students will critically respond to the following questions:

- What animals and plants are part of my biome?
- How am I affecting my biome?
- How is my ecosystem different from another ecosystem?
- How are other people affecting their ecosystem?
- How are real ecosystems different from the simulation?
- What are the strengths and weaknesses of the simulation?
- What changes are occurring in all three ecosystems (simulation, local, and remote?)

## 8. Results and Presentation

Once all the data has been collected and conclusions have been made, students will work together in their small groups to create a short video or a poster documenting their findings, including pictures of their own ecosystems, discovered images of remote ecosystems, charts of their data, and conclusions. These presentations will be placed on the class web site so parents and other students can view them. Once they have completed their presentation, they will complete an individual reflection on the project. In the reflection, students will look back on what they knew before the lesson, what they learned, and how their knowledge may have changed. They will also discuss the sources from which they collected data and analyze their credibility.

## 9. Activities Before Using Technology

In a large group discussion, teacher will introduce the topic of a balanced ecosystem, and ask students to create a Know/Want/Learned chart about the topic, which students will share. For a homework assignment, students will observe their local ecosystem for half an hour, recording temperature, weather, wildlife and plants observed, etc. Students will present their findings to the rest of the class.

Before beginning their data search, students should pick their topic of study (choose a remote ecosystem), and should organize a plan of attack for the search. The instructor should discuss how to find credible sources.

Students will also be introduced to the technological tools (if new) that will be used (spreadsheet, multitouch display, video editing software) and informed of their appropriate usage.

## 10. Activities While Using Technology

While in small groups, students will rotate through several stations:

- Some students will be observing the simulation on the multitouch display. Here, they can collect specimens, manipulate the environment (plant seeds, water plants), or record additional data (temperature, etc.)
- Other students will be using the individual computer terminals or the classroom library to look for data on their remote/local ecosystem

## 11. Activities After Using Technology

After a research session, students will be in the group work area, discussing the data and comparing the results that they found. Discussion should be driven by the critical thinking questions posed in Section 7.

## 12. Supporting Activities

**Lesson-related:** Students will create a food chain chart of plants and animals observed in their own environment.

**Multiple lesson:** The instructor will discuss the importance of the carbon and water cycles, as well as the importance of renewable resources and waste management.

**Interdisciplinary:** Students will study the history of the geographical location of their ecosystem, describing human population and industrial history.

