1A: Energy in Ecosystems Sept.

Content Area: **Science**
Course(s):
Time Period: **September**
Length: **2 Weeks**
Status: **Published**

Unit Overview

Flow of Energy

- In most ecosystems, the flow of energy starts with the sun. Producers, mainly plants, convert light energy into usable chemical energy in the form of sugar.
- Organisms consume plants and may then consume each other in a complicated and interconnected series of relationships called a food web. Food webs show how energy is transferred from one organism to another.
- Every organism in the world is connected, no matter how remotely, to all of the other organisms in other food webs.
- What happens in one food web indirectly affects what happens in every other food web.

Transfer of Energy

- This transfer of energy occurs in the form of food.
- Food is necessary to organisms in order for them to grow, develop, and eventually reproduce.
- Food provides the materials for building cells and tissues and the energy required to move and conduct all life processes.

Trout in the classroom

Trout in the Classroom (TIC) is an environmental education program in which students in grades k-12 . . .

- raise trout from eggs to fry.
- monitor tank water quality.
- engage in stream habitat study.
- learn to appreciate water resources.
- begin to foster a conservation ethic.
- grow to understand ecosystems.

Most programs end the year by releasing their trout in a state-approved stream near the school or within a nearby watershed.During the year each teacher tailors the program to fit his or her curricular needs. Therefore, each program is unique. TIC has interdisciplinary applications in science, social studies, mathematics, language arts, fine arts, and physical education.

http://www.troutintheclassroom.org/about

Trout in the Classroom (TIC) is a science-based program that teaches children about the importance of coldwater conservation through a hands-on approach to learning. Through the process of raising trout from eggs provided by the Pequest Trout Hatchery to fingerling size for release, students learn about the importance of clean, cold water, not only for the trout they are raising, but also for the other organisms, including people.

The TIC program is cross-curricular and can encompass many subject areas such as science, math, art, language arts, reading, technology, music and more. While the activities associated with the program are geared towards middle school aged students, schools from Kindergarten through college levels are using the same materials.

https://www.state.nj.us/dep/fgw/tic.htm

Enduring Understandings

By the end of the lesson, students should be able to:

- Analyze data to understand how variable access to resources impacts individuals and populations.
- Understand the geographical distribution of species by matching them to the ecosystems and biomes that provide the resources they need.
- Ensure that the living things in a model ecosystem have sufficient resources.

Essential Questions

- **Overarching Question**
    - How and why do organisms interact with their environment, and what are the effects of these interactions?
- **Focus Question**
    - How do matter and energy move through an ecosystem?
- **Lesson Questions**
    - How does energy flow through ecosystems?
    - Why is food important for organisms?
    - How are all organisms connected to each other?

- **Can You Explain?**
    - How do organisms interact with each other and their environment in ways that move energy and matter through an ecosystem?

1. What are threats to biodiversity?
2. How can biodiversity be conserved?
3. How can ecosystems be restored?

Instructional Strategies & Learning Activities

- **Observing Phenomena** [10 min]**:** Students examine the phenomenon of poison dart frogs losing their toxicity in captivity.

Suggested Reading: Introduction

- **Investigation 1** [25 min]**:** Analyzing Data to Learn How Resources Impact Organisms

Students use graphs to represent data about how resources impact individuals.

Suggested Reading: Section 1

- **Investigation 2** [60 min]**:** Analyzing Data to Learn How Resources Impact Populations

Students analyze data on how resources impact populations and then present case studies and make general statements about the relationship between resources and populations.

Suggested Reading: Section 2

- **Investigation 3** [50 min]**:** Predicting How Resource Needs Shape Ecosystems and Biomes

Students predict how resource availability impacts species distribution through a game modeling resource needs.

Suggested Reading: Sections 3-5

- **Making Sense of Phenomena** [10 min]**:** Students explain how resources impact captive poison dart frogs' loss of toxicity.

Suggested Reading: Lesson Summary

Integration of Career Exploration, Life Literacies and Key Skills

CRP.K-12.CRP1 Act as a responsible and contributing citizen and employee.

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
TECH.9.4.8.CI.1	Assess data gathered on varying perspectives on causes of climate change (e.g., cross-cultural, gender-specific, generational), and determine how the data can best be used to design multiple potential solutions (e.g., RI.7.9, 6.SP.B.5, 7.1.NH.IPERS.6, 8.2.8.ETW.4).
TECH.9.4.8.CI.3	Examine challenges that may exist in the adoption of new ideas (e.g., 2.1.8.SSH, 6.1.8.CivicsPD.2).
TECH.9.4.8.CI.4	Explore the role of creativity and innovation in career pathways and industries.
TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.
TECH.9.4.8.IML.7	Use information from a variety of sources, contexts, disciplines, and cultures for a specific purpose (e.g., 1.2.8.C2a, 1.4.8.CR2a, 2.1.8.CHSS/IV.8.AI.1, W.5.8, 6.1.8.GeoSV.3.a, 6.1.8.CivicsDP.4.b, 7.1.NH. IPRET.8).
	Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.
	Gathering and evaluating knowledge and information from a variety of sources, including global perspectives, fosters creativity and innovative thinking.
	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
TECH.8.1.8.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.8.D	Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
TECH.8.1.8.F	Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
TECH.8.2.8	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Differentiation

Struggling Students

1. Explain to students how energy flows between organisms within an ecosystem.
2. Ask students to explain the role and importance of plants in an ecosystem.

