



DragonBall Z Food Webs

Lesson Topic
Energy Transfer

RIEL Biology Element
Funds of Knowledge

Time Required
One 50-minute class period

Standards Addressed
SC.912.17.9 Use of food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels

Science and Engineering Practice
Developing and using models.

Content Learning Objectives
Students will be able to diagram food chains and food webs and determine how important each organism is to a food web's stability.

Lesson Summary

Students will use DragonBall Z characters to determine how energy is transferred in a food web and food chain. Then students will calculate the energy transfer among the trophic levels in the energy pyramid.

***Note:** This lesson connects to and leverages student funds of knowledge related to Anime and DragonBall Z and is presented as a model for how these student funds of knowledge can be used when structuring activities in ways that connect to emergent bilingual students' interests. Ideally, teachers will utilize the included Student Self-Portrait Activity to access their students' funds of knowledge and modify this lesson to leverage those interests when designing and structuring the activities.*

Materials

- 1 set of Dragon Ball Z organism cards per group (15 cards)
- Producer, Primary consumers, Secondary consumer, Tertiary consumers labels
- Calculator
- Student Journal worksheets, 1 per student

Before the Activity

Cut and laminate one set of DragonBall Z organism cards for each student group. Distribute the card sets and student journals to students.

Lesson Activities

Engage:

1. **Introduce Ecosystems:** Students will watch an [anime video on an ecosystem](https://www.youtube.com/watch?v=ggSiX1mJcME) to relate the lesson to learning objectives.

Explore:

1. **Introduce the Activity:** Present the students with the anime animals from the DragonBall Z Organism Cards. Tell students that these animals behave similarly to their earth animal counterparts and eat/are eaten by similar animal types. Explain that they will use these animals to construct a food web and explore how energy is transferred through that web.
2. **Identify Producers/Consumers:** Have students read each Organism Card and then determine if the organism is a producer or a consumer.
3. **Sort Consumers:** Next, instruct students to sort the consumers into four groups: primary consumer, secondary consumer, tertiary consumer, and quaternary consumer. Have students record their answers in their Student Journals.

Explain:

1. **Develop Food Chain Model:** Instruct students to construct a food chain using the producer and consumer cards at their table and the information they just gathered by sorting the cards. In their Student Journals, have students sketch one food chain using the organisms from the cards.
2. **Develop Additional Food Chain Model:** Have students reconstruct the food chain and sketch another food chain using at least one of the same organisms from step three. Students continue reconstructing and recording until they have at least three connected food chains.

Anime Video URL:

<https://www.youtube.com/watch?v=ggSiX1mJcME>

Content Learning Objectives cont.

Students will be able to calculate the energy and matter flow through the trophic levels.

Teacher Notes

Ask the students the following questions during the lesson:

- What is the difference between a food web and food chain?
- What are the trophic levels?
- What is the importance of decomposers in an ecosystem?
- What are the various types of heterotrophs? Can you provide me with an example in the DragonBall Z world and in real life?
- How would you use a food web to identify and distinguish between producers, consumers, and decomposers?
- Why is an energy pyramid used to model energy transfer through trophic levels?
- Make a distinction between autotrophs and heterotrophs

Teacher Notes cont.:

- Predict what would happen to a food web if the sun were no longer available in DragonBall Z

Assessments:

- Students are assessed on their knowledge of the content standards with a 3-question mini-assessment
- Students will be assessed on their knowledge of trophic levels in part I of their student journals for correct responses
- Students will be assessed on their knowledge of energy transfer on part II of their student journals for correct responses

Evaluate

1. **Assessment:** Students will be assessed on their knowledge of the content standards with a 3 question mini-assessment in the Student Journal. The questions are styled similarly to the Florida End of Course Exam (EOC) to measure the benchmark assessed on the EOC.

