

# Ecosystem Ecology:

## Integrating 7th Grade Science, English and Math with Research and Hands-on Ecology Projects

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### **Unit Rational:**

Ecology is an ending unit within Oakley Jr. High School's Life Science curriculum. For this unit it is recommended to begin the school year with an overview and discussion on what an ecosystem is, what ecology is and what evidence identifies ecosystems in the students' surroundings. This information can be utilized throughout the year when doing labs. An example is doing microscope work using pond water collected from one of the ecosystems identified in the beginning lesson.

Oakley Jr. High School makes an effort to integrate at least one project per year. This project is collaborated on with the English 7, Math 7 and Science 7 teachers. The best practice is to utilize the expertise of the educators on sections of the project. If integration is not possible at this school or in another setting, the unit can be completed in the science classroom only. The expert project is science related. This one is based on ecology and ecosystems. Students choose an ecology topic of their choice. They then decide what topic needs to be researched to make them an expert on an ecological or ecosystem issue. That expertise helps them hypothesize and complete a hands-on experiment, demonstration or activity (i.e. game, human web, etc.) Research and hands-on parts of the project are completed in the science class. Writing a research paper is completed with the English teacher and charts and graph dealing with data is completed with the math teacher. The students then share their research, project and expert knowledge with elementary students, high school students and the community in a "Jr. High Community Presentations" event.

The expert project requires approximately one semester of work. It incorporates many standards due to the nature of the project. Students are researching a wide variety of ecology project and writing about them which adds common core standards to the unit. The project allows students to use the knowledge and abilities they have gained in their academic education to this point in school. It is an opportunity for all to share and be congratulated on their hard work.

**Standards and Benchmarks:**  
 Grade level: 7th Grade Life Science  
 Unit topic: Ecosystem Ecology

**1. Idaho State Science Standards (ISSS) and Idaho Core Standards**

<p><b>ISSS Performance standards:</b></p> <ul style="list-style-type: none"> <li>● LS2-MS-1. Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem</li> <li>● LS2-MS-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems</li> <li>● LS2-MS-3. Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem.</li> <li>● LS2-MS-4. Develop a model to describe the flow of energy through the trophic levels of an ecosystem</li> <li>● LS2-MS-5. Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations</li> <li>● LS2-MS-6. Evaluate competing design solutions for maintaining biodiversity and ecosystem services</li> </ul>	<p><b>ISSS scientific practices:</b></p> <ul style="list-style-type: none"> <li>● Developing and Using Models</li> <li>● Analyzing and Interpreting Data</li> </ul> <p><b>ISSS crosscutting concepts:</b></p> <ul style="list-style-type: none"> <li>● Patterns</li> <li>● Cause and Effect</li> <li>● Energy and Matter</li> <li>● Stability and Change</li> </ul>
<p><b>ISSS supporting content:</b></p> <ul style="list-style-type: none"> <li>● LS2.A: Interdependent Relationships in Ecosystems</li> <li>● LS3.B: Cycle of Matter and Energy Transfer in Ecosystems</li> <li>● LS2.C: Ecosystem Dynamics, Functioning, and Resilience</li> <li>● LS4.D: Biodiversity and Humans</li> </ul>	
<p><b>Idaho Core Standards:</b></p> <ul style="list-style-type: none"> <li>● RST.6-8.1 Cite specific textual evidence to support analysis of science and technical texts.</li> <li>● RST.6-8.8 Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.</li> <li>● RI.8.8 Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.</li> <li>● WHST.6-8.2 Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.</li> <li>● WHST.6-8.9 Draw evidence from literary or informational texts to support analysis, reflection, and research.</li> <li>● SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.</li> <li>● SL.8.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.</li> <li>● 6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.</li> <li>● 6.SP.B.5 Summarize numerical data sets in relation to their context.</li> </ul>	

**Essential Question:**

Ecosystems contain biotic and abiotic factors that work together for the successful survival of organisms in a given area. This is much like teammates who work together, sharing their unique talents and abilities, to strengthen the team and add to the chance of a winning season; therefore, guiding students to answer the following question given their personal look at an ecosystem.

**Is survival a team sport?**

Subquestion for explaining how factors affect an ecosystem:

How do successful and problematic ecosystems compare?

