Engage: Web of Wonders: Connecting the Dots in Our Ecosystem

INSTRUCTOR:
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Objective:

In this activity, you will create a visual representation of a food web to show how different organisms in an ecosystem are connected. You will demonstrate the flow of energy through these relationships and explore important ecological processes like photosynthesis, respiration, and the water and carbon cycles. You will also learn how both living (biotic) and non-living (abiotic) factors work together in an ecosystem.

Background Information:

An ecosystem is made up of many different organisms that interact with each other and their environment. These interactions form complex relationships that help maintain balance in the environment. Some organisms produce their own food (**producers**), some eat other organisms (**consumers**), and others break down dead plants and animals (**decomposers** and **detritivores**). Energy flows through these organisms in a process called a **food chain**, but in nature, these chains connect to form a **food web**.

- **Producers/Autotrophs** are organisms that can make their own food using sunlight, like plants or algae. They are the foundation of the food web because they provide energy for all other organisms - **Photosynthesis**.
- **Consumers/Heterotrophs** are organisms that get their energy by eating other living things. There are different types:
    - **Primary** consumers are herbivores (animals that eat plants).
    - **Secondary** consumers are carnivores (animals that eat other animals).
    - **Tertiary** consumers are apex predators, meaning they are at the top of the food web and have few or no natural predators.
- **Decomposers** are organisms like fungi and bacteria that break down dead plants and animals. They recycle nutrients back into the environment.
- **Detritivores** are animals like earthworms and vultures that eat dead plants and animals and help break them down.

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In addition to living organisms (biotic factors), ecosystems also include non-living factors (abiotic factors) like sunlight, water, air, and soil, which are essential for life to thrive.

Materials Needed:

- Picture cards of different organisms (producers, consumers, decomposers, and detritivores)
- Large poster paper, bulletin board, or wall space
- Markers, pencils, or pens
- Adhesive (tape, glue, or sticky tack)
- Yarn to show connections
- String or arrows (pre-made or drawn by students)

Instructions:

1. Preparation:

- Each group will receive a set of picture cards that represent organisms in an ecosystem (forest or ocean).
- Make sure your cards include a variety of:
    - **Producers** (e.g., plants, algae)
    - **Primary consumers** (e.g., herbivores)
    - **Secondary consumers** (e.g., carnivores)
    - **Tertiary consumers** (e.g., apex predators)
    - **Decomposers** (e.g., fungi, bacteria)
    - **Detritivores** (e.g., earthworms, vultures)
- Choose a spot on the poster or bulletin board where you will arrange your food web.

2. Building the Food Web:

- Look at your picture cards and figure out the role of each organism (producer, consumer, decomposer, or detritivore).
- Group the cards by their roles.
- Use arrows or yarn to connect the organisms. The arrows should point in the direction of energy flow (e.g., from a plant to an herbivore).

3. Incorporating Ecological Concepts:

- **Photosynthesis:** Label how producers use sunlight to create energy.
- **Respiration:** Show how organisms release energy from food.
- **Water and Carbon Cycles:** Show how decomposers and detritivores recycle nutrients and energy back into the system.
- Identify the **biotic factors** (living organisms) and **abiotic factors** (sunlight, water, soil) that affect the ecosystem.

4. Labeling and Detailing:

- Label each arrow with a brief description of the relationship (e.g., "Eaten by," "Consumes").
- Add a legend or key to explain any symbols, colors, or terms.
- Highlight the roles of the different levels in the food web: producers, consumers, and decomposers.

5. Collaborative Discussion:

As you build your food web, talk with your group about these questions:

- *What eats what in your food web?*
- *How are these organisms connected to each other?*
- *How do photosynthesis and respiration help energy flow in the ecosystem?*
- *What do decomposers and detritivores do to recycle nutrients?*
- *What would happen if one organism were removed from the food web?*

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6. Presentation:

Once your food web is finished, present it to the class. Explain:

- *How energy starts from the sun and flows through the producers.*
- *The roles of different consumers, decomposers, and detritivores.*
- *How the water and carbon cycles are important for supporting the ecosystem.*
- *How changes in the food web can affect the entire ecosystem.*

Reflection and Analysis:

After the presentations, reflect on the following questions:

1. **How does energy flow affect the health of an ecosystem?**
    - Sentence Stem: *"Energy flows through the food web starting with _____, which supports _____. Without this energy, _____."*
2. **How do biotic and abiotic factors work together to support life?**
    - Sentence Stem: *"Biotic factors like _____ and abiotic factors like _____ both help to _____."*
3. **What surprised you about the complexity of food webs and ecological cycles?**
    - Sentence Stem: *"I was surprised by _____ because _____."*