Elaborate:

1. **Ask students to recall:** Instruct students to recall what they know about food webs and food chains. Write the information on the board and ask a series of broad questions to get them thinking about the trophic levels.
2. **Identify trophic levels:** Instruct students to label each section of the pyramid in their Student Journals with the correct trophic level.
3. **Identify energy levels of producers:** Tell students to add up the total amount of energy for all of the producers. They should then record this in their Student Journals in the appropriate area of the provided energy pyramid. The amount of energy available for each organism is labeled on the organism cards.
4. **Calculate total energy:** Students add up the total energy available for the primary consumers and record it in their Student Journals in the appropriate area of the energy pyramid provided. Have students repeat this step for the remaining trophic levels.
5. **Calculate energy loss:** Have students calculate the energy loss at each trophic level.
6. **Practice calculations:** Instruct students to complete the additional calculations in Part II of their Student Journals.

Extend:

1. **Relate to real ecosystems:** Assign each student one non-fictional organism and instruct students to arrange themselves in the classroom to create a group food web.



2. **Lead a class discussion:** Have students come back together and discuss how a real food web relates to the DragonBall Z by discussing the following prompt: *What are some things that you can conclude for the ecosystems involved in food webs and food chains?*



Name: _____

Date: _____

Organism Cards

Dragon Ball Bamboo

(*Elymus glaucus*)



Bamboo is a common plant that produces a large amount of seeds and grows rapidly. This plant can grow over 1 meter high and is a main source

of food for herbivores in open plains areas. It produces its energy from the sun through photosynthesis

Total Energy:
5000 KCal

Skunk

(*Mephitis mephitis*)

Skunks are omnivorous, meaning they eat both plants and animals. They will eat many things, including insects, bird eggs, and small rodents, as well as seeds, nuts, and berries. Because skunks are omnivores, they can actually be classified in more than one trophic level.



Total Energy:
91 KCal

Western Crows

(*Sturnella neglecta*)

This relative of the blackbird is common on the prairies. The western crow feeds on seeds and insects and will use the tall prairie grasses to build nests on the ground. Because they are omnivores, they can actually be classified in more than one trophic level.



Total Energy:
75 KCal

DragonBall Z Grass

(*Panicum virgatum*)

This hardy grass is common on the prairie. It has deep roots and coarse leaves to help it survive drought and other unfavorable conditions. It produces its energy from the sun through photosynthesis.



Total Energy:
5000 KCal

Common wolf

(*Canis donbe*)

Wolves are superior hunters and usually work in packs. They are a very common species in the Dragon World and have the same features as their real life counterparts. Wolves will eat many things, but prefer small mammals. They have been observed targeting ground-nesting birds.



Total Energy:
1.5 KCal

King Kai's Cricket

(*Neocurtilla hexadactyla*)

Mole crickets can be found throughout the world. They are about 20 mm long and have powerful legs. Their back legs are useful for jumping, and their strong front legs help them burrow in the soil so they can eat underground stems and roots.



Total Energy:
518 KCal



Name: _____

Date: _____

Organism Cards

Paradise Herb (Gokuraku Sou)

Paradise Herb is an herb found only in the Forest of Terror. It can apparently increase a person's lifespan as, after eating some of it. It produces its energy from the sun through photosynthesis .



Total Energy:
8000 KCal

Pilaf Orbweaver (Araneus trifolium)

Even though these spiders have poor vision, they are experts at catching small insects for dinner! These spiders appears inside Pilaf's Castle in "The Dragon Balls are Stolen



Total Energy:
20 KCal

Giant Snake (Sistrurus catenatus)

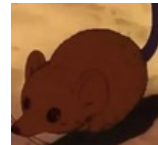
These giant snakes are extremely aggressive and poisonous. The giant snake will eat during the day in the spring and fall, but in the heat of the summer, it hunts at night. This snake prefers small rodents, frogs, and lizards.



Total Energy:
23 KCal

Pirate Mouse (Peromyscus maniculatus)

Named after where these mice were first found, Pirate cave, the pirate mouse now can be found in most places around the World. They are nocturnal animals and eat a variety of roots, fruit, and small arthropods if seeds are not available. Since these mice eat a variety of things they are classified as more than trophic level



Total Energy:
60 KCal

Hikou Hawk (Buteo jamaicensis)

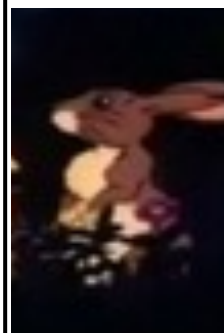
The Hiko hawk is a carnivorous bird of prey. These birds prefer small mammals but will also eat snakes and small birds.