The students will be able to explain a “winning” ecosystem and a “losing” ecosystem. In comparing the differences, they can explain what factors lead to success or failure of an ecosystem, in particular the ecosystem chosen for their project.

Subquestion for identifying biotic and abiotic factors:

Why are biotic and abiotic factors necessary for a successful ecosystem?

The students will be able to identify the various biotic and abiotic factors associated with their chosen ecosystem of study.

*I will reintroduce a lesson from the beginning of the year when familiar ecosystems from the area were identified, drawn as a mural and labeled with biotic and abiotic factors. This was a team project. Those same teams will come back together and discuss what is successful within their ecosystem and what are some harmful, if any, factors that are a threat to the survival of the same ecosystem.*

**Frontloading:**

At the beginning of the year we will discuss and investigate the various ecosystem in the community and agricultural land surrounding the school. As teams students will create a mural of their chosen, familiar ecosystem. The mural will be detailed, colored and labeled (biotic and abiotic factors). These will be displayed and referred to throughout the year. When doing microscope work students will observe and investigate pond water, soil samples, leaves, insects, etc. from the identified ecosystem. Prior to the project students will work in the original groups to discuss the factors that affect their ecosystem deciding if those effects are successful or detrimental to the ecosystem and surrounding environment.

Students will also read and take notes from the assigned text over information directly related to ecology. For my class we use McDougall Littel Life Science text chapters 8 and 14-16. We will then use vocabulary directly related to ecology in our classroom discussion.

**Guiding Questions:**

Questions are for classroom discussions and for student use as they create their projects.

- What is the best way to present the ecosystem and the variables affecting it?
- How can land and water be affected by biotic factors?
- What is the importance of organisms found in a given ecosystem?
- How biotic relationships affect an ecosystem?
- How does your project demonstrate effects to the ecosystem or environment?
- How does pollution affect an ecosystem?
- How does human use affect the given ecosystem?
- Other questions as necessary for individual projects?

## **Progression of Learning:**

This schedule is based on a block schedule with two to three 90 minute periods per day.

### **Week 1:**

- Frontloading activity begins with the review of posters created at the beginning of school that show factors within a familiar ecosystem. and Student lead discussions on how changes within those systems can change the whole system. (see lesson)
- Take notes on vocabulary and concepts from text on chapters directly related to ecology. (McDougall Littel Life Science chapters 8 and 14-16)

### **Week 2:**

- Complete notes on vocabulary and concepts from text on chapters directly related to ecology. (McDougall Littel Life Science chapters 8, 14, 15and 16)
- Brainstorm guiding questions that can be used by students. Using the guided questions, demonstrate how to choose a topic and decide on the area that will need further research. Students will then choose an ecological topic of interest and ask themselves guiding questions from the list we have brainstormed.
- They will make a list of two possible topics to research.

### **Week3:**

- Students will find an internet source for information on the research topics chosen. They will be guided through highlighting information within an article. This gives the opportunity to read the information.
- Using what they have read and taken notes on, they will narrow their research to one topic. They will also choose a project which can be an activity, a model, an experiment, a demonstration or other on approval.
- Start filling out the project check-off. (see example)
- Ask a scientific question from which to form a hypothesis. Type the question and save to an expert project folder. (see lesson)
- Quiz 1a and 1b (see example)

### **Week 4:**

- Students will find two more resources. One must be a print source and the third is student choice.
- Read resources and write questions.
- Start project.
- Quiz 2a and 2b (see example)

### **Week 5:**

- Learn to find different types of resources to use for research including internet, print, digital, etc.
- Read resources and write questions.
- Complete a works cited page.
- Choose three main topics for the research.
- Work on project.
- Quiz 3a and 3b (see example)

### **Week 6:**

- Complete research and work with English teacher to complete the outline and final paper.

- Write a hypothesis to answer the question written in week 3 for the project. Type the hypothesis for the display. (wall chart)
- Scientific Method test (see example)

**Week 7:**

- Work on the project, experiment demonstration or activity. Collect the materials and follow or write the procedure you are using.
- Write the materials and procedure for the display. (wall chart)
- Make a data table or chart to use for observation of the project. (wall chart)
- Complete conclusion. (wall chart)
- Quiz 4a and 4b (see example)

**Week 8:**

- Continue to collect data and analyze what has been collected in answer to the project.
- Type a formal data and analysis for display.
- Complete the trifold display. (see example)
- Present to the class for practice and grading.
- Quiz 5a and 5b

**Week 9:**

- Participate in a community presentation activity.
- Students set up in the gym and present individually as people visit their project. Community, elementary school, high school and parents provide the audience.
- Individual science projects that deal with ecosystem ecology beyond their own.