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Forest Food Web

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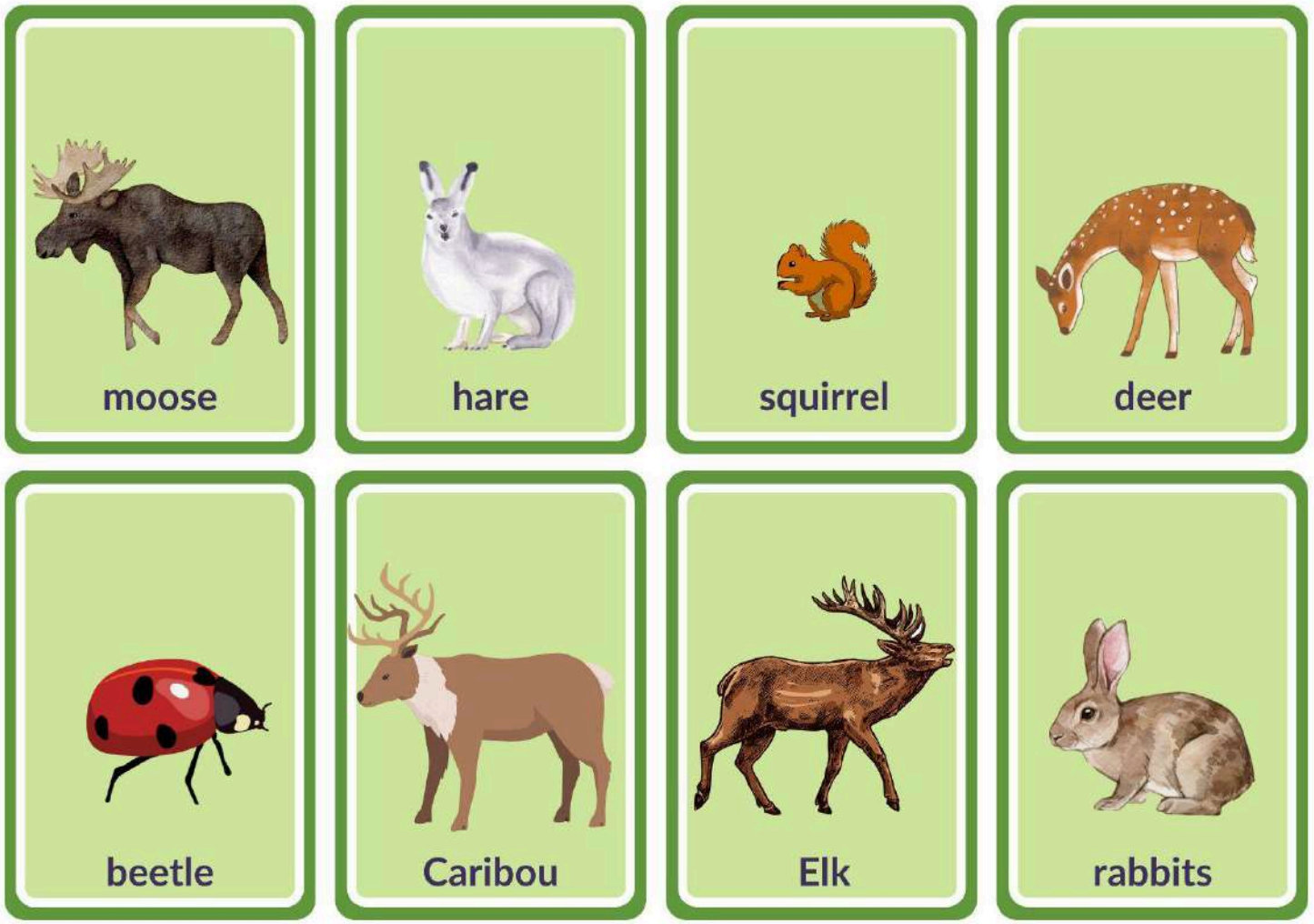

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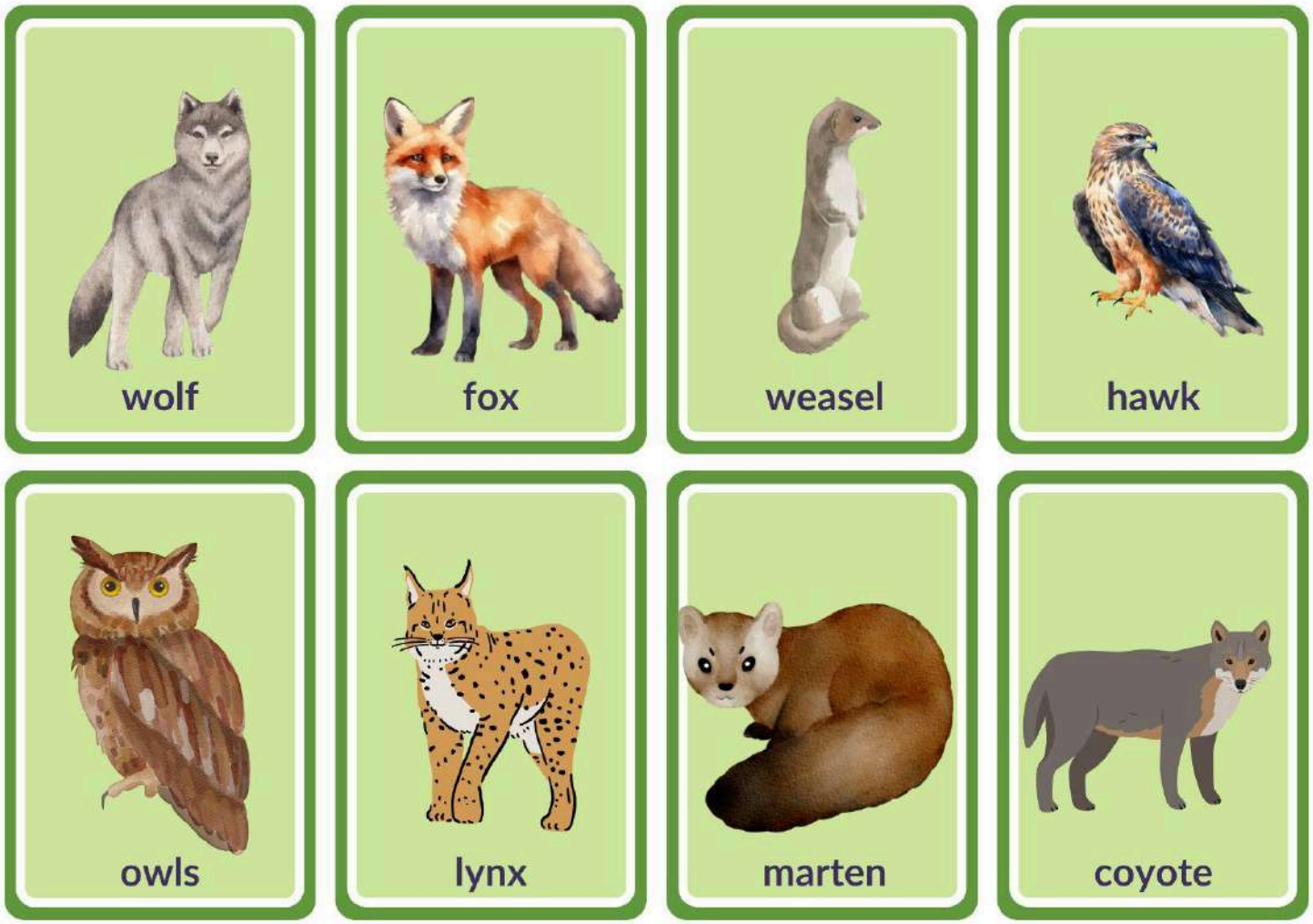