Total Energy:
1 KCal

Eastern Cottontail (Sylvilagus floridanus)

Eastern cottontails first were found where Gohan and his friend like camping, they spend most of the day resting, and tend to eat grasses and herbs when visibility is limited. Sweet grasses and clover are the cottontail's favorite diet.



Total Energy:
954 KCal



Name: _____

Date: _____

Organism Cards

The tree of might

(*Shinseijū syriaca*)

This tree produces the fruit of the Tree of Might after enough energy and life force is absorbed through the sun, but like a regular plant, it needs a suitable atmosphere to survive (such as Earth's). As such, large amounts of energy from the sun are required to supply the fruit's growth.



Total Energy:
6500 KCal

Vampa Beetle

(*Goliamites auratus*)

These are found on the planet Vampa and are capable of sucking out nutrients from living beings such as fruits from the tree of might or the surrounding beets. These beetles lay eggs in the dragon ball grasses and the pupae feed on the roots.



Total Energy:
465 KCal

Mount Paozu Butterfly

(*Hesperotettix viridis*)



The Mount Paozu Butterfly is an insect that gains sustenance from tree sap and will also eat the nectar from the flower that bears the fruit in the tree of might.

Total Energy:
533 KCal



Name: _____

Date: _____

Student Journal: Explore

Part I: Food Chains and Food Webs

1.