**Other formative assessment to use as needed:**

- Check in progress
- “What have you learned?” table activity.
- “Give me ideas and feedback” table activity.
- Partner share on current assigned material.
- Exit ticket for assigned work or learned concept.
- Take student self-evaluation
- Final test on ecology concepts.

## Expert Project

Select an ecological project that deals with ecosystems and/or possible changes to organisms or habitats and the results of those changes possibly in a biome, and/or characteristics, or a current ecological issue. Research the organism, place, or problem and carefully document your sources. Using the information you gather, compose a research paper to share your expertise on your chosen subject. Create an experiment, demonstration or activity to test and illustrate your knowledge about the project.

### Project Choice

1. \_\_\_\_ Choose a topic to research \_\_\_\_\_
  2. \_\_\_\_ Choose an experiment, demonstration or activity \_\_\_\_\_
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### Research (insert science teacher's name)

1. \_\_\_\_ Develop a research graphic organizer (RGO) that includes:  
\_\_\_\_ an introduction  
\_\_\_\_ at least 3 main ideas with details  
\_\_\_\_ a conclusion
2. \_\_\_\_ Highlight each of the five areas with its own color.
3. \_\_\_\_ Search for 3 varied sources of information that include:  
\_\_\_\_ a print source  
\_\_\_\_ an internet source  
\_\_\_\_ a source of your choice
4. \_\_\_\_ Make a hard copy of the of the source information to highlight whenever possible.
5. \_\_\_\_ Create a "Works Cited" page correctly citing each source, and then write out each citation on a source card.
6. \_\_\_\_ Write 15 open-ended questions (OE?) on your topic.
7. \_\_\_\_ Take notes on 3 x 5 cards. Include the following information:  
\_\_\_\_ A question written on the top margin.  
\_\_\_\_ Highlight the corner or question to match where it fits on the RGO  
\_\_\_\_ Write the source identifier on the back of the card (in text citation).  
\_\_\_\_ Use "jot dots" to write down the facts to summarize or paraphrase the answer the question.  
Remember you may use a maximum of 5 words for each "jot dot."  
\_\_\_\_ A minimum of 3 direct quotes that are marked and highlighted

### Writing (insert English teacher's name)

1. \_\_\_\_ Write a thesis statement with at least three points of emphasis. Your thesis should answer the questions about what impact this subject has on the ecosystem or environment.
2. \_\_\_\_ Transfer the approved thesis statement, introduction, 3 Big Ideas, and conclusion to the HOUSE

writing graphic organizer (WGO).

3. \_\_\_ Using the WGO, develop an outline
4. \_\_\_ Write a 2-3-page paper in vivid, informational writing that boils your research down to the essentials.  
\_\_\_ Participate in a skills workshop and make corrections to your own paper.  
\_\_\_ Participate in peer editing at a revision roundtable.  
\_\_\_ Publish a final draft that reflects the changes and suggestions from the workshop.
5. \_\_\_ Attach a Works Cited page to the final paper.

**Creating an Expert Project Display** (insert science teacher's name)  
(You will need a trifold display board)

1. \_\_\_ Choose an experiment, demonstration or activity.
2. \_\_\_ Create a title that will catch people's attention. Use a font size big enough to see from 20 feet and center it on the display.
3. \_\_\_ Using a font and font size that is easy to read and captioning all pictures, charts and graphs, make visuals for the parts of the scientific method including  
\_\_\_ question  
\_\_\_ hypothesis  
\_\_\_ research  
\_\_\_ data (insert math teacher's name)  
\_\_\_ analysis (Insert math teacher's name)  
\_\_\_ conclusion
4. \_\_\_ Document resources used for your project on a separate Works Cited page and display it on your trifold.
5. \_\_\_ Create your display board- remember neat, orderly, easy to read, and creative.

