Flow of Energy

**Direct Instruction Lesson**

Freshman Biology

**Preplanning Tasks**

TEKS: 12C Analyze the flow of matter and energy through the trophic levels using various models, including food chains, food webs, and ecological pyramids

Objective: SWBAT-> demonstrate the flow of energy in an ecosystem by creating their own correct, five-step food chain with an autotroph and four of the heterotrophs.

Objective rationale: The energy we get from our food originally comes from the sun and different trophic levels. Since we cannot make our own energy then we have to consume it and this lesson will show where we can get our energy.

**Content Analysis**

Definition: Energy is needed to fuel the power of life’s processes. The energy is taken from the sun and flows from the organisms that use solar energy to the organisms that eat other organisms to gain their energy.

Critical attributes: Organisms can produce food by using either solar energy or chemical energy. Energy flows up the trophic levels. Only part of the energy goes to the next trophic level.

Related concepts: Ecology, cycles of matter

Materials: Blank note sheets, food chain and web cards

Room Arrangement: Whole class instruction so regular seating will work best.

**Lesson Setup**

Gain Attention: “eyes” or “pineapple”

Behavior expectations: Eyes and ears on me, participate in AP (pair and share)

**Lesson Opening**

State objective: Today we will learn about the flow of energy in three examples; food chains, food webs, and ecological pyramids. At the end you will have to construct your own food chain and web.

State purpose: The energy we obtain from our food did not originate there, it was first made by the producers and then probably followed a long chain of consumers before it got to you

Activate Prior Knowledge: Bell ringer-> From our previous lessons, describe what an autotroph and heterotroph is, and give two examples for each.

**Lesson Body**

AP=fill in the blank note taking

Explanation: Students will follow along during the lecture and fill in the blanks on a note sheet handed out.

Subject matter outline:

Energy is needed to power life's processes

* Sunlight is the main energy source for life
* Autotrophs use the energy from the environment to make inorganic compounds into complex organic compounds for food.

AP=in journals, list two examples of producers

* Autotrophs are sometimes called producers because they make their own food

Some organisms gain energy from the sun or inorganic chemical compounds

* Photosynthesis
* Chemosynthesis is the process used by some organisms that uses chemical energy to produce carbohydrates.

Heterotrophs are organisms that rely on other organisms to obtain their food and energy.

AP=pair and share

* Heterotrophs are also called consumers (AP- pair and share examples)

There are different types of heterotrophs

* Herbivores get energy by eating plants (cows, caterpillars, deer)
* Carnivores get energy from eating animals (snakes, dogs, owls)
* Omnivores eat both plants and animals (humans, bears, and crows)
* Detrivores feed on dead matter or detritus (mites, earthworms, snails, and crabs)
* Decomposers break down organic material (bacteria and fungi)

The flow of energy in an ecosystem is one directional, from the sun to the producers to the various consumers.

Food chains are series of steps in which organisms transfer energy by eating and being eaten. (Algea->Zooplankton->Small Fish->Squid->Shark) (VS- diagram of a food chain on the ELMO)

VS= food chain diagram

Food webs are networks of complex feeding relationships between various organisms in an ecosystem. (VS- diagram of a food web on the ELMO)

* Food webs link all the food chains in an ecosystem together.

VS= food web diagram

Each step in a food chain or web is called a trophic level.

* Only part of the energy in a trophic level is passed on to the next one.

VS=ecological pyramid

Ecological pyramids show the amount of energy or matter in an ecosystem. (VS- diagram draw on the smart-board)

* Definition: A diagram that shows the relative amount of energy available in each tropic level of a food chain or web
* There are three types of ecological pyramids: energy pyramids, biomass pyramid, pyramid of numbers
* Biomass is the total amount of living tissue within a tropic level
	+ Represents the potential amount of food available for each tropic level in an ecosystem.

Supervised Practice: Food chain cards and drawing an ecological pyramid

* Separate the cards into three like piles
* Use the arrows and the words to put the trophic levels in order (walk around to CFU).  Students write this down in their journal; turn journal horizontal and write it right in the middle of the page.
* Demonstrate food chain on smart board and write examples above each, such as sunlight, autotrophs, and heterotrophs.
* Now students place the cards with a picture under the words to make a visual food chain.  Students will either draw or write those examples under their food chain in their journals (walk around for CFU).
* Draw an energy pyramid on the board with the examples.  Then have the students create their own energy pyramid with their examples (walk around for CFU)

**Lesson Closing**

Review key concepts:

* Energy is taken from the sun and used by producers and then producers are eaten by consumers in food chains
* The amount of energy decreases as you go up the energy pyramid, and it is one directional

Have student pairs share their food chains they developed in the supervised practice.

Ask the students to find possible food chains around their area and write it down on a piece of paper and turn it in the following class.

**Evaluation**

Students will create their own five-step food chain in their note section of their journal using an energy source, a producer, and four consumers. I will go around checking them off my list if they have completed it correctly. A correct example would have all the components, in order from the energy source to the producer to the primary consumer and so on until they reach the quaternary consumer.

**Editing Tasks**

Write in critical management skills

Check for useful and effective universal and selected instructional interventions

Evaluate congruence

Energy Flow Notes

Energy Flow

Key terms: autotrophs, producers, photosynthesis, chemosynthesis, heterotrophs, consumers, food chains, food webs, tropic level, ecological pyramids,

Energy is needed to power life's processes

* is the main energy source for life
* use the energy from the environment to make inorganic compounds into complex organic compounds for food.
* Autotrophs are sometimes called because they make their own food

Some organisms gain energy from the sun or inorganic chemical compounds

* is the process where plants take sunlight energy and use it to produce food
* is the process used by some organisms where chemical energy used to produce carbohydrates.

 are organisms that rely on other organisms to obtain their food and energy.

* Heterotrophs are also called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

There are different types of heterotrophs

* get energy by eating plants (cows, caterpillars, deer)
* get energy from eating animals (snakes, dogs, owls)
* eat both plants and animals (humans, bears, and crows)
* feed on dead matter or detritus (mites, earthworms, snails, and crabs)
* break down organic material (bacteria and fungi)

The flow of energy in an ecosystem is , from the sun to the producers to the various consumers.

 are series of steps in which organisms transfer energy by eating and being eaten. (Algea->Zooplankton->Small Fish->Squid->Shark)

 are networks of complex feeding relationships between various organisms in an ecosystem.

* Food webs link all the food chains in an ecosystem together.

Each step in a food chain or web is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_.

* Only part of the energy in a tropic level is passed on to the next one.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ show the amount of energy or matter in an ecosystem.

* Definition: A diagram that shows the relative amount of energy available in each tropic level of a food chain or web
* There are three types of ecological pyramids: energy pyramids, biomass pyramid, pyramid of numbers
* Biomass is the total amount of living tissue within a tropic level
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Formative assessment

What are two forms of energy that power living systems?

Describe the flow of energy among organisms in an ecosystem.

Is all the energy from one tropic level transferred to the next?

Draw an energy pyramid for a five-step food chain.  How much energy is at the last tropic level if you originally started with 100%?