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Description:

 Learners explore the basic parts and functions of an energy pyramid while also creating food chains and webs.

Grade Levels**:** 4th and 5th

Time Needed: 7 days

DOK Levels: 1, 2, 3, and 4

 Students will identify, list, recall, recognize, define, interpret, make observations, compare, relate, draw conclusions, construct, and create.

Objectives:

* Students will be able to classify populations of organisms as producers, consumers, or decomposers by the role they serve in the ecosystem.
* Students will be able to differentiate between three types of consumers (herbivore, carnivore, and omnivore.)
* Students will be able to categorize organisms as predator or prey in a given ecosystem.

Featured Books:

* Scott Foresman Science: See Learning in a whole new light; by Dr. Timothy Cooney
* Scott Foresman Science: The Diamond Edition; by Dr. Michael P. Klentschy
* Picture Perfect Science Lessons: Using Children’s books to guide inquiry by Karen Rohrich Ansberry and Emily R. Morgan
* Animal Lives: Barn Owl by Sally Tagholm
* Butternut Hollow Pond by Brian J. Heinz
* Who Eats What? By Patricia Lauber

Academic Vocabulary Words:

 producer carnivore community food chain

 consumer decomposer niche food web

 omnivore ecosystem predator energy pyramid

 herbivore population prey trophic levels

Grade Level Expectations (GLE’s) and Reading Comprehension Strategies:

**Science**

* Strand 4: 2Aa – Grade 4
	+ Classify populations of organisms as producers, consumers, or decomposers by the role they serve in the ecosystem.
* Strand 4: 2Ab – Grade 4
	+ Differentiate between three types of consumers (herbivore, carnivore, omnivore)
* Strand 4: 2Ac – Grade 4
	+ Categorizes organisms as predator or prey in a given ecosystem.

**Communication Arts**

* CA 2, 3, 1.5
	+ Read grade level instructional text with
		- a. fluency, accuracy and expression
		- b. adjusting reading rate to difficulty and type of text
* CA 2, 3, 1.5, 1.6
	+ Develop vocabulary through text using
		- a. root words and affixes
		- c. context clues
		- d. glossary and dictionary
* CA 2, 3, 1.5, 1.6
	+ Apply pre-reading strategies to aid comprehension
		- a. access prior knowledge
* CA 2, 3, 1.5, 1.6, 3.5
	+ During reading, utilize strategies to
		- a. determine meaning of unknown words
* CA 2, 3, 7, 1.5, 1.6, 1.9
	+ Identify and explain relevant connections between
		- a. text to text (text ideas ---information and relationships in various fiction and non-fiction works--compare and contrast)
		- b. text to self (text ideas and own experiences)
		- c. text to world (text ideas and the world by demonstrating an awareness that literature reflects a culture and historic time frame)
* CA 2, 1.5, 1.6, 2.4
	+ Use grade level text to
		- a. locate, interpret and apply information in a title, table of contents and glossary
* CA 3, 1.5, 1.6, 2.4, 3.5
	+ Apply information in illustrations, title, chapter headings, table of contents, glossary, charts, diagrams, graphs, captions and maps to comprehend text
* CA 3, 1.5, 1.6, 2.4, 3.1, 3.4, 3.5, 3.6, 3.7, 3.8
	+ Use details from text to
		- a. demonstrate comprehension skills previously introduced
		- c. sequence events
		- d. identify cause and effect
		- f. compare and contrast
		- g. make predictions
		- h. make inferences
		- k. identify problems and solutions
* CA 4, 2.1
	+ Compose text with
		- a. a clear controlling idea
		- b. relevant details /examples

Reading Strategies:

* Making connections – with biomes and organisms within a biome.
* Questioning – during class activities and discussions about the flow of energy and characteristics of the organism at a particular trophic level.
* Inferring – during and after activities and lessons.
* Determining Importance – while reading text and picture books.

Instructional Strategies:

* Summarizing and note taking in science notebooks during activities and discussions.
* Cooperative learning during group activities and discussions.
* Comparing similarities and differences between the biomes and organisms within the energy pyramid.
* Identifying waypoints through a GPS activity.

Materials:

* 200 pieces of large macaroni noodles. Uncooked; dyed green, blue, or black.
* 30 Ziploc baggies with macaroni divided between them (approx. 5 pieces each)
* Labels for each student showing their animal. (animals recommended: rabbit, fox, and bear. The three animals used need to represent three consumer levels.)
	+ 15 Rabbits
	+ 7 Foxes
	+ 3 Bears
* Stopwatch (1)
* Science notebooks for recording data (1 for each student)
* Pencil (1 for each student)
* Science Texts and Picture Books on biomes and food chains (listed above)
* Construction Paper
* Index cards (5 for each student)
* String (4 short pieces for each student)
* Hole Punch (1)
* Crayons or Markers (assortment for whole class)
* Scissors (1)
* GPS Units and required materials for GPS activity (4-6 units based on class size)
* Textbooks- listed above
* Picture Books – listed above

Lesson Narrative:

 These 5 E’s will guide the students through learning about the parts of an energy pyramid. They will do this by teaching vocabulary associated with the energy pyramid and the food chains that make up the energy flow within different biomes.

