

7.1 A Model Ecosystem

Story Extension for This Lesson:

This lesson will cover all issues presented in the intermediate story. It is encouraged that students seek out direct passages from the text to connect with their model ecosystem.

Grade: 7

Strand: Interactions in the Environment

Big Ideas:

- Ecosystems are made up of biotic (living) and abiotic (non-living) elements, which depend on each other to survive. (Overall expectations 2 and 3)
- Ecosystems are in a constant state of change. The changes may be caused by nature or by human intervention. (Overall expectations 1 and 2)

Overall Expectations:

1. assess the impacts of human activities and technologies on the environment, and evaluate ways of controlling these impacts
2. investigate interactions within the environment, and identify factors that affect the balance between different components of an ecosystem
3. demonstrate an understanding of interactions between and among biotic and abiotic elements in the environment

Specific Expectations:

- 2.1** follow established safety procedures for investigating ecosystems
- 2.2** design and construct a model ecosystem, and use it to investigate interactions between the biotic and abiotic components in an ecosystem
- 2.4** use appropriate science and technology vocabulary, including sustainability, biotic, ecosystem, community, population, and producer, in oral and written communication
- 2.5** use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes
- 3.5** describe how matter is cycled within the environment and explain how it promotes sustainability
- 3.7** explain why an ecosystem is limited in the number of living things that it can support
- 3.8** describe ways in which human activities and technologies alter balances and interactions in the environment

Inquiry Skills:

Modelling, Gathering Data, Experimenting, Reporting

Instructions:

How It's Done:

An ecosystem exists in an area where biotic and abiotic parts of the environment interact. The purpose of this activity is to observe changes that occur in a model ecosystem and the interactions between living and non-living things within the ecosystem.

A Model Ecosystem:

This activity is from the **Nelson Science and Technology Perspectives 7** textbook.

Purpose:

In this lesson, students will design, build, and maintain the interactions between biotic and abiotic elements in an ecosystem.

Procedure:

1. Use the equipment listed in the materials section to build ecosystems. Feel free to add items to the list.
2. Make sure that student ecosystems include the following: good soil drainage, plants and animals, adequate space for living things to grow, moisture, a way for fresh air to enter and leave, a means to record temperature, and a way to keep animals from escaping the container.
3. Approve ecosystem designs before students begin constructing their model.
4. Students will build their ecosystem model. Students will record the number and type of plants and animals that are placed in their ecosystem.
5. Place the container in a sunny location or under artificial light. Modelled ecosystems should receive six to eight hours of light per day.
6. Students will record their observations. Refer to BLM - Ecosystem Observations. Students will use diagrams to illustrate their observations. Encourage students to describe any changes seen in the organisms or in the activities that the organisms are performing.
7. Students will continue to maintain and observe their ecosystem for at least three weeks. Add water as needed.
8. At the end of the three weeks, students will take apart their ecosystem. Students will release any animals into appropriate natural habitats and clean up remaining materials.

Analyze and Evaluate:

Students will answer the following questions:

- What are the abiotic and biotic elements of your ecosystem?
- Use your observations to explain the interactions between the biotic and abiotic elements in your ecosystem.
- Was your model ecosystem design successful? Explain. How might you design it differently?
- Describe three interactions you think were occurring in your model ecosystem that you did not observe directly.

Application:

Have students review their observations and diagrams of their ecosystem.

- What might happen to the ecosystem if you removed an abiotic element from your ecosystem?

Inquiry Challenge:

Using the Smarter Science framework (refer to Steps to Inquiry), design an experiment to determine what the affect of different variables would have on an ecosystem's health.

Materials List:

Materials for the experiment:

- 2L plastic bottle
- light source
- hand lens or magnifying glass
- Thermometer
- Gravel
- Aquarium-grade charcoal
- garden soil

- Earthworm and isopods
- water
- dry leaves
- Ecosystem Observations

Framework materials:

- - Steps to Inquiry

Assessment Strategy:

It is recommended you focus your assessment on process skills. To help get you started on this path, a series of charts have been provided for you - Introducing the Framework.

- Process-Skill-Modeling
- Process-Skill-Gathering-Data-6
- Process-Skill-Experimenting
- Process-Skill-Reporting-8

This lesson can be connected to the Mathematics: Data Management strand as students will be required to analyze data.