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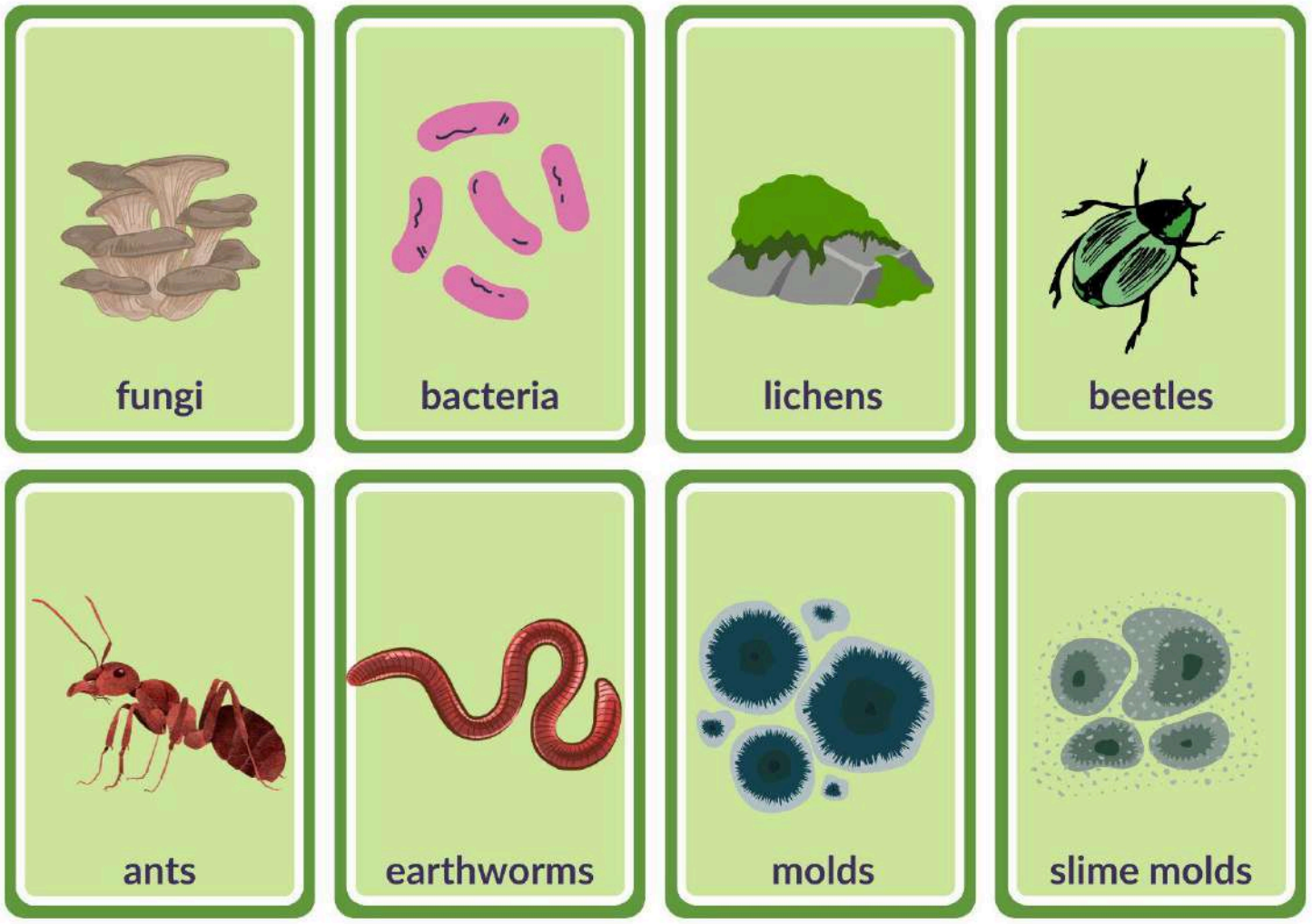

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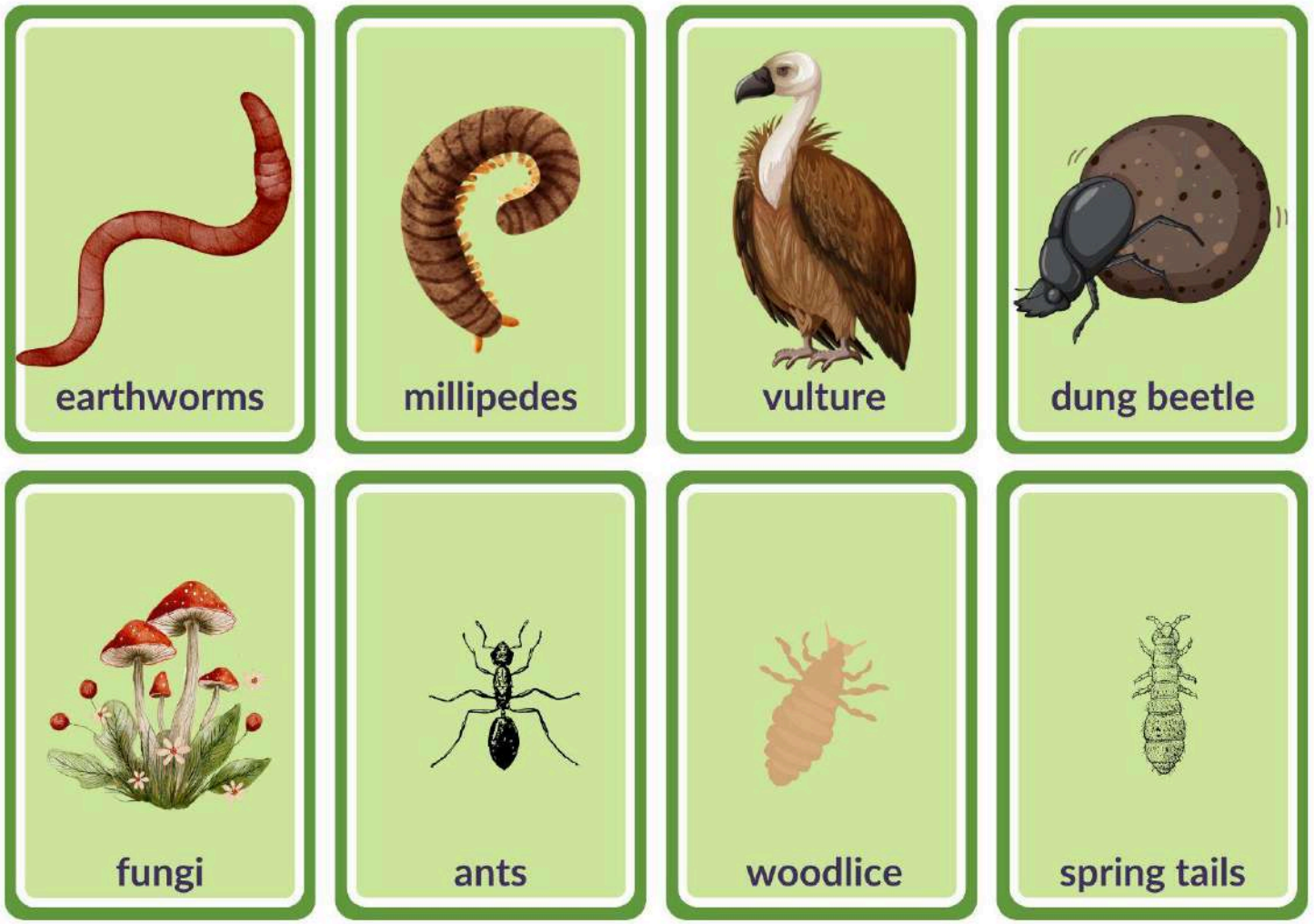

