**Energy Flow In A Food Chain Game Lesson**

* HOOK: Show students the video of a hamburger commercial. <https://www.youtube.com/watch?v=5XDnQqVTtbY>
	+ Ask students:
		- Would that hamburger give me energy? Why? Where did it the energy come from?
		- List al of the items on the hamburger. Go over the list of items.
		- Can you trace each item on the hamburger back to the sun?
	+ Students will meet with shoulder partner to discuss each item.
	+ Discuss each item as a whole group relating each item back to the sun. Review photosynthesis and how the sun’s energy is converted to chemical energy (stored in food). Review vocabulary words:

food chain, producer, consumer, decomposer, herbivore, carnivore, and omnivore

* + Why would having energy be important to a living thing? What do living things need to survive? Why do engineers think it’s important to study energy pyramids?
* Today we are going to play a game and model the transfer of energy between organisms in the same ecosystem.

1. Write the small food chain of a plant, mouse, and snake on the board. Discuss with students which organism is a producer/ consumer and which one is an herbivore/carnivore.

2. Place students in one line. Give every other student a small white cup. The students with a cup will step to the side in one group. These students are representing the plants/producers of energy.

3. The students without a white cup will need to be split in half. One half of the students will be given a medium red cup. These students will represent mice. The other half of these students will receive a large black cup. They will represent the snake.

4. Put some Cheerios in each of the small white cups. The amount of Cheerios in each cup doesn’t matter. Don’t worry if you spill any on the ground either. Explain to the students that the Cheerios are now being stored in the plants/producers of the food chain (the white cups). (Cheerios = energy).

5. The object of the game - The mice (the students with the red cups) are to tag one of the ‘plants/producers of energy’ (students with the white cups). When they do, they will pour the cheerios into their medium red cup. Before time is called (1-2 minutes), they must have at least half of their red cup full to have enough energy to ‘stay alive.’

6. Next, the snakes (the students with the black cups) must tag a mouse (a student with a red cup) and put their cheerios in their large black cup. Option: The teacher has the power to point to any organism (red or black cup) and that organism will get sick and die. At this point only the plants/producers (the students with the white cups) can collect the snake or mouse energy because they use dead organisms’ compost as nutrients to grow.

7. At the end of a round, one person can tally how many plants/producers, mice, and snakes are still alive with at least half of their cup full of Cheerios.

8. You can play another round. Option #2: The teacher can assign any dead organism to become a hawk. The hawk can be given an extra-large blue cup to fill up. The hawk can eat the snake (black cup) or the mouse (red cup).

* Students will fill in the data chart in their STEM notebooks.

Discussion:

* Discuss with students that many organisms were not able to survive because there wasn’t enough energy. Help students identify reasons for insufficient energy. Reasons could include not enough energy (Cheerios) available at the beginning of the food chain (too few plants/producers to convert solar energy to energy in food), and loss of energy by organisms (Cheerios spilling out of their cups) when running around trying to get food. Remind the class that it takes energy to get energy and organisms use energy for other life processes. This energy eventually leaves the organism in the form of heat and is unavailable to the next organism in the food chain.
* Discuss what changes to the game would have to be made to make the food chain more sustainable. Help students understand that because energy is lost at each link of the food chain, there needs to be enough energy at the beginning so that there is still enough energy remaining in the system after the necessary losses. Remind students of the budget. Emphasize that reducing the loss of energy at each link is not possible because animals can only digest certain portions of what they eat and they must use energy to get energy
	+ Students should conclude that there must be more producers than primary consumers, and more primary consumers than secondary consumers. Ask students how many plants (small cups), primary consumers, and secondary consumers there should be at the beginning of the game. Record their suggestions in the chart in the column “Round 3” under “Beginning.” Add cups and arrange students accordingly.
* Draw the simple food chain used during the game on the board. Discuss all parts of the food chain.
	+ Discuss with students the following questions,
		- What is an energy pyramid?
		- Where does the energy for an energy pyramid come from?
		- How does the energy flow within the pyramid?
		- What has the most and what has the least amount of energy?
* Students will complete both discovery stations and read an article on the energy pyramid, as well as watch a video on the energy pyramid. Discuss both the article and video at table groups then as a whole group.
* Students will complete the formative assessment as an exit ticket in the STEM Notebooks.
	+ Here is a list of organisms in the same ecosystem. Draw an energy pyramid using these organisms.
		- Shark, Shrimp, Tuna, Algae, Squid
	+ Using the energy pyramid you just drew, explain which organism has the least energy and which organism has the most energy and why. Why do you think knowing how the energy pyramid works is important to scientists and engineers? How could they use this information in a helpful way?
* Have two students share why engineers think it is important to study energy pyramids.