Subject Area:

Mathematics

Connects to:

Grade 7

Connections:**Handouts/Assessments:**

- Ecosystem Observation
- Steps to Inquiry 1

Name: _____

Ecosystem Observations

Date	Temperature	Soil Condition	Changes

Name: _____

Date	Temperature	Soil Condition	Changes

Name: _____

Date	Temperature	Soil Condition	Changes

Name: _____

Date	Temperature	Soil Condition	Changes

Investigation Design and Perform

Step 1: Observing & Questioning

Place sticky notes of the same colour in the space below.

Place sticky notes of a new colour in the space below.

WHAT DID I OBSERVE?

(What do you notice about the object or event?
Use your senses to describe the object or event.)

WHAT AM I WONDERING?

(What questions or predictions do you have about
the object or event?)

How can the questions be answered?
(Question Sort)

LABELLED DIAGRAM:

Level: 

Experiment Design and Perform

Step 2(a): What could I measure or observe about the object, or event?

Brainstorm (Place sticky notes of the same colour in the space below.)

Possible Dependent Variables

Step 2(b): What could I change or vary about the object or event that may affect what I could measure or observe?

Brainstorm (Place sticky notes of a new colour in the space below.)

Variables

Level: 2



Experiment Design and Perform

Step 3(a): What will I change?

ONE VARIABLE I WILL CHANGE:

Independent
Variable

(Place a sticky note from Step 2(b) here)



I WILL MEASURE OR OBSERVE THIS RESULT:

Dependent Variable

(Place a sticky note from Step 2(a) here)

Step 3(b): What will I not change?

VARIABLES I WILL NOT CHANGE:

What conditions will be held constant so it is a fair test? Place remaining sticky notes from Step 2(b) here.

Controlled
Variable

Controlled
Variable

Controlled
Variable

Controlled
Variable

Controlled
Variable

Controlled
Variable

Level: 2



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Experiment Design and Perform

Step 4: What is the question I want to explore?



Step 5: What is my hypothesis (what and why)?

BASED UPON MY QUESTION, I PREDICT THAT:

if the _____ is _____

Independent Variable How the independent variable will be changed
(e.g. increased or decreased, heated or cooled, stirred or not stirred...)

then the _____ will _____
Dependent Variable How the dependent variable will be affected
(e.g. increased or decreased, heated or cooled, stirred or not stirred...)

I think this will happen because _____

Level: 2



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Step 6: How will we test our prediction?

**OUR TEST
SET-UP**

**Here's how we
will change
the variable...**

(What will we do?
How will we change
the variable?)



**Changed
Variable**



**OUR CONTROL
SET-UP**

**Here's how we
won't change
this variable...**

(What will we do?
How will we keep the
variable the same?)

OUR TEST STEPS:

OUR CONTROL STEPS:

Level: **1**

Step 7b): Equipment Set-Up & Check

Have we

- ☐ collected all of the materials?
- ☐ organized and/or set-up our equipment properly?
- ☐ reviewed our procedure and recording chart?
- ☐ made changes where necessary?

Step 7c): Perform Experiment and Collect the Data

Follow the procedure to complete the experiment. Record the data in your chart. (See Step 7a).

Level: 1

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Step 8: Graphing Results

What type of graph best suits my data?