**Calendar of Project** (example for a block schedule)

January	23B overview of ecology	24	25 overview of ecology	26	27 overview of ecology
February	30	31B choose an ecosystem ecology topic of interest	1	2 What needs to be researched?	3
	6B What type of project?	7	8 Research Find an internet source Read and highlight source Quiz 1a	9	10 Read and highlight source  Start RGO Quiz 1b
	13	14B Finish RGO through Big Idea 1 Quiz 2a	15	16 No school GBB state	17 ½ day GBB state
	20 No school President's Day	21B Find print resource Finish all 3 Big Ideas Quiz 2b	22	23 Find 3 <sup>rd</sup> resource Add intro to RGO Work on project question Quiz 3a	24
March	27B Work together on "Works Cited" page Work on project Work on project hypothesis Quiz 3b	28	1 Work on project materials and procedures	2	3 Work on project data Scientific Method test Parent survey due
	6	7B Work on project analysis Quiz 4a	8	9 Work on project conclusion Quiz 4b	10



	13B Finish up time Quiz 5a	14	15 Finish up time Quiz 5b			
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**Parent Survey**

**Thank you for helping your child with the expert project this year. We have included this survey to allow your input. Please answer the following questions by circling Y for yes or N for no. We have included space for your constructive comments. We value your insight. Return to the box in (insert teacher’s name) room by (insert date).**

Have you read through your student’s expert project schedule handed out on (insert date)? Y N

Has your student brainstormed project ideas with you? Y N

Do you know the topic your student has selected? Y N

Does this project increase your child’s literacy skills (thinking, listening, reading, writing and speaking)? Y N

Does this project help your student better utilize the internet? Y N

Do you like the way Science, Language, and Math are integrated in this project? Y N

Do you think this expert project is beneficial to your child? Y N

Do you plan to attend the community presentation of the projects on insert date) from time? Y N

Comments:

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Thank you,

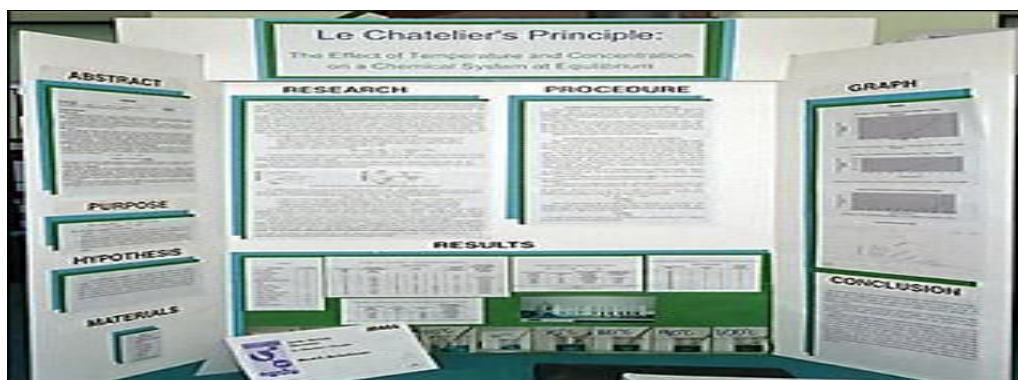
(insert the names of teachers involved in the project)

## Display Board

For almost every science fair project, you need to prepare a **display board** to communicate your work to others. Display boards can be found at Amazon, Walmart, Target, Shopko, Michaels and other retailers.



**Organize your information like a newspaper** so that your audience can quickly follow the thread of your experiment by reading from top to bottom, then left to right. Include each step of your science fair project: Abstract, question, hypothesis, variables, background research, and so on.



**Use a font size of at least 16 points** for the text on your display board, so that it is easy to read from a few feet away. It's OK to use slightly smaller fonts for captions on picture and tables.

**The title should be big and easily read from across the room.** Choose one that accurately describes your work, but also grabs peoples' attention.

**A picture speaks a thousand words!** Use photos or draw diagrams to present non-numerical data, to propose models that explain your results, or just to show your experimental setup. But, don't put text on top of photographs or images. It can be very difficult to read.