List the Producers

List the Consumers

Primary
Consumers

Secondary
Consumers

Tertiary
Consumers

Quaternary
Consumers

2. Sketch a food chain. Use the arrows to indicate the transfer of energy from one organism to another.



energy
→

energy
→

energy
→

3. Label the processes that occurring in your food chain.
- Photosynthesis
 - Cellular respiration
 - Loss of by heat



Name: _____

Date: _____

Student Journal: Explain

Reflections and Conclusions

1. What is a food web?

2. What are trophic levels?

3. What is the importance of decomposers in an ecosystem?

4. Explain the various types of heterotrophs and provide an example of each.

a. Herbivores –

b. Carnivores –

c. Scavengers –

d. Omnivores –

e. Detritivores –

f. Decomposers –

5. How would you use a food web to identify and distinguish between producers, consumers, and decomposers

6. Can one organism be included in more than one trophic level? Explain.

7. Predict what would happen to a food web if the sun were no longer available.

8. Draw a five-step food chain that represents a marine

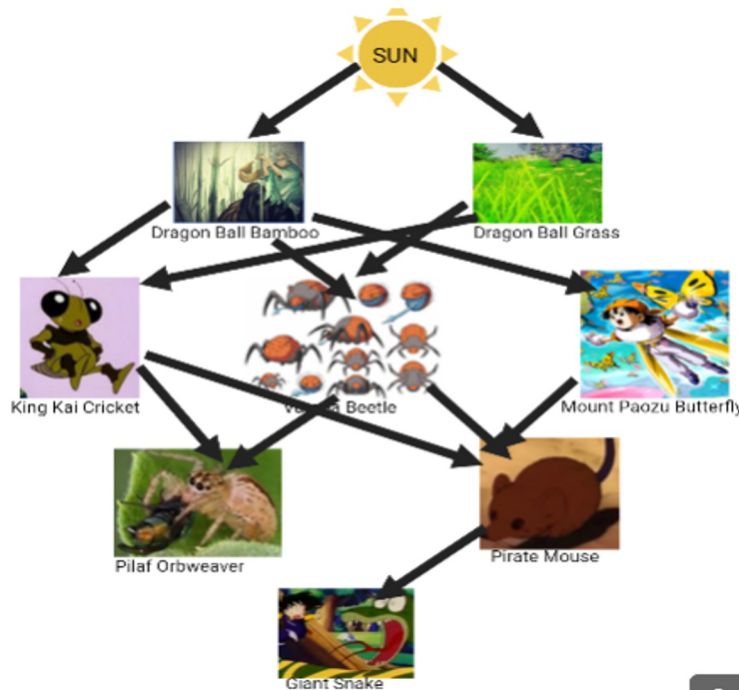


Name: _____

Date: _____

Student Journal: Evaluate

- Which of these organisms would most likely be found at the top of a food chain?
 - Vampa Beetle- a primary consumer
 - Pirate Mouse- a primary consumer and secondary consumer
 - Hikou Hawk- a secondary and tertiary consumer
 - Paradise Herb- a primary producer
- The framework of organic molecules essential to all organisms is composed mainly of carbon atoms. Which processes are involved in the cycling of carbon within an environment?
 - photosynthesis and respiration
 - evaporation and condensation
 - transcription and translation
 - diffusion and transpiration



- A food web diagram is provided. Based on the diagram, it is reasonable to conclude that energy could follow which of the following paths as it cycle through this ecosystem?
 - The Sun→ Dragon Ball Grass→ Dragon Ball Bamboo
 - Giant Snake→ Pirate Mouse→ King Kai Cricket
 - Dragon Ball Bamboo→ King Kai Cricket→ Pirate mouse
 - King Kai Cricket→ Pirate Mouse→ Dragon Ball Bamboo