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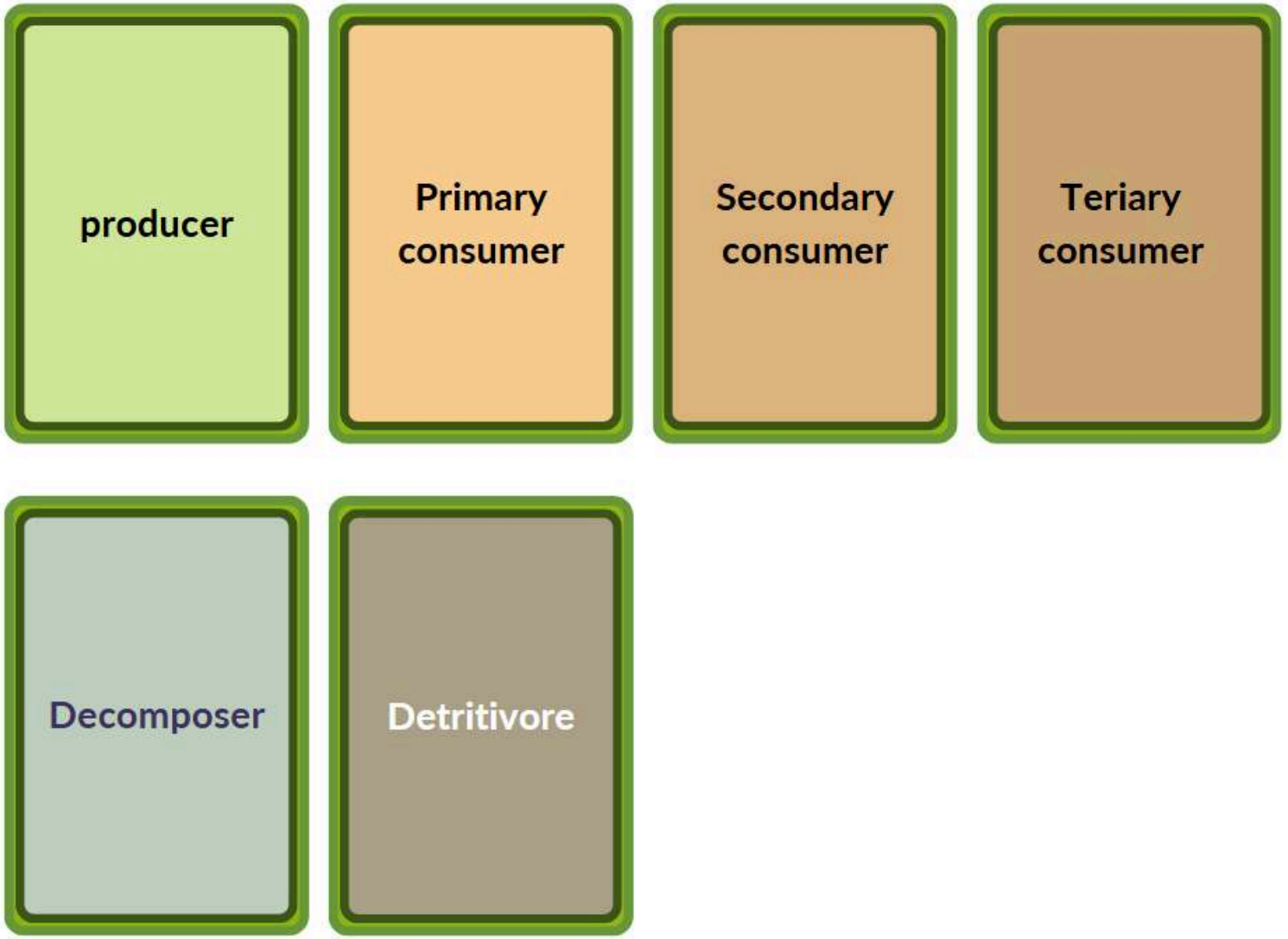