**Check the rules for your science fair.** Here is a list of items that some science fairs allow (or even require) and some science fairs don't require (or even prohibit):

- o Captions that include the source for every picture or image
- o Acknowledgements of people who helped you
- o Your laboratory notebook (some science fairs want you to have it only during judging)
- o Equipment such as your laboratory apparatus or your invention

### Expert Project Rubric (example)

Name: \_\_\_\_\_ Project Title: \_\_\_\_\_

	4	3	2	1	0
Introduction	Background information is researched and cited. Hypothesis is stated in “If... , then...” format and explained.	Background information is researched and cited. Hypothesis is stated but not explained and not in “If..., then...” format.	Background information is vague or brief. Hypothesis is stated but not explained and not in “If..., then...” format.	Background information is vague or brief, hypothesis is vague, or background or hypothesis is missing.	No introduction is present.
Materials and methods	Materials and amounts are identified. Steps are easy to follow and in paragraph form.	Materials are mentioned but without amounts. Steps are easy to follow and in paragraph form.	Materials are mentioned but without amounts. Steps are vague but in paragraph form.	Doesn't provide enough information to represent an experimental procedure.	No materials and methods described.
Data	Data is complete and relevant. Tables are easy to read and units are provided. Graphs are labeled and show trends. Questions are answered completely and correctly.	One component of data incomplete: ___ Tables ___ Graphs ___ Questions	Two components of data incomplete or one missing: ___ Tables ___ Graphs ___ Questions	Data is brief and missing significant pieces of information.	No data reported.
Conclusion	Conclusion summarizes experiment, cites data, addresses hypothesis, and cites sources of	One component of conclusion missing: ___ Summary ___ Data ___ Hypothesis ___ Errors	Two components of conclusion missing: ___ Summary ___ Data ___ Hypothesis ___ Errors	Conclusion is brief and is missing significant pieces of information.	No Conclusion is present.

	error.				
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### Rubric for Expert Project Display (example)

Student's Name: \_\_\_\_\_ Project Title: \_\_\_\_\_

<b>PRESENTATION BOARD</b>	<b>TOTAL CATEGORY SCORE:</b>	
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<b>Use of Materials and Space</b>		<b>Subcategory Score:</b>
4	The student uses display board and space creatively in a neat and orderly manner. The display can be read easily from a distance both top to bottom and left to right.	
3	The student uses display board and space in a neat and orderly manner. The display can be read from a distance both top to bottom and left to right.	
2	Display board and use of space needs minor modification to be neat and /or orderly. The display can be read with little difficulty from a distance both top to bottom and left to right.	
1	Display board and use of space needs major modification to be neat and /or orderly. The display can be read with difficulty from a distance both top to bottom and left to right.	
0	Display board is not submitted.	

<b>Presentation</b>		<b>Subcategory Score:</b>
4	Original and creative use of color and visuals. Well organized, neat, typed, thoroughly proofread, and easy to read from left to right at 1 meter away. Well balanced presentation of project in each of the sections. Captions are used for all pictures. All graphs, tables, and charts have titles and labels.	
3	Visually appealing, neat, and easy to read from left to right. Typed and proofread. Font style allows for reading from 1 meter away. Well balanced presentation of project in each of the sections. Captions are used for all pictures. Graphs, tables, and charts have titles and labels.	
2	Neat, with few errors. Presentation lacks visual appeal, but is still readable.	
1	Readability is severely impeded by many errors or sloppy presentation.	
0	Display board is not submitted.	

<b>Content</b>		<b>Subcategory Score:</b>
4	All essential sections are represented (question, hypothesis, research paper, experiment or demonstration, data, analysis and conclusion). Information is clearly presented under the correct headings. Display includes an abstract, background research, and works cited.	
3	All essential sections are represented (question, hypothesis, research paper, experiment or demonstration, data, analysis and conclusion). Information is clearly presented under the correct headings.	
2	The essential sections (question, hypothesis, research paper, experiment or demonstration, data, analysis and conclusion) are represented although some of the information may be confusing or skeletal. Information is presented under the correct headings.	

1	Display board is missing some or most of the required sections (question, hypothesis, research paper, experiment or demonstration, data, analysis and conclusion) . Information is unclear, missing, or presented under the wrong headings.
0	Display board is not submitted.