## Section II.

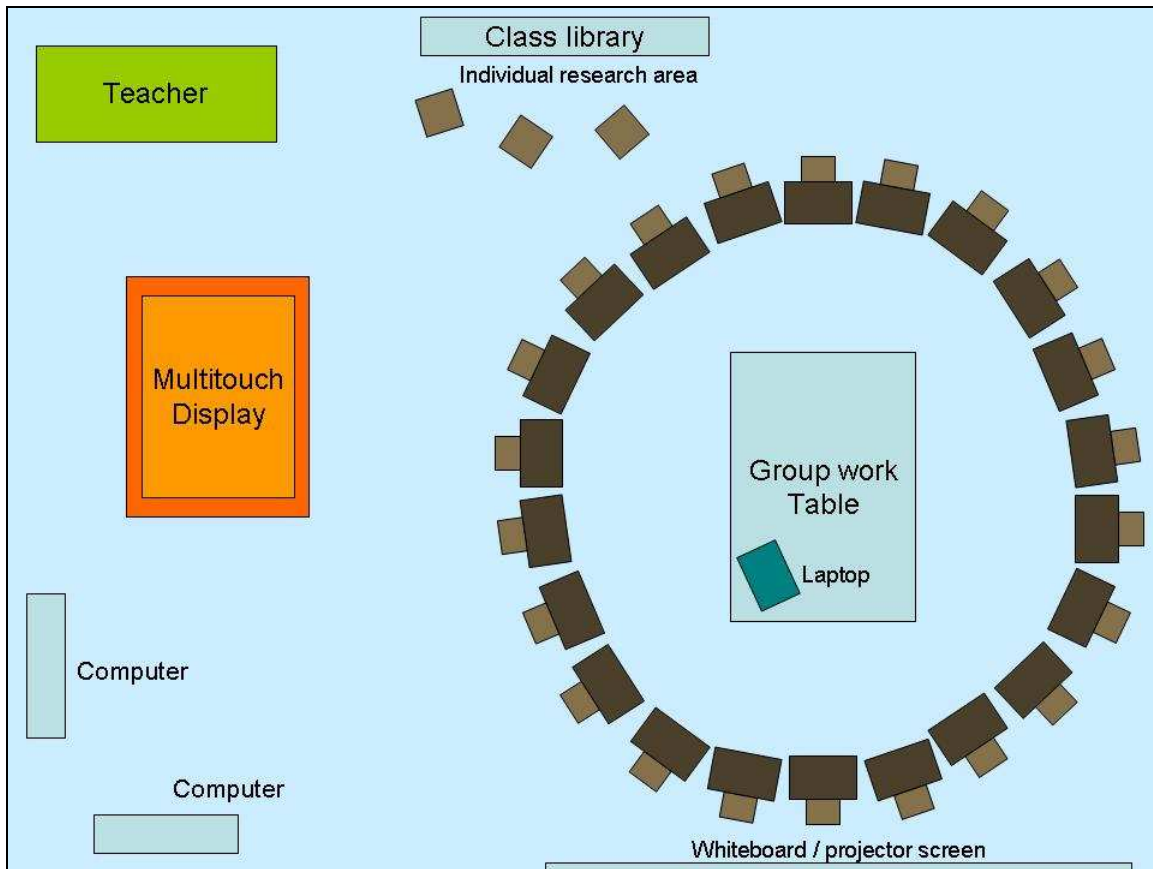
## 13. Management Strategies

In order for this lesson to be managed properly, the classroom must be rearranged. In class discussions, desks should be placed in a circle to reinforce and encourage participation as well as discouraging misbehavior.

When working in small, rotating groups, the teacher should be moving from group to group, ensuring good behavior and answering questions. All computer screens should face inwards, so the instructor has a full view of the screens at all times. Restrictions can be placed on the simulation and blogs so mischievous students do not violate the integrity of either service.

However, despite these restrictions, both systems should be checked frequently for misuse, and the teacher should be close in proximity.

Such a classroom could be set up as follows:



## 14. Assessment

To assess the student's grasp of the unit material, several direct, performance-based components will be used.

- Before work begins on the final presentation, students will be given a rubric so standards for performance are established early.
- Using a project framework defined by the instructor, student groups will develop and propose their concept to the teacher, so the students are involved in setting the goals of the project.
- Groups will meet with the instructor over the course of the unit periodically to update the instructor and help guide student learning.
- Each component of the unit will have an associated think sheet which will support concepts and encourage higher-order thinking.
- Research and feedback posted on blogs will be monitored by the instructor and discussed by the class as a whole.

## Section III.

## 15. Sample Think Sheet

### Living Lab Simulation Think Sheet

After observing the living lab simulation, answer the following questions:

1. Of the seeds you planted, which vegetation was eaten by insects? What wasn't?
2. How would this affect the ecosystem balance?
3. What trash have you found in the simulation?
4. What are those pieces of trash made of? How could they affect the local ecosystem?
5. How could those pieces of trash affect other ecosystems?
6. Visit the recycling homepage for the State of Pennsylvania (<http://www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/Recycle.htm>). How many tons of garbage are created each year? How much is recycled? What is the trend?
7. How do these real world results relate to the simulation? What do these numbers mean for local and global ecosystems?
8. How are we, as humans, affected?