ELL

1. Provide the students with an outline of the trophic levels in a basic ecosystem. Have students label or add the parts of the ecosystem shown in the glossary. Have them add names in both English and their mother language. Students may add more detail as the lesson progresses.

Accelerated Students

1. Have students investigate the difference between the words *primary*, *secondary*, and *tertiary*.
2. After watching the video segment "Converting Food to Energy," remind students that the source of energy for nearly all organisms, with the exception of plants, is food.
3. Using their current knowledge of ecosystems and energy, have students discuss with a partner the impact of removing a species from

an ecosystem.

Additional Lesson Resources

Additional notes:

Differentiation in science can be accomplished in several ways. Once you have given a pre-test to students, you know what information has already been mastered and what they still need to work on. Next, you design activities, discussions, lectures, and so on to teach information to students. The best way is to have two or three groups of students divided by ability level.

While you are instructing one group, the other groups are working on activities to further their knowledge of the concepts. For example, while you are helping one group learn the planet names in order, another group is researching climate, size, and distance from the moon of each planet. Then the groups switch, and you instruct the second group on another objective from the space unit. The first group practices writing the order of the planets and drawing a diagram of them.

Here are some ideas for the classroom when you are using differentiation in science:

- Create a tic-tac-toe board that lists different activities at different ability levels. When students aren't involved in direct instruction with you, they can work on activities from their tic-tac-toe board. These boards have nine squares, like a tic-tac-toe board; and each square lists an activity that corresponds with the science unit. For example, one solar system activity for advanced science students might be to create a power point presentation about eclipses. For beginning students, an activity might be to make a poster for one of the planets and include important data such as size, order from the sun, whether it has moons, and so on.

- Find websites on the current science unit that students can explore on their own.

- Allow students to work in small groups to create a project throughout the entire unit. For example, one group might create a solar system model to scale. Another group might write a play about the solar system. This is an activity these groups can work on while they are not working directly with you.

Differentiation in science gets students excited to learn because it challenges them to expand their knowledge and skills, instead of teaching the whole group concepts they have already mastered.

Modifications & Accommodations

Refer to QSAC EXCEL SMALL SPED ACCOMMOCATIONS spreadsheet in this discipline.

Modifications and Accommodations used in this unit:

IEP and 504 Accommodations will be utilized.

In addition to differentiated instruction, IEP's and 504 accommocations will be utilized.

Benchmark Assessments

Benchmark Assessments are given periodically (e.g., at the end of every quarter or as frequently as once per month) throughout a school year to establish baseline achievement data and measure progress toward a standard or set of academic standards and goals.

Schoolwide Benchmark assessments:

Aimsweb benchmarks 3X a year

Linkit Benchmarks 3X a year

Additional Benchmarks used in this unit:

The students will complete two summative benchmark tests administered by the teacher via Google Forms and Google Classroom. There is one benchmark test administered in the middle of the year around January, and a second one administered in May.

Formative Assessments

Assessment allows both instructor and student to monitor progress towards achieving learning objectives, and can be approached in a variety of ways. **Formative assessment** refers to tools that identify misconceptions, struggles, and learning gaps along the way and assess how to close those gaps. It includes effective tools for helping to shape learning, and can even bolster students' abilities to take ownership of their learning when they understand that the goal is to improve learning, not apply final marks (Trumbull and Lash, 2013). It can include students assessing themselves, peers, or even the instructor, through writing, quizzes, conversation, and more. In short, formative assessment occurs throughout a class or course, and seeks to improve student achievement of learning objectives through approaches that can support specific student needs (Theal and Franklin, 2010, p. 151).

Formative Assessments used in this unit:

See assessments located in the unit link above

Summative Assessments

Summative assessments evaluate student learning, knowledge, proficiency, or success at the conclusion of an instructional period, like a unit, course, or program. Summative assessments are almost always formally graded and often heavily weighted (though they do not need to be). Summative assessment can be used to great effect in conjunction and alignment with formative assessment, and instructors can consider a variety of ways to combine these approaches.

Summative assessments for this unit:

See assessments located in the unit link above

Instructional Materials

See materials located in Unit above through TeachTCI

Standards

SCI.MS-LS2	Ecosystems: Interactions, Energy, and Dynamics
SCI.MS-LS2-3	Develop a model to describe the cycling of matter and flow of energy among living and nonliving parts of an ecosystem. Emphasis is on describing the conservation of matter and flow of energy into and out of various ecosystems, and on defining the boundaries of the system.
SCI.MS.LS2.B	Cycles of Matter and Energy Transfer in Ecosystems Food webs are models that demonstrate how matter and energy is transferred between producers, consumers, and decomposers as the three groups interact within an ecosystem. Transfers of matter into and out of the physical environment occur at every level. Decomposers recycle nutrients from dead plant or animal matter back to the soil in terrestrial environments or to the water in aquatic environments. The atoms that make up the organisms in an ecosystem are cycled repeatedly between the living and nonliving parts of the ecosystem.