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 1A

Name three types of bacteria: 1) \_\_\_\_\_, 2) \_\_\_\_\_, and 3) \_\_\_\_\_

Why is a virus not a living organism? 4) \_\_\_\_\_  
 \_\_\_\_\_

What are the 4 characteristics of all living things? 5) \_\_\_\_\_,  
 6) \_\_\_\_\_, 7) \_\_\_\_\_, and  
 8) \_\_\_\_\_

What is photosynthesis? 9) \_\_\_\_\_  
 \_\_\_\_\_

What is cellular respiration? 10) \_\_\_\_\_  
 \_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 1B

What are the 4 characteristics of all living things? 1) \_\_\_\_\_,  
 2) \_\_\_\_\_, 3) \_\_\_\_\_, and  
 4) \_\_\_\_\_

What is cellular respiration? 5) \_\_\_\_\_  
 \_\_\_\_\_

Why is a virus not a living organism? 6) \_\_\_\_\_  
 \_\_\_\_\_

What is photosynthesis? 7) \_\_\_\_\_

Name three types of bacteria: 8) \_\_\_\_\_, 9) \_\_\_\_\_, and 10) \_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 2A

- 1. What is a decomposer? \_\_\_\_\_
- 2. What is a characteristic of a producer? \_\_\_\_\_
- 3. What is the difference between an autotroph and a heterotroph? \_\_\_\_\_  
\_\_\_\_\_
- 4. What is a consumer? \_\_\_\_\_
- 5. What is the difference between biotic and abiotic factors? \_\_\_\_\_  
\_\_\_\_\_
- 6. What are the levels of taxonomy? \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, and \_\_\_\_\_
- 7. What are the 3 domains? \_\_\_\_\_, \_\_\_\_\_, and  
\_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 2B

- 1. What are the levels of taxonomy? \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_,  
\_\_\_\_\_, and \_\_\_\_\_
- 2. What is a characteristic of a producer? \_\_\_\_\_
- 3. What is the difference between an autotroph and a heterotroph? \_\_\_\_\_  
\_\_\_\_\_
- 4. What is a decomposer? \_\_\_\_\_
- 5. What is the difference between biotic and abiotic factors? \_\_\_\_\_  
\_\_\_\_\_
- 6. What is a consumer? \_\_\_\_\_

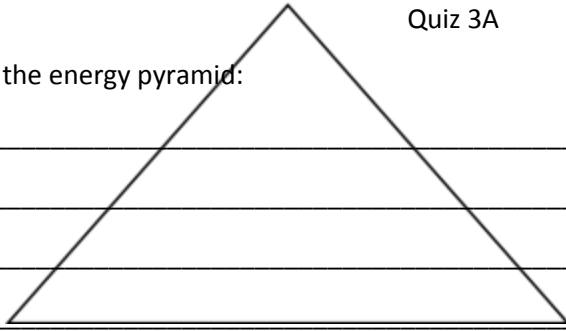
7. What are the 3 domains? \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 3A

Name the levels of the energy pyramid:

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_



- 5. What is pollution? \_\_\_\_\_
- 6. Name a renewable resource: \_\_\_\_\_
- 7. Name a nonrenewable resource: \_\_\_\_\_
- 8. What is carrying capacity? \_\_\_\_\_
- 9. What is a limiting factor? \_\_\_\_\_
- 10. What is a population? \_\_\_\_\_

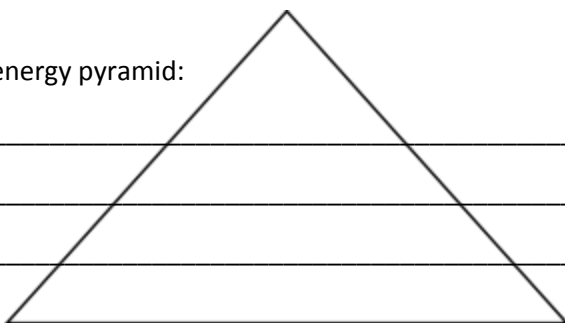
Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Quiz 3B

1. What is pollution? \_\_\_\_\_

Name the levels of the energy pyramid:

- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_



- 6. Name a renewable resource: \_\_\_\_\_
- 7. Name a nonrenewable resource: \_\_\_\_\_

8. What is carrying capacity? \_\_\_\_\_
9. What is a limiting factor? \_\_\_\_\_
10. What is a population? \_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

#### Quiz 4A

What are the needs of life and an example of each need?