## 16. Sample Technical Step-By-Step Guide

### Using the Living Lab Simulation

**Rules:**

- Do not turn off the system unless instructed to by your teacher
- Do not kick or shake the table
- Do not knock on the glass

**To Enter the Game:**

Step 1: Touch the screen

Step 2: Select your picture from the class list

Step 3: Touch different tools to use them

Step 4: When you are finished, touch the "X" button next to your picture

**Tools:**

- Glass Jar: Collect specimens and add them to your online collection
- Watering Can: Give your plants a drink!
- Seed Packet: Add a new plant
- Hand: Pick something up

**Tips:**

- Press your fingers flat against the screen

## 17. Sample Resource Guide

Resource	Type	Where is it?	Information Provided
National Weather Service	Website	Internet Bookmarks	Climate data, satellite images, forecasts, warnings
Weather.com	Website	Internet Bookmarks	Global climate data
What We Know About Climate Change	Book	Resource Shelf	Global warming and it's relationship to natural disasters

Climate: The Force That Shapes Our World and the Future of Life on Earth	Book	Resource Shelf	Weather events and human interaction with climate
Awesome Library: Ecology	Website	Internet Bookmarks	Global warming, renewable energy, saving forests
Planet In Peril	DVD	Resource Shelf	Climate change, habitats, endangered species and population growth
BBC's Material World	Podcast	iTunes Library	Environment and species
The Nature Conservancy	Website	Internet Bookmarks	Conservation

## 18. Sample Task List

<b>Task List: Blogging your Results</b>			
Did I include a meaningful title?	Yes	Somewhat	No
Did I give an introduction to my results?	Yes	Somewhat	No
Did I check spelling?	Yes	Somewhat	No
Did I include graphs of my results for easy viewing?	Yes	Somewhat	No
Are my graphs named correctly?	Yes	Somewhat	No
Is my data organized neatly?	Yes	Somewhat	No
Is my data entered correctly?	Yes	Somewhat	No
Is the post published to the web?	Yes	Somewhat	No
Did I include links to other relevant and credible sources?	Yes	Somewhat	No
Did I include pictures of my observations?	Yes	Somewhat	No

## 19. Sample Assessment Rubric

Rubric for poster/video presentation on simulation and real world observation results.

<b>Objective</b>	<b>4: Distinguished</b>	<b>3: Proficient</b>	<b>2: Acceptable</b>	<b>1: Attempted</b>
Content and Understanding	Complete and accurate, with multiple credible sources listed and an in-depth critical understanding of the material.	Majority of content is complete and accurate, with several credible sources and a basic understanding of the material.	Some content is missing and a few errors are present, with one or no credible sources. Some gaps in understanding.	Content contains multiple errors and is grossly incomplete. No credible sources are listed, and there is no understanding of the material.
Presentation	Information is organized and presented in a clear, connected manner, with well-chosen examples. Design is aesthetically very pleasing and matches the topic.	Information is organized in a somewhat clear manner, with main ideas supported by several examples. Design is aesthetically pleasing.	Information is presented in a somewhat disconnected manner, with only main ideas and one or no examples.	Information is completely disconnected. No main ideas presented or supported, and the design does not match topic or purpose.

Proofreading	Clear evidence of proofreading, with no noticeable errors.	Evidence of proofreading, with few errors that do not detract from the presentation.	Evidence of proofreading, with many errors that detract from the presentation.	Little or no proofreading, with errors that interfere with the presentation.
Interpretation of content	Unique interpretations and very persuasive arguments.	Expected interpretations and persuasive arguments.	Few interpretations or extensions, with little support for argument.	No interpretations or extensions, and limited or no support for argument.
Evidence	Great deal of credible and well-developed evidence presented for argument.	Adequate credible evidence presented for argument.	Basic, unsupported evidence presented for argument.	Little or no evidence presented for argument.

## 20. Sample Included Materials

### Living Lab Simulation: Play to Learn Activity

**Oh no!** For some reason, gnats are out of control in our Living Lab garden! All of a sudden, swarms and swarms of the pests are making everyone miserable. What might have caused this problem, and how can it be solved without hurting the other plants and animals in the garden?



#### Guesstimate

Develop a hypothesis. What are some common reasons that insect populations grow out of control?

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#### Investigate

Look for clues. What do you see in the garden that might support your hypothesis?

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#### Speculate

Now that you have discovered a possible cause, how can you solve the problem?

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#### Activate

Put your plan into action! Collect and chart your results. Were you correct? Have you saved the garden?