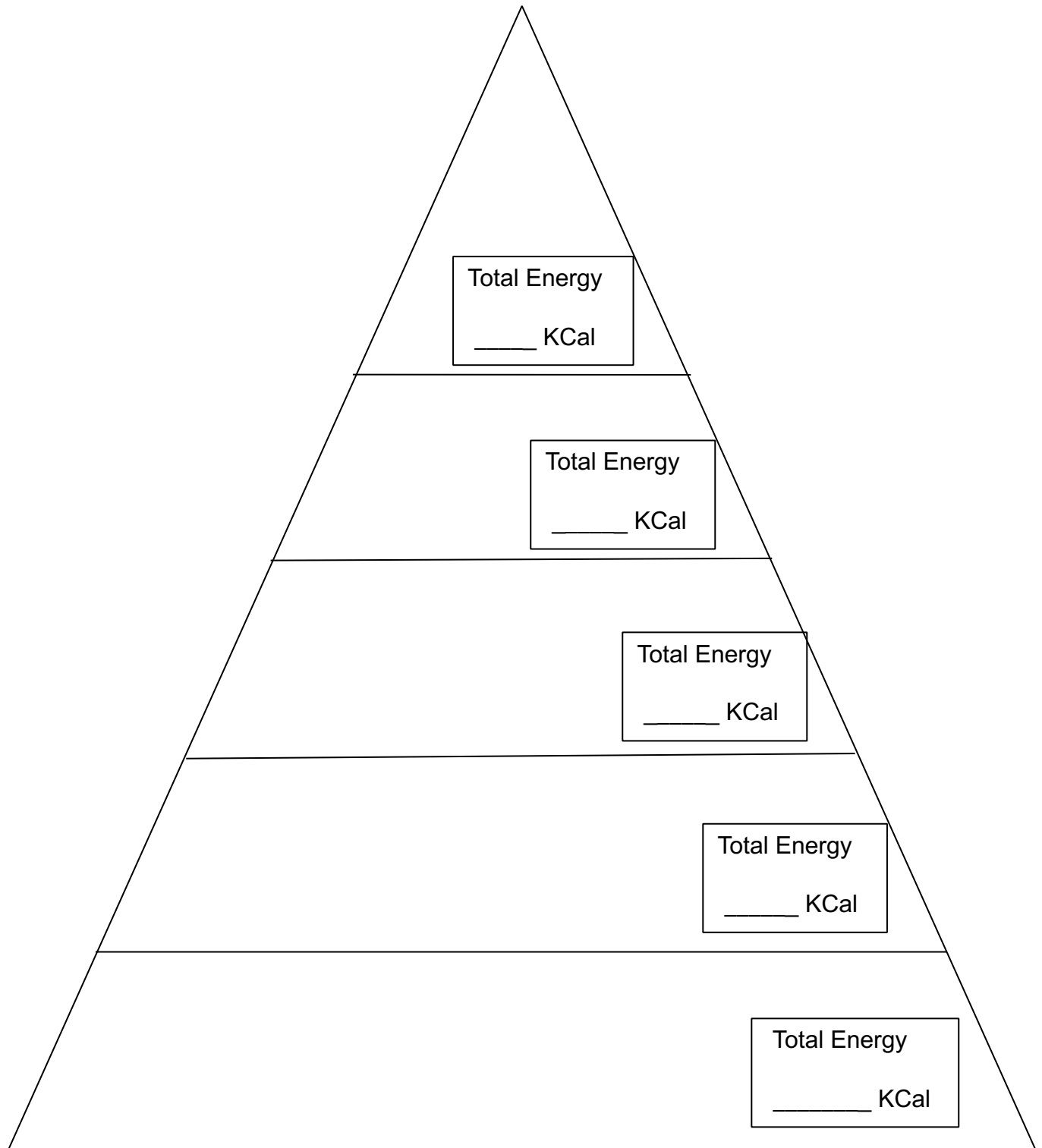


Name: _____

Date: _____

Student Journal: Elaborate

The Ecological Pyramid





Name: _____

Date: _____

Student Journal: Elaborate

Calculate the energy lost and energy available at each trophic level.

Example: Let's say a producer (oak tree) has 5,000 KCal available. The primary consumers feeding on the tree have 490 Kcal available. How much energy (%) was **lost** between the producer and the primary consumers? How much energy is **available** for the primary consumers?

Producer Energy 5000 KCal

—

Primary Consumer Energy 490 Kcal

= 4510

KCal

$4510 \text{ KCal} \div 5000 \text{ KCal} = .902$
(total energy)

$.902 \times 100 = 90.2\%$ **Energy Lost**

Energy Available:

$100\% - 90.2\% = 9.8\%$ **Available Energy**



Name: _____

Date: _____

Elaborate Student Journal

Your Turn! Calculate energy lost and the available energy for each trophic level. Use the example, if needed.

Producer Energy	_____ KCal
—	
Primary Consumer Energy	_____ KCal
=	_____ KCal
_____ KCal	÷ _____ KCal (total energy) = _____
_____ X 100 = _____ %	Energy Lost
Energy Available:	
100% - _____ = _____ %	Available Energy

Primary Consumer Energy	_____ KCal
—	
Secondary Consumer Energy	_____ KCal
=	_____ KCal
_____ KCal	÷ _____ KCal (total energy) = _____
_____ X 100 = _____ %	Energy Lost
Energy Available:	
100% - _____ = _____ %	Available Energy

Secondary Consumer Energy	_____ KCal
—	
Tertiary Consumer Energy	_____ KCal
=	_____ KCal
_____ KCal	÷ _____ KCal (total energy) = _____
_____ X 100 = _____ %	Energy Lost
Energy Available:	
100% - _____ = _____ %	Available Energy

Tertiary Consumer Energy	_____ KCal
—	
Quaternary Consumer Energy	_____ KCal
=	_____ KCal
_____ KCal	÷ _____ KCal (total energy) = _____
_____ X 100 = _____ %	Energy Lost
Energy Available:	
100% - _____ = _____ %	Available Energy



Using the Self-Portrait Activity

The self-portrait is an activity teachers can use to access their students' funds of knowledge, or to become familiar with their students' lives outside of the classroom. The DragonBall Z Food Web activity can and should be modified to fit the interests of the students in your classroom.

Materials

- 1 self-portrait worksheet per student
- Optional: markers, colored pencils, or crayons

Instructions

1. Distribute self-portrait activity to students.
2. Tell students that you are interested in getting to know them better so that you can relate your science instruction to their lives. You may wish to consider completing your own self-portrait and sharing it with students, both to give an example and to help students get to know you better.
3. Give students approximately 20 minutes to complete the activity.
4. Collect students' completed self-portrait worksheets.
5. Review the self-portrait worksheets and look for common themes.



Name: _____

Date: _____

Self-Portrait Worksheet

Please follow the instructions to create a self-portrait, and then answer the questions below. You may write on the back of this paper if you run out of room.

1. In the rectangle below, create a self-portrait using drawings and/or words to represent who you are at this moment in time. Feel free to include any people, places, activities, or things that are important to you.

1. Use the space below to tell me about your self portrait