1. Need- \_\_\_\_\_ Example- \_\_\_\_\_
2. Need- \_\_\_\_\_ Example- \_\_\_\_\_
3. Need- \_\_\_\_\_ Example- \_\_\_\_\_
4. What is emigration? \_\_\_\_\_
5. What is immigration? \_\_\_\_\_
6. What are quantitative observations? \_\_\_\_\_
7. What are qualitative observations? \_\_\_\_\_

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

#### Quiz 4B

What are the needs of life and an example of each need?

1. Need- \_\_\_\_\_ Example- \_\_\_\_\_
2. Need- \_\_\_\_\_ Example- \_\_\_\_\_
3. Need- \_\_\_\_\_ Example- \_\_\_\_\_
4. What is emigration? \_\_\_\_\_
5. What is immigration? \_\_\_\_\_
6. What are quantitative observations? \_\_\_\_\_
7. What are qualitative observations? \_\_\_\_\_



## Scientific Method and Lab Procedures Test

Choose the best objective, or scientific question.

- a. How does fertilizer affect the presence of algae in a lake?
- b. What kind of fertilizer should be used on a field?
- c. How does algae grow?
- d. How does fertilizer and algae affect a lake?

1 large jar

4 identical small containers

Rubber gloves

Fertilizer-and-water solution

Eyedropper

This is...

- a. A list of experiments
- b. A list of research
- c. A list of materials
- d. A list of observations

Choose the poorly written hypothesis?

- a. If the amount of fertilizer in lake water is increased, then the amount of algae will also increase.
- b. If the amount of fertilizer in lake water decreases, then the amount of algae will increase.
- c. If the amount of fertilizer and algae in lake water increases, then the water will be dirty.
- d. If the amount of fertilizer in lake water increases, then the algae will decrease.

Gene Copies vs. Time	
Time	Gene Copies
0 min	75
3 min	150
6 min	300
9 min	600
12 min	1200
15 min	2400
18 min	4800
21 min	9600

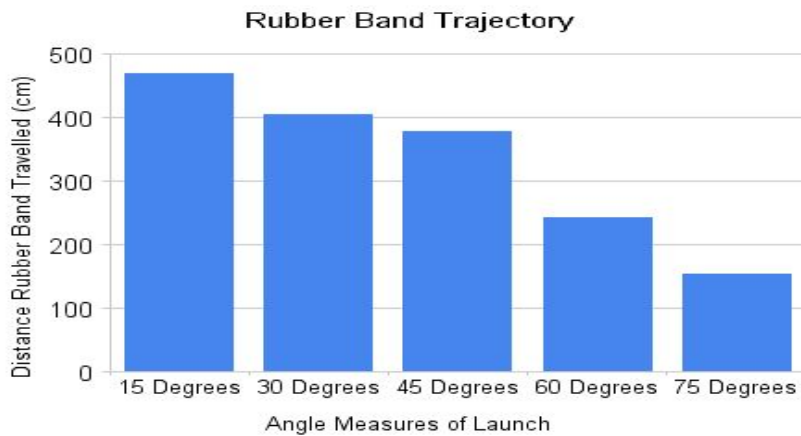
What is the title of the data table? \_\_\_\_\_

What are the labels of the data table? \_\_\_\_\_

How many genes will be copied in 15 minutes? \_\_\_\_\_

How many gene copies will there be in 16 minutes? \_\_\_\_\_

Explain your answer. \_\_\_\_\_



What tools would you need to collect data for this analysis?

- a. compass, rubber bands, ball
- b. rubber bands, tape measure, compass
- c. rubber bands, tape measure
- d. rubber bands

The graph indicates that

- a. the smaller the angle of trajectory, the shorter the distance travelled.
- b. the higher the angle of trajectory, the shorter the distance travelled.
- c. the higher the angle of trajectory, the longer the distance travelled.
- d. the angle of trajectory doesn't matter for the distance travelled.

Volume is measured in

- a. liters.
- b. grams.
- c. meters.
- d. Celsius.

Distance is measured in

- a. liters.
- b. grams.
- c. meters.
- d. Celsius.

Mass is measured in

- a. liters.
- b. grams.
- c. meters.
- d. Celsius.

Water freezes at

- a. 100 ° Celsius.

- b. 10 ° Celsius.
- c. 0° Celsius.
- d. -10° Celsius.

Water boils at

- a. 100 ° Celsius.
- b. 10 ° Celsius.
- c. 0° Celsius.
- d. -10° Celsius.

Which of the following would be a good source for research?

- a. 1980 edition of the Encyclopedia Britannica
- b. 2007 science fiction book
- c. 2009 internet article from the Journal of Science
- d. 2015 Wikipedia article

What are the 8 parts of safety?

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_
- f. \_\_\_\_\_
- g. \_\_\_\_\_
- h. \_\_\_\_\_

Why should you not smell a chemical experiment? \_\_\_\_\_

How do you observe an experiment?

- a. look at it
- b. listen to it
- c. smell it
- d. all of the above

John's hypothesis stated that if a dog were given a bone every day at 5:00 PM, then the dog would automatically come to John at 5:00 PM after three weeks.

What is the constant? \_\_\_\_\_

What is the independent (manipulated) variable? \_\_\_\_\_

What is the dependent (resulting) variable? \_\_\_\_\_

## Pre-lesson

This lesson is to be used at the beginning of the year and reintroduced at the beginning of the project.

**LS2-MS-5:** Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations

**LS2.A:** Interdependent Relationships in Ecosystems

### Objectives:

Students can identify biotic and abiotic factors within an ecosystem.

Students can explain the importance of particular factors to an ecosystem.

Students can argue why factors are in a particular ecosystem using evidence.

What is an ecosystem?

What are possible ecosystems in the area?

What are biotic factors? Why?

What are abiotic factors? Why?

### Materials:

Butcher paper for each group (48")

Scissors

Stencils

Masking tape

Markers, crayons, colored pencils

### Activity 1:

1. Students work as a team at a table.

As a group they decide on a familiar ecosystem to draw.

Table leaders make sure everyone has a job to do.

Draw, color and label the mural.

2. Students describe and explain the mural including the location of the ecosystem, its significance to the area, the abiotic and biotic factors, and why those factors are important.
3. Hang up the murals in the classroom using masking tape. Display throughout Quarter 1.

### Activity 2:

1. Group student into original table groups.
2. Have them take out their murals and discuss the parts of the ecosystem and their importance.
3. Have them introduce a scenario like drought, flood, insects, high nitrates, etc. They must then discuss and present a question and hypothesis of what might happen due to the changes.
4. Redisplay murals throughout Quarter 3.

### Lesson Reflection:

#### Activity 1:

Students engaged in the activity to a degree that surprised me. I think it had to do with the familiarity of the material. With the agricultural nature of our community, students were able to easily come up with an area and go out to see what the biotic and abiotic factors were included. They were quite creative, especially the ecosystem of a dairy cow.

**Activity 2:**

Reintroducing the activity was a little more difficult, but after discussing changes good and bad to the environment, students were able to come up with good discussion.

**Developing Scientific Questions**

To begin the project process students need to create a question that helps to guide their research and develop their project. The question should lead to an argumentative claim, a counterclaim and evidence to back it up.

**LS2-MS-2:** Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems

**Objective:**

Students can create a question that directs the research needed to complete research and experiments.

**Activity:**

Write the following on the board:

What is the effect of \_\_\_\_\_ on \_\_\_\_\_?

Give a variety of scenarios and brainstorm possible questions that will result in taking a stand on the hypothesis and require experimentation to prove the answer.

Discuss your ideas with your table group. Use the following questions in your discussions: What is your topic? What are the biotic and abiotic factors related to your topic? What type of changes will affect your ecosystem? To what degree will those changes affect the ecosystem? What are other adverse factors affecting the ecosystem? What are other ways of stating questions that will result in evidence or experimentation to hypothesize an answer?

**Examples:**

What is the effect of drought on potato plants?

What is the effect of oil pollution on seabirds?

What is the effect of human interaction on sea turtles?

What is the effect of changes to the environment on the barn owl?

**Lesson Reflection:**

I need to work on scenarios to use for the questions to hypotheses to experiment or activity.