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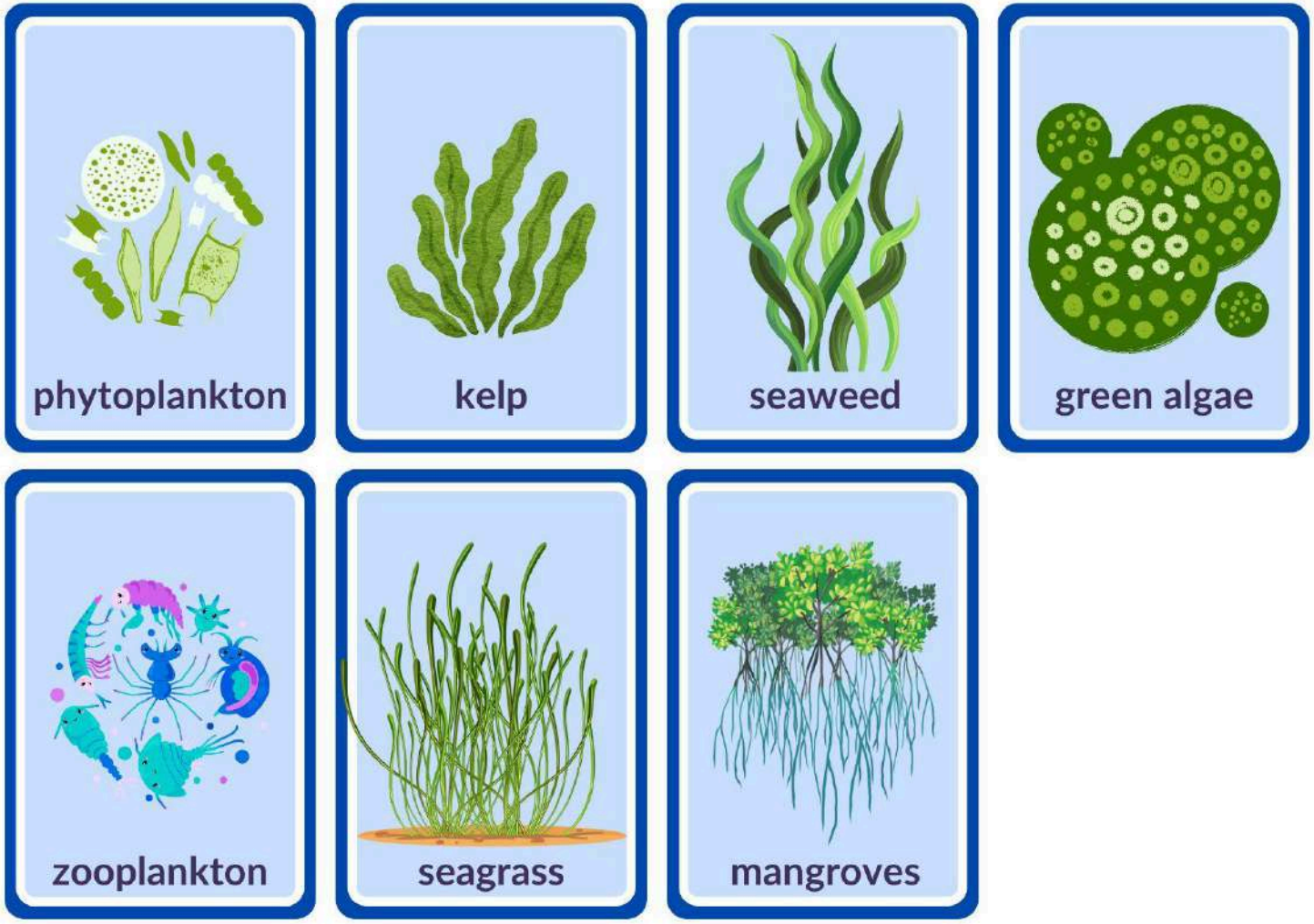
Marine Food Web



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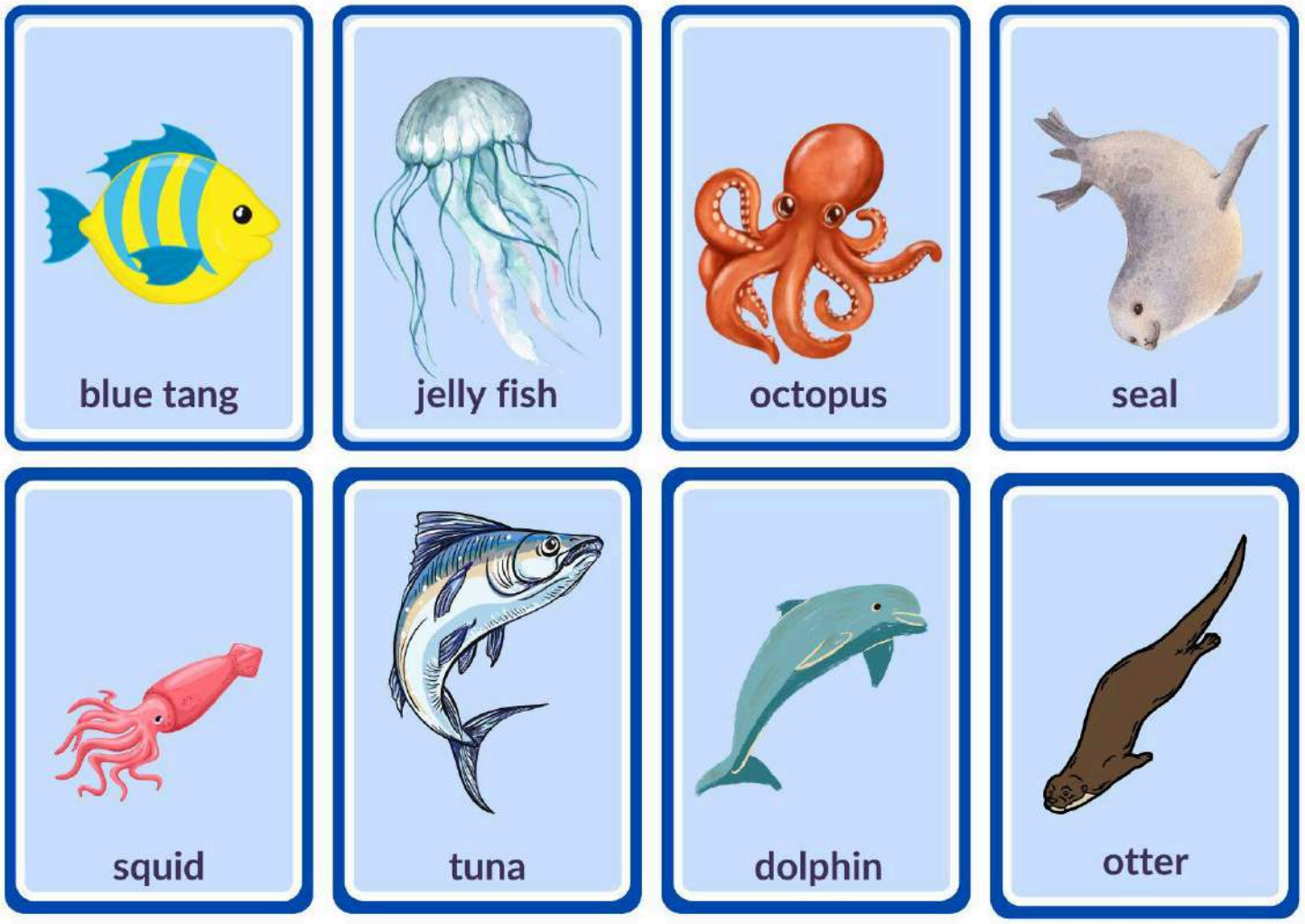