**Engage: 1 Day – DOK Level 1**

 Read Aloud

 Picture Book: Who Eats What? By Patricia Lauber

**Explore: 1 Day – DOK Level 3**

**“Energy Flow, Where does it go?”**

An interactive activity where students will be able to see the flow of energy first hand while being an organism in the energy pyramid.

Objective: Students will be able to interpret the flow of energy from participating and observing in an activity that places them in the energy pyramid.

Materials: (based on a classroom of 25 students)

* 200 pieces of large macaroni noodles. Uncooked; dyed green, blue, or black.
* 30 Ziploc baggies with macaroni divided between them (approx. 5 pieces each)
* Labels for each student showing their animal. (animals recommended: rabbit, fox, and bear. The three animals used need to represent three consumer levels.)
	+ 15 Rabbits
	+ 7 Foxes
	+ 3 Bears
* Stopwatch
* Science notebooks for recording data
* Pencil

Procedure:

1. Prior to the lesson make sure the macaroni has been dyed green, blue, or black. When dying the macaroni you want to use a minimal amount of water so the macaroni does not expand. Before placing the noodles in the Ziploc baggies make sure it has been completely dried out by waiting 24 hours or placing noodles at a low warming temp of 170 F in the oven for a few hours.
2. Divide noodles into each of the 30 baggies. Approximately 5 or 6 pieces will be placed in each bag.
3. Mark off an area outside approximately 20x20 square feet.
4. Throw the 30 baggies into the marked off area. Make sure that the baggies are evenly spread out.
5. Line up the 15 students that have been assigned to be rabbits. They will get 30 seconds to go into the area and collect 2 baggies each. If the students are not able to collect 2 bags in the given time their organism will not continue in the energy pyramid and their food is discarded to the waste pile.
6. Each rabbit will have to dispose of one baggie in the “waste spot” and throw their other baggie back into the 20x20 marked off area. The “waste baggie” will represent the energy that is used by the rabbit and disposed of. The other baggie will represent the rabbit’s energy that is still stored and usable by other predators.
7. Next you will line up the 7 students that have been assigned to be a fox. Foxes are larger animals and therefore will be required to collect 3 baggies each. The foxes will also be given 30 seconds to collect 3 baggies each.
8. If the foxes are not able to collect 3 bags in the given time their organism will not continue in the energy pyramid and their food is discarded in the waste pile.
9. Each fox will have to dispose of one baggie in the “waste spot” and throw their other 2 baggies back into the 20x20 marked off area. The “waste baggie” will represent the energy that is used by the fox and disposed of. The other baggies will represent the fox’s energy that is still stored and usable by other predators.
10. Next you will line up the 3 students that have been assigned to be a bear. Bears are larger animals and therefore will be required to collect 4 baggies each. The bears will also be given 30 seconds to collect 4 baggies.
11. If the bears are not able to collect 4 bags in the given time their organism will not continue in the energy pyramid and their food is discarded in the waste pile.
12. Students will need to summarize what they experienced and observed during the activity.

For example:

How many bears survived?

Compare the amount of food intake with the organism’s trophic level.

What conclusions can you draw from this data?

**Explain: 2 Days – DOK Level 1**

* Students will create a vocabulary foldable as they are introduced to new words. Word list is provided above.
* Use the 4th grade Scott Foresman Science Text and Leveled Readers for students to read about and understand the flow of energy and energy pyramid. Scott Foresman Science: See Learning in a whole new light; by Dr. Timothy Cooney. Chapter 3, Lesson 1, 2, and 3. Leveled Reader; Ecosystems, Life in an Ecosystem, and Pond Life.
* Discuss Food Chain and Food Web parts. What make s a food chain? How does the energy flow?
* Assign students an organism. Each organism will be part of a food chain previously made by the teacher, but the students will not know what food chain they belong to. Students will have to construct a food chain by finding students that would complete an accurate chain. Each small group will have to present their chain to the class by showing the progression. Teacher and classmates will discuss if this is a possible chain and why.

**Elaborate: 1 Day – DOK Level 4**

**“How are organisms connected?”**

 Students will choose a biome and they will assemble as many possible food chains for their biome.

Objective: Students will be able to create a possible food chain for a particular biome.