Bar Graph

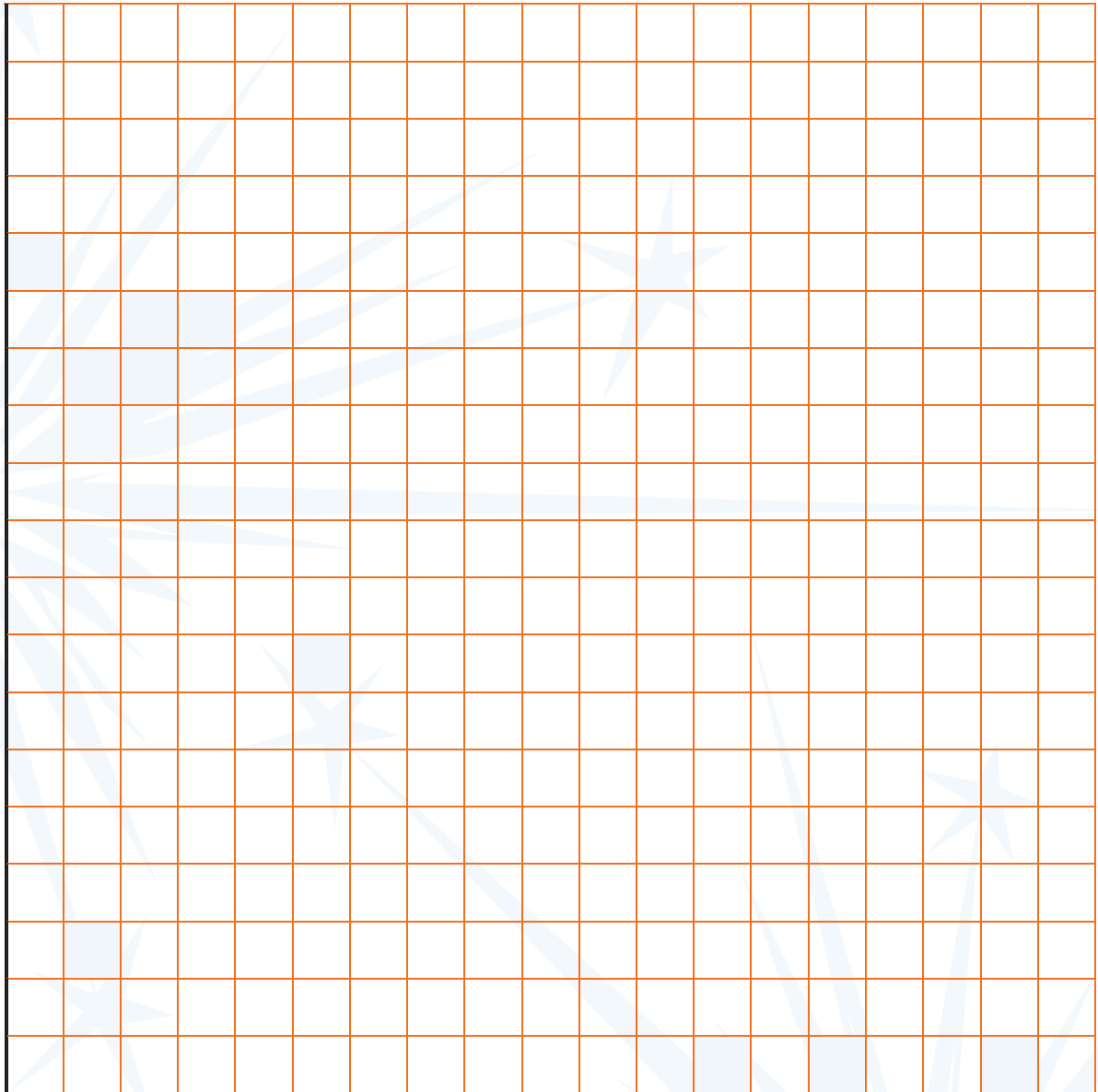
Line Graph

Other

MY GRAPH SHOWING



What We Observed...



What We Changed...

Remember to label axes and add scales appropriately.

Level: 1



Step9: Finding Patterns and Relationships in Results

FROM THE GRAPH/TABLE:

The highest value/number	The lowest value/number	Values/numbers that are equal or constant

The graph/table shows that when we change _____, the
(Changed variable)

(Describe what happens to what we measured/observed.)

WE KNOW THIS BECAUSE:

(What is our evidence?)

DATA FROM SENSES	When we observed _____ We saw/heard/felt/smelled, _____ _____ _____
DATA FROM MEASUREMENTS	When we measured _____ with _____, we found _____ _____ _____

Level: 1

Communicate

Step 10(a): Communicating My Results

ANSWER THE QUESTION IN A GENERAL WAY.

When I _____ the _____
increased/decreased changed variable

_____ what I measured/observed _____ increased / decreased

MAKE A CONCLUDING STATEMENT BASED ON THE EVIDENCE.

Therefore, changing _____ makes
the changed variable

_____ the change in what I measured/observed

CONCEPT MAP

Draw a word map that summarizes the idea you started with and what you did during this investigation

IDEA

Level: 1



Communicate

REFER TO YOUR PREDICTION.

☐ THE DATA DOES
SUPPORT MY PREDICTION...