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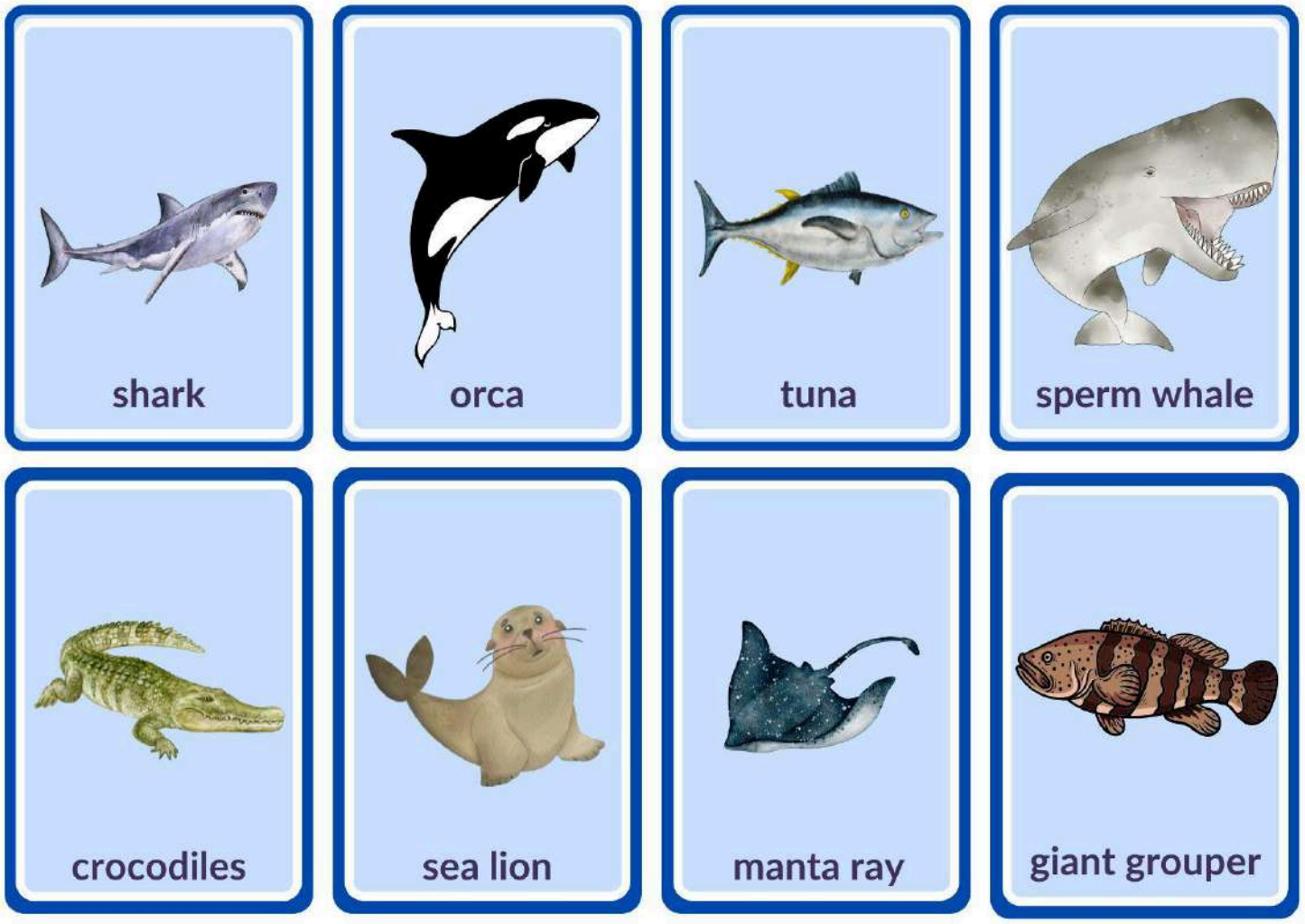

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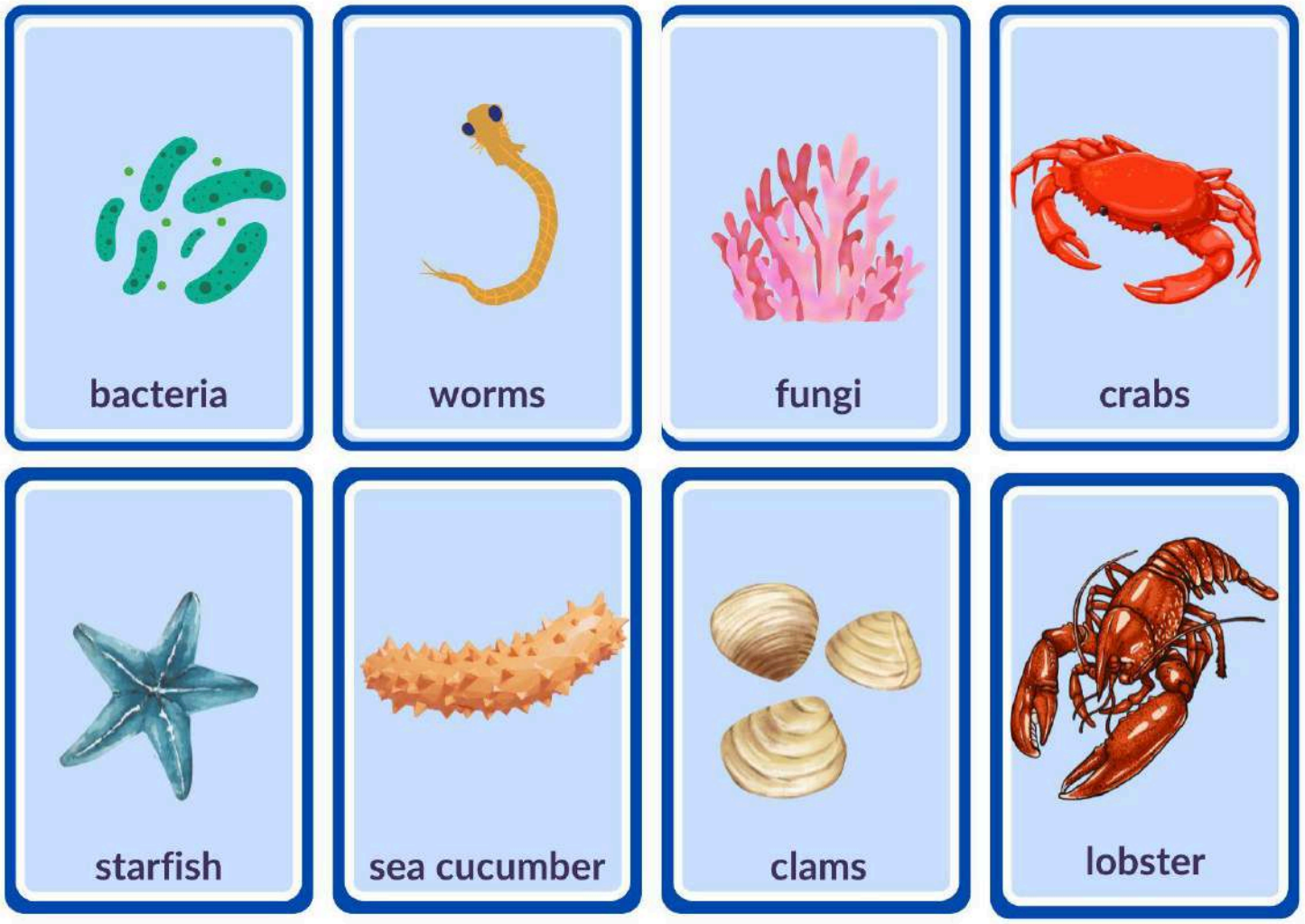

