

Matter and Energy in Ecosystems

WebQuest Description: In the previous units, you learned how plants and animals obtain energy and food through the processes of cellular respiration and photosynthesis. In this section, you will look at the transfer of matter and energy (through photosynthesis and cellular respiration) on a larger level and see how it all fits together in an ecosystem.

Grade Level: 9-12

Curriculum: Science

Keywords: Ecosystem, Food Web, Food Chain, Biology, Energy, Matter, Biodiversity

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Introduction

Students, you will take on the role of Ecologist for this WebQuest. An Ecologist is a scientist who focuses on relationships between organisms and their interactions with their environment. You hail from a distant planet and it is up to you to document the ecosystems of your planet and all the living things that inhabit it. Over the next few days you will be diving into different ecosystems around Earth to discover how diverse our world really is!

Tasks

By the end of this WebQuest you will understand the relationships between organisms and their environment through the transfer of energy and matter that takes place within an ecosystem. **Role:** You are an Ecologist from a distant planet. Your job is to document the ecosystems of your planet and all the living things that inhabit it. **Audience:** After a natural disaster, you hope to send the information about your planet to the neighboring planets in your galaxy to seek help in returning your planet to its natural balance. **Format:** You will send documentation of the native species diagrams of the natural food web before the disaster, as well as the devastation that the disaster has caused on the food web. You will do this through the following documentation: Planning document describing the organisms in your food web and the effect of the disaster Poster with a food web diagram and graph showing the change in population of one organism affected by the disaster

Process

Step 1: Exploratory Ecology Simulation Use the Lab Procedure to walk you through the online simulation Ecology Lab that explores the relationship between food web complexity and biodiversity in an ecosystem. The guiding question of this investigation is, How does food web complexity affect the biodiversity of an ecosystem? This should be completed in groups of 2-3 students. Remember to make your own copy of the google doc and move it to your science folder. **Step 2: Gathering Information** After you have completed the exploration, you will now use guided notes to learn more about the complexities of ecosystems through vocabulary development and close reading of the CK-12 notes. **Topics Covered** Ecosystems Different relationships in an ecosystem Role of a decomposers Flow of energy through a food chain and a food web These notes should be completed independently. **Remember** to make your own copy of the google doc and move it to your science folder. **Step 3: Additional Resources** After you have completed the notes, pair up with another student. Together visit at least 1 video and 1 interactive. As you are reviewing be sure to think about what roles you need to fill in your own ecosystem. Include your brainstorming ideas in the close out google form. **Videos** Producers and Consumers Decomposers **Crash Course: Food Webs** **Crash Course: Fungi** **Interactives** Food chains **Ecosystem game:** build food webs to wipe out your component and grow your own population! **Step 4: Analysis and Conclusions** Based on the information you have gathered so far, you are now going to use this document to engage in analysis of an aquatic food chain and read about a real world problem of sea lion pups being abandoned in California. From there you are going to draw conclusions on how energy is transferred in ecosystems and learn a few ways humans are effecting them. This document should be completed independently. Remember to make your own copy of the google doc and move it to your science folder. **Step 5: Get Creative!** In this assignment, you will create your own creatures to be a part of an intricate food web found on a distant alien planet. Your creatures are living peacefully but (oh no!) a natural disaster hits that upsets the balance of your fragile ecosystem. It is up to you to preserve your planet's history. Use this planning document to help guide you along they way!

Evaluation

Step 4: Analysis and Conclusions Rubric Step 5 Analysis and Conclusions Rubric

Category and Score	Proficient	Emerging	Needs Improvement	Not Attempted	Score
Application	Biological concepts were applied thoughtfully (30pts)	Biological concepts were applied somewhat (20pts)	Biological concepts were mentioned but not applied meaningfully (10pts)	Biological concepts were not mentioned (0pts)	30
Components Present	All required components were present (15pts)	Most required components were present (10pts)	Little to no required components were present (5pts)	Incomplete or Off Topic (0pts)	15
Accuracy	All information presented is accurate and cited. (30pts)	Most information presented is accurate and cited. (20pts)	Information presented is inaccurate or not cited. (10pts)	Information presented is completely inaccurate and no citations provided. (0pts)	30
Creativity	Components were original and neatly presented. (15pts)	Components were mostly original and semi-neatly presented. (10pts)	Components were mostly unoriginal and slightly disorganized when presented. (5pts)	Components were unoriginal and disorganized when presented. (0pts)	15
				Total Score	90

Conclusion

Congratulations! You are now all Ecologist from another world! You should have a pretty good idea why ecosystems are so important and the key role matter and energy play in them. Next unit, we are going to look at how matter and energy are cycled on a global scale and how humans are effecting these natural cycles!! If you want more information on Matter and Energy in ecosystems check out this Khan Academy Unit that has videos, extra practice, and a discussion board!!If you want to look ahead at Biogeochemical Cycles, check out the picture below and this Khan Academy Unit that also has videos, extra practice, and a discussion board!Until next time Scientists!-Ms. Hoy

Teacher Page

Focus:The focus of this WebQuest is to provide 9th grade Biology students an interactive way to learn about key topics in Ecology.
Objectives:I would recommend using this project to introduce Ecology to your students after you have covered Photosynthesis and Cellular Respiration. It will expose them to key ideas and key terms as well as allow them to use technology. Students will also get practice annotating a text and showing mastery through art.
Resources: Prerequisite Skills: Comfort level with the Internet and google documents
Time Required: 1 week of instruction
Materials: Chromebooks Posterboards Art Supplies (markers, colored pencils) Graph Worksheet

Standards

Next Generation Science Standards:HS-LS2-1. Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.HS-LS2-2. Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.HS-LS2-6. Evaluate claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.
ACT Standards:EMI 201: Find basic information in a model (conceptual)EMI 302: Determine which models present certain basic informationIOD 401: Select data from a complex data presentationIOD 403:Translate information into a table, graph, or diagramIOD 304:Determine how the values of variables change as the value of another variable changes in a simple data presentation

Credits

The resources and web links included on this website are external websites. I would like to thank the owners/creators of the sites for allowing my students access to them!

Other