Materials:

* Science Texts and Picture Books on biomes and food chains
* Construction Paper or index cards (5 for each student)
* String (4 small pieces for each student)
* Hole Punch
* Crayons or Markers
* Scissors

Procedure:

1. Have each student choose a biome.
2. Students will brainstorm and research a list of plants and animals that live in that biome.
3. From the list they will build as many different food chains that are possible.
4. The student will choose their favorite chain to create a model.
5. Each organism in the food chain will be drawn on an index card and placed in order of the energy flow. Each index card will be attached by punching a hole in the top and bottom. String will be used to connect each of the index cards. This will create a mobile showing a food chain.
6. Have students present and discuss their food chains. Present the option of connecting multiple food chains to create a food web. Can any of the chains be connected and still flow?

**Evaluate: 2 Days DOK Level 2** GPS activity with unit review questions. Attached.

**Additional activities and websites: DOK Level 2**

Online food chain story book –

<http://www.msnucleus.org/membership/storybooks/foodchain.html>

Choose a biome and create food chain with given organisms - <http://www.gould.edu.au/foodwebs/marine.htm>

Learn360.com

**Australian Animals Need Energy**

 Presents several species of animals found only in Australia and uses their interactions to explain the food chain and energy flow in an ecosystem. (6min.)

United Streaming.com

**The Magic School Bus: Gets Eaten**

 Dives into the deep watery seas to explain the mechanisms of the ocean food chain. The memorable Ms. Frizzle maps the relationships between plankton, fish, and plants in this unique ecosystem while also describing the rich habitat of the underwater world. (25 min.)

**The Food Chain Mystery**

Follow the flow of energy through the food chain from the sun to producers, consumers, and decomposers. Vivid animations using a linear food chain and an energy pyramid show how energy passes through the food chain. Other concepts include photosynthesis, predator-prey relationships, herbivores, carnivores, and omnivores. (15 min)

**Energy Pyramid and Food Web (segment)**

 Learn how energy passes through the food chain.(1.44 min)

**Teacher and Rockbots (music) – food chain**

 Sings along with Teacher and the Rockbots and provides examples of producers, consumers, and decomposers as well as herbivores, carnivores, and omnivores.

<https://www.pearsonsuccessnet.com>

**Brain Pop** – Food Chains – subscription required

 Food chain activity worksheet included

<http://www.brainpop.com/>

Misconceptions:

* Producers are at the top of the energy pyramid.
* In our ecosystem there are fewer consumers than producers based on the energy pyramid.
* The energy flow arrow travels from consumer to producer (biggest to smallest.)
* Decomposers are always at the end of the food chain.
* 100% of the energy is transferred to the consumers.

Safety/Management:

* Adequate space needed for outdoor activities.
* Multiple adults for necessary activities.
* Proper attire i.e.: tennis shoes, sun block, rain coat, etc.
* Rules and procedures put in place for energy activity.
* GPS safety precautions listed with Individual activity lesson plan

Other Related Titles:

* Who eats what? : food chains and food webs; By: Lauber, Patricia
* What are food chains and webs?; By: Kalman, Bobbie
* Food chains and webs; By: Wallace, Holly
* A tundra food chain: a who-eats-what adventure in the Arctic; By: Wojahn, Rebecca Hogue.
* An Australian outback food chain : a who-eats-what adventure; By: Wojahn, Rebecca Hogue
* Pond circle; By: Franco, Betsy
* Makers and takers : studying food webs in the ocean; By: Hooks, Gwendolyn
* Grassland buffet : studying food webs in the grasslands and savannahs; By: Lundgren, Julie K
* Freshwater feeders : studying food webs in freshwater; By: Hooks, Gwendolyn
* Forest fare : studying food webs in the forest; By: Lundgren, Julie K
* Desert dinners : studying food webs in the desert; By: Lundgren, Julie K
* Arctic appetizers : studying food webs in the Arctic; By: Hooks, Gwendolyn
* Nature's cleaners; By: Kalman, Bobbie
* A rain forest food chain; By: Tarbox, A. D
* Please don't eat me; By: De Muth, Roger.
* Gobble it up! : a fun song about eating!; By: Arnosky, Jim
* What do you know about food chains and food webs? By: Slade, Suzanne.
* Trout are made of tree; By: s Sayre, April Pulley
* The world of food chains with Max Axiom, super scientist; By: O'Donnell, Liam
* Scholastic's The magic school bus gets eaten : a book about food chains; By: Relf, Patricia
* Gets eaten [videorecording] Cole, Joanna

Bibliography:

Books:

 Foresman, Scott. Scott Foresman Science. Illinois: Pearson Education, Inc, 2006.

 Lauber, Patricia. Who Eats What? New York, NY. Harper Collins Publishers, 1995

Websites:

United Streaming. 2009 Discovery Education. July 29, 2009. <http://streaming.discoveryeducation.com/>