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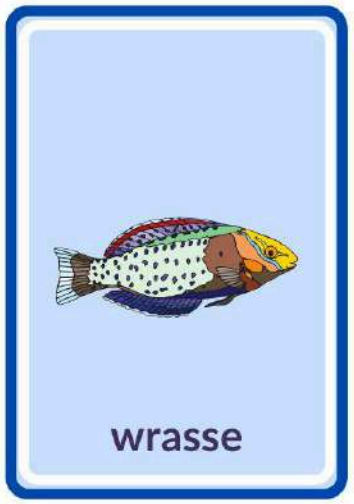

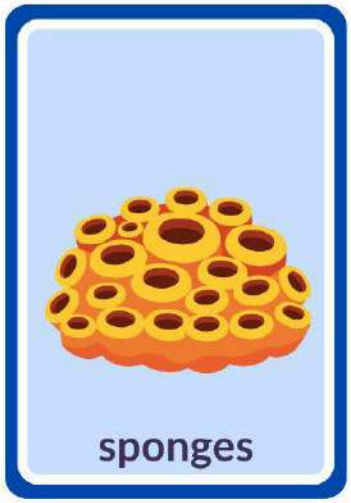

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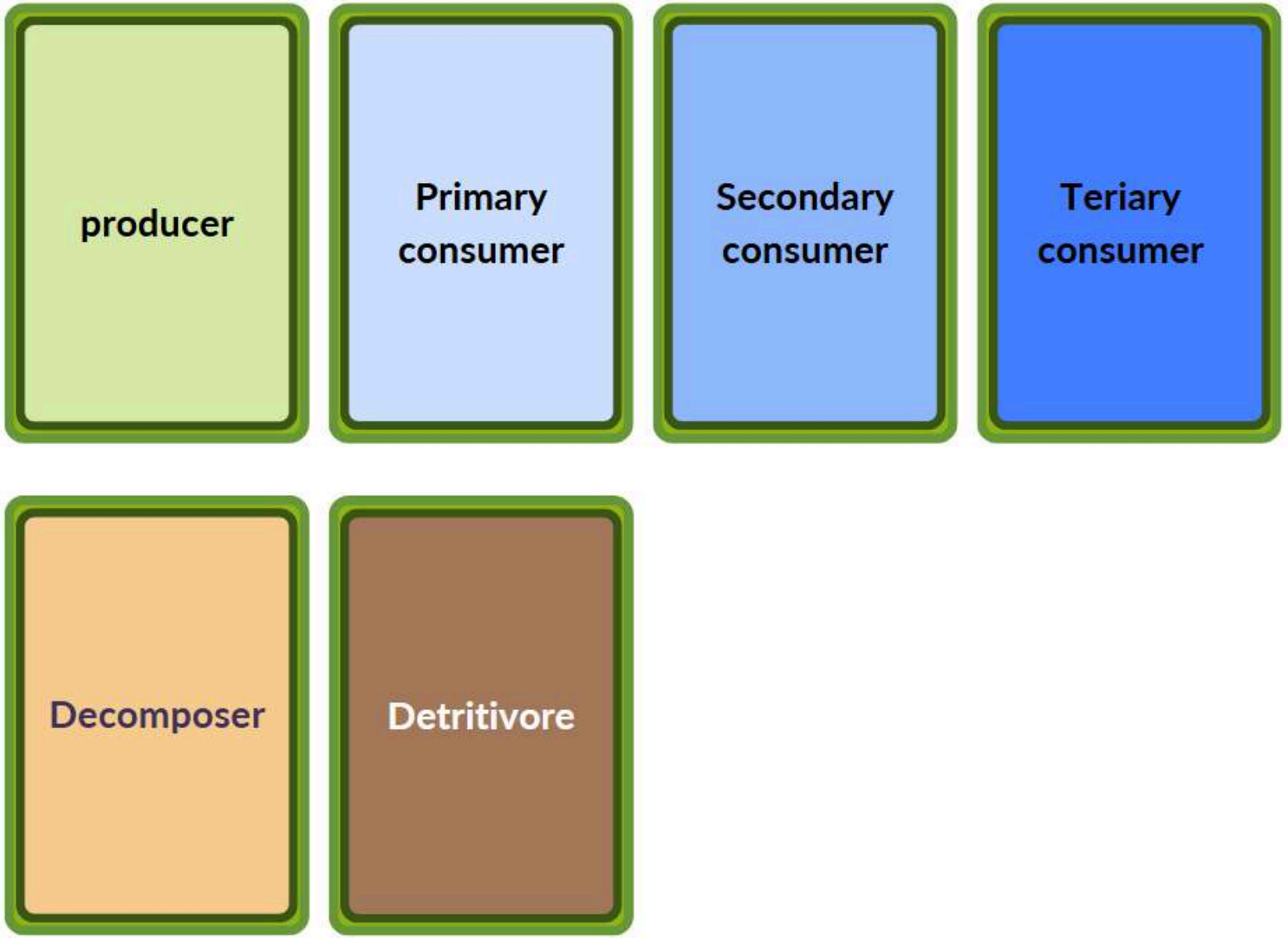

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Teacher Instructions for : Web of Wonders: Connecting the Dots in Our Ecosystem

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Objective:

Students will use picture cards to build a food web for both a forest and a marine ecosystem. The goal is to understand the relationships between producers, consumers, decomposers, and detritivores within each ecosystem and how energy flows through these connections.

Materials Needed:

- Picture cards representing organisms in both forest and marine ecosystems (producers, consumers, decomposers, and detritivores)
- Large poster paper or wall space to assemble the food webs
- Markers or pens for labeling and connecting cards
- Yarn to show connections
- String, arrows, or other connectors for indicating relationships
- Adhesive (e.g., tape or sticky tack) for affixing the cards to the poster or wall

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Instructions for Forest Ecosystem Food Web Cards:

1. **Preparation of Forest Ecosystem Cards:**
    - Prepare a set of picture cards that represent a forest ecosystem. The cards should include:
        - **Producers:** Pine trees, mosses, ferns, grasses, etc.
        - **Primary Consumers:** Deer, rabbits, insects, squirrels, etc.
        - **Secondary Consumers:** Foxes, hawks, weasels, etc.
        - **Tertiary Consumers:** Wolves, mountain lions, bobcats, etc.
        - **Decomposers:** Fungi, bacteria, beetles, earthworms, etc.
        - **Detritivores:** Earthworms, millipedes, dung beetles, etc.
2. **Assemble the Food Web:**
    - Start by assigning students to groups and give each group a set of the forest ecosystem cards.

- Each group should first organize the cards by categories: producers, consumers, decomposers, and detritivores.
- Begin placing the producer cards (trees, mosses, etc.) at the base of the food web.
- Arrange consumers above the producers, following the order from herbivores (primary consumers) to carnivores (secondary and tertiary consumers).
- Place decomposers and detritivores at appropriate points in the food web.

3. **Connect the Organisms:**
   - Using arrows or string, connect the organisms to show the flow of energy.
     - For example, connect plants to herbivores (e.g., "eaten by" or "consumed by"), herbivores to carnivores, and decomposers to dead organic matter.
     - Show how energy flows from the sun to the producers (plants) through photosynthesis.
4. **Label and Explain Relationships:**
   - Label each arrow or connection with a brief description of the relationship (e.g., "eaten by", "eats", "consumes").
   - Discuss the flow of energy and nutrients within the ecosystem.
   - Encourage students to include labels for processes like photosynthesis and respiration and to show how decomposers and detritivores recycle energy back into the ecosystem.

Instructions for Marine Ecosystem Food Web Cards:

1. **Preparation of Marine Ecosystem Cards:**
   - Prepare a set of picture cards that represent a marine ecosystem. The cards should include:
     - **Producers:** Phytoplankton, seaweed, algae, seagrasses, etc.
     - **Primary Consumers:** Krill, small fish (e.g., anchovies), zooplankton, etc.
     - **Secondary Consumers:** Jellyfish, squid, small fish (e.g., sardines), etc.
     - **Tertiary Consumers:** Sharks, orcas, large fish (e.g., tuna), etc.
     - **Decomposers:** Marine bacteria, detritus-feeding worms, etc.
     - **Detritivores:** Hermit crabs, sea cucumbers, scavenging shrimp, etc.
2. **Assemble the Food Web:**
   - Provide each group with a set of marine ecosystem cards and have them organize the cards into categories: producers, primary consumers, secondary consumers, tertiary consumers, decomposers, and detritivores.
   - As with the forest ecosystem, the producer cards (phytoplankton, seaweed, algae, etc.) should be placed at the base of the food web.

- Consumers should be arranged above the producers in a logical order (e.g., primary consumers above producers, secondary consumers above primary consumers).
- Place decomposers and detritivo**res in appropriate spots to show the breakdown of organic matter.**

3. **Connect the Organisms:**
   - Use arrows or string to indicate the energy flow between organisms.
     - For example, connect the producers (phytoplankton or seaweed) to primary consumers (like krill), primary consumers to secondary consumers (e.g., jellyfish), and so on.
   - Show how photosynthesis occurs in marine producers (phytoplankton and algae), providing energy for the entire food web.
   - Make sure to connect decomposers and detritivores to show how they break down dead organisms and recycle nutrients back into the ecosystem.
4. **Label and Explain Relationships:**
   - Each arrow should be labeled with a brief description of the relationship (e.g., “consumed by”, “eats”, “eaten by”).
   - Discuss how energy is transferred up the food chain and how marine food webs can vary based on the species in different parts of the ocean (e.g., coral reefs, open ocean).
   - Encourage students to include processes like photosynthesis, respiration, and the role of decomposers and detritivores in recycling nutrients.

Final Steps for Both Ecosystems:

1. **Class Discussion:**
   - Once students have completed their food webs, encourage them to present their food web to the class.
   - Have students explain the energy flow through their food web and discuss how each organism fits into the overall ecosystem.
2. **Reflection:**
   - **Lead a class discussion with questions like:**
     - "What happens if one organism is removed from the food web?"
     - "How do the energy and nutrient cycles work in these ecosystems?"
     - "How do producers, consumers, decomposers, and detritivores work together to maintain the ecosystem?"

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Assessment:

- **Evaluate the students' food webs based on:**
    - Accuracy of the organism's placement and the energy flow connections.
    - Clarity of labeling and relationships.
    - Creativity in presenting the food web.
    - Collaboration and involvement of all group members.

By using these instructions, students will gain a deeper understanding of how different organisms in a forest and marine ecosystem are interconnected and how energy and nutrients flow through these systems.