...because I predicted that

change in the changed variable

would make

the change in what I
measured/observed

I thought _____

the changed variable

would cause this change because _____

☐ THE DATA DOES NOT
SUPPORT MY PREDICTION...



...because I predicted that

change in the changed variable

would make

the change in what I
measured/observed

I thought _____

the changed variable

would cause this change because _____

Now I know that _____

the changed variable
doesn't have that effect.

MAKE AN INFERENCE:

Level: 1



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I think this happened because _____

Level: 1



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Communicate

Step 10(b): Other Considerations

1. If you had data that was different from other groups (or was inconclusive or inconsistent), what might have caused these results? _____

2. How might have you improved your investigation? _____

3. What new/additional questions do you now want to investigate? _____

Level: 1

Process Skill - Modeling

Process Skill	Students	Teachers	What This Skill Should Lead To
Modeling	☐ making physical/concrete representations of a concept, object, or event using different formats (e.g., graphic/computer simulation, 3D model) ☐ a way to visualize something that may not be directly observed ☐ a way of predicting future events based on present circumstances (e.g., flood plain table) ☐ a way to reinforce what is already known about a concept developed through a planning process	☐ a way to reach visual and kinesthetic learners	☐ understand an abstract idea or a phenomenon which may not be directly observed; ☐ determine relationships between ideas, objects, or events; and ☐ clarify explanations.

Teacher Notes:

Process Skill - Gathering Data

Process Skill	Students	Teachers	What This Skill Should Lead To
Gathering Data	☐ working independently or in groups to collect and record data for inquiry ☐ using a wide variety of data-gathering tools (e.g., scientific instruments/equipment, surveys, observation checklists, statistics, online databases, interviews) to collect data ☐ locating data through research and organizing it for their purposes ☐ using appropriate strategies (e.g., tables, checklists) to organize and record data so it can be easily retrieved and analyzed at a later time ☐ ensuring the information collected is accurate; using proper data collection methodologies ☐ taking steps to minimize bias in the data collected (e.g., randomly choosing samples)	☐ making available scientific instruments/equipment and technology for students to select and use in their inquiries ☐ instructing students on the importance of accuracy (e.g., using a thermometer is superior to using touch) and quantity (e.g., multiple replications increase the reliability of the data) ☐ introducing data-gathering techniques. These can be modeled and explored before being used independently in investigations.	Students will be more engaged and will develop better data management skills.

Teacher Notes:

Process Skill - Experimenting

Process Skill	Students	Teachers	What This Skill Should Lead To
Experimenting	☐ deliberately manipulating one characteristic of a situation or object to discover how it affects another characteristic ☐ designing and performing all of the steps involved in an inquiry-based investigation, including the question, associated variables, procedure, type of data to be collected, format for organizing and interpreting data, and the format in which results will be shared	☐ providing rich experiences to help generate relevant, curriculum-based questions that students can explore ☐ giving students opportunities to solve a problem or answer a question by designing and performing their own experiment ☐ supporting students through the gradual release of responsibility by scaffolding the process of experimentation (e.g., Smarter Science Steps to Inquiry, PEOE, Problem Based Learning)	☐ More engaged students ☐ Greater appreciation for precision, accuracy, and repeated trials in experimentation ☐ Increased ability to think critically about scientific and pseudo-scientific claims and the processes that support them

Teacher Notes:

Process Skill - Reporting

Process Skill	Students	Teachers	What This Skill Should Lead To
Reporting	□ sharing ideas, based on facts and evidence, with others □ using creative and original presentation formats □ using an extensive vocabulary, yet writing or speaking succinctly □ giving others the opportunity to understand the world as the reporter does	□ encouraging connections, inferences, and predictions □ promoting the sharing of ideas and evidence in a logical and concise manner □ encouraging creativity and the use of technology □ differentiated. Permitting and encouraging different presentation formats allows all students to successfully communicate their findings. □ scaffolding the process for students. Students can start by using a structured report format which evolves into a more sophisticated self-structured format. □ a natural literacy link	Students acquire research, speaking, and presenting skills through reporting. It is this step in an inquiry that establishes the factual and investigative background that informs their investigation. They gain an improved sense of logical sequences and often improve their ability to use vocabulary. A skilled reporter knows how to summarize background information and present it in a manner that piques the audience's interest.

Teacher Notes: