USU 4-H Food Chain Tote

BIG IDEA:
All components of ecosystems are interrelated.

UNDERSTANDINGS:
Energy and nutrients cycle through the environment.
Specific adaptations enable organisms to best use the energy and nutrients available in their environment.

ESSENTIAL QUESSTIONS:
Why is it important to understand how components of an ecosystem are interrelated?
How do organisms adaptations enable them to survive?
How do we pattern our adaptations after things we see in the natural world?

THREE DIMENSIONS, UTAH SCIENCE STANDARDS, AND INTENDED LEARNING OUTCOMES:
See pg. 11-17

Supplies

- Paper*
- Pencils*

Oh Deer! p. 2
- Large Playing Area*

Skull Adaptations p. 4
- Poster board and markers (optional)
- *Food Chain Discovery Kit* Booklet
- Skull Replicas (coyote, jackrabbit, barn owl, meadow vole and rattlesnake)
- *Guide to Skulls and Bones*

Part of the Food Web p. 6
- Playing Space
- Yarn
- 3x5 inch cards

Designed for a habitat p. 8
- Markers/crayons/colored pencils
- Poster board (optional)

*Not included in tote

Activity 1: Oh Deer

Time: 20-30 min

Grade Level: 2-5

Materials:

- Paper
- Pencil
- Large Playing Area

To Do:

1. Discuss how all components of an ecosystem are interrelated. Discuss food chains and food webs being sure to address the roles of the sun, producers, consumers, decomposers, water, and shelter.
2. Select one fourth of the class to represent deer. The rest of the students will represent components of the habitat, food, water, and shelter.
3. Place two parallel lines 10 to 20 feet apart and have the deer line up on one and the habitat students line up on the other.
4. Each deer will choose a resource (food water or shelter) that they will look for in a particular round. When they find that resource the deer will take that resource back to the deer line and they will both be deer in the next round. If a deer does not find the resource it is looking for it dies and becomes part of the habitat.
5. Students may select any resource to be or to look for each round but cannot change during a round. Deer and resources represent who they are or what they are looking for by putting a hand on their stomach to represent food, a hand on their mouth to represent water, and a hand on their head to represent shelter.
6. Record the number of deer starting each round. When mountain lions are added, be sure to include how many of them start each round as well.
7. After 3 to 5 rounds introduce a mountain lion. Do this by selecting a student to begin at the sidelines. When the round begins their goal is to tag a deer with both hands. That deer becomes a mountain lion. Both mountain lions continue being mountain lions in the next round. If they do not tag a deer they die and become part of the habitat.
8. Continue for about 15 rounds. Each round represents a year.
9. Return to the classroom and have students discuss the game and graph the number of deer and cougars from each round.

REFLECT:

- As Oh Deer! was played, were there patterns? What did you observe?
- What role does recording and graphing observations play? Did graphing the number of habitat, deer, and cougars help you see anything new?
- What would happen if you removed a component like the sun, water, producers, or decomposers?
- Why are decomposers important?
- How is energy transferred as it goes up the system? Is any lost?

APPLY:

Ecosystems are not ever in a perfect balance. Similar to the game Oh Deer! Resource availability fluctuates causing the deer population to change which causes the cougar population to change. Natural events, like forest fires and droughts, as well as man-made events, like construction or farming, affects what resources are available. By collecting and recording data, it is easier to see patterns and relationships in an environment. This enables us to see problems and find solutions in the world around us.

All organisms need energy to exist. Energy enters the ecosystem through sunlight. Plants are able to take that energy in and change it to energy that other organisms, consumers, can use. Consumers that only eat plants are call herbivores. Consumers that only eat meat are called carnivores. Some consumers eat plants and meat. They are called omnivores. Because plants make the sun's energy usable, they are called producers. Organisms that cannot make energy from the sun eat plants to get their energy. They are called consumers. Secondary and tertiary consumers get their energy by eating organisms that eat plants. As energy moves from plants to consumers to tertiary consumers energy is lost as heat and cannot be reused.

While energy cannot be reused, nutrients can. Decomposers break down organisms enabling the nutrients in the organisms to return to the soil, air, and water. Each component of the environment, the sun, producers, consumers, decomposers, and resources (like water, food, and shelter), are essential to the ecosystem's health.

Activity 2: Skull Adaptation

Time: 30+ min

Grade Level:

Materials:

- Paper
- Pencil
- Poster board and markers (optional)
- *Food Chain Discovery Kit* Booklet
- Skull Replicas (coyote, jackrabbit, barn owl, meadow vole, and rattlesnake)
- *Guide to Skulls and Bones*

To Do:

1. Learn about the different parts of the skull (orbit, auditory bulla, molars, premolars, canines, incisors, and nasal passage). There is a diagram on the second page of the Food Chain Discovery Kit Booklet.
2. Split your class into 5 groups. If you have a small class you may not need or want to split. Pass out the different skulls to each group. Have them identify the parts of the skull as a group and try to determine characteristics of their animal based on the skull. *Guide to Skulls and Bones* can be used to find more information on skulls. Groups may want to draw and label their skull on a poster board. Alternatively have students write their observations and questions on their own paper or in notebooks.
3. Present or discuss observations and inferences. If desired, students can study all the skulls before presenting.
4. Using what was learned about each skull, infer what its diet likely is, and who is likely to eat it. Create a food chain to represent these animals relationship to each other.

REFLECT:

- What can the different parts of the skull tell you about the animal you are studying?
- What were you able to infer about your animal just by looking at the skull? What questions do you still have about the skull?
- Did other students observe different things?
- If you found a skull outside without a label, how you try to determine where it came from?
- What features do you think were the most interesting or most helpful?

APPLY:

Skulls can tell you a lot about the animal they came from. Knowing about the basic parts of the skull helps you identify characteristics the animal likely has. Large orbits typically indicate better vision. The types of teeth in the skull help to identify the type of diet the animal has. (See page 2 of *Food Chain Discovery Kit* booklet for more information.)

Different features may be more or less important depending on the environment an animal lives in. For some animals it is more important to have a great sense of smell rather than great vison or hearing. Some animals may rely more heavily on another sense. Examining their skulls can help people learn more about how they live and function.

Activity 3: Part of the Food Web

(Adapted from "Aliens in the Web" by Mark Goddard)

Time: 30+ min

Grade Level: 4-6

Materials:

- Paper and Pencil
- Markers, crayons, or colored pencils (optional)
- White board or poster board (optional)
- Yarn
- 3" by 5" cards (various colors are helpful)

To Do:

1. Begin by having students create a food chain either on individual papers, as groups or as a class. Make sure that students understand that all life depends upon the sun for energy. An example of a food chain could be the sun to pine tree to pine seed to squirrel to great horned owl.
2. Talk about producers, primary consumers, secondary consumers, and tertiary consumers. Define herbivore, omnivore, and predator as well as decomposers and biotic and abiotic resources.
3. Before class, fill out, or have students fill out in class, 3"x5" cards with a biotic or abiotic resource. You may want to color coordinate the cards based on whether it is Abiotic, Biotic, a Producer, Consumer, or Decomposer. Be sure that there are enough cards for each student in the class. Be sure to include the sun, water, soil, and various producers, consumers, and decomposers. Create some introduced resources (or invasive species) to use in the game later.
4. Ask students to raise their hand if they depend on the sun (all students should raise their hand). Have the sun begin with the yarn. Have students toss the yarn to other students that rely directly on them for nourishment until everyone is connected in the web. You may need to pass the yarn to some students multiple times in order to fit everyone into the web. Let students use their knowledge and creativity to solve problems of who depends on whom and to fit everyone in the food chain.

   *There is lots of room for creativity and variation in this activity. You could have multiple balls of yarn going out from the sun and limit the length of yarn that leaves the water, soil, grass, or another resource indicating its limitations. Let students come up with variations that incorporate things they have learned or observed.

5. Have students step apart from each other to make the web taut. Introduce some new species that will affect a specific resource by giving a student an "introduced species" card. Have students who are connected to that resource raise their hand to visualize how many animals and resources are affected by the presence of the introduced resource. Feel free to let students come up with introduced species and analyze what the effects of those resources are.

   Variation: Instead of students raising their hands if they are affected by the invasive species, have them drop their yarn. Have everyone whose yarn went slack consider how they would be affected by the disappearance of that resource and what further affects could happen.
6. If desired, trade or rewrite cards and create a new web
7. Discuss what students learned and observed. Have students write, or draw about their experience with the food web activity.

REFLECT:

- Think of your food web. What were some of the connections you did not initially think of? Why were those connections surprising?
- There are many ways resources affect one another that you may not have initially thought of. What if an introduced bug kills certain trees that serve as a windbreak? What if cows introduced overgraze an area? What if people kill all of a bothersome insect that is a bird's primary source of food?
- What abiotic (nonliving) resources are important besides the sun?
- Why are decomposers important?
- How was the food web you created an accurate representation of an ecosystem? How was it inaccurate?

APPLY:

Ecosystems are extremely dynamic. Not only do living plants and animals affect each other, abiotic resources like water, soil, and wind play important roles in how particular ecosystems function. As resources travel up the food chain, decomposers break down plants and animal resources, returning nutrients into the environment. People often think of the things around us as resources that are separate and independent of each other. By introducing or removing species, unintended chain reactions can occur. It is difficult to make a perfectly accurate model of an ecosystem but working to create models helps to bring understanding and awareness.

Activity 4: Designed for a Habitat

Time: 30+ min

Grade Level: 4-6

Materials:

- Paper
- Pencil
- Markers
- Poster board

To Do:

1. Tell students they will be creating an animal to survive in a specific habitat.
2. Write down and cut out about 3-5 varieties of shelter, food, water, and predator for students to choose from. (You may use the example below or create your own variations.)
3. Put the types of shelter, food, water, and predators in separate cups or bowls. Have each student or groups of students draw from the container to determine what type or habitat they need to make their animal suitable for. You may choose whether to have habitat attributes repeated or not).
4. Have students draw, name and write about the animal they have created.
5. Have each student/group present their habitat and animal and what traits it has to meet the demands of where it lives.

REFLECT:

- Was it easy to create an animal to survive in the specific habitat you had? Was the animal realist? Was the habitat realistic?
- Why are animals characteristics suited to their environments? How do animals become so well suited to where they live?
- Where did you get your ideas for the characteristics you gave your animal?
- Did other students find different solutions than you did to solve similar problems? Which way do you think would work better? Why?
- What real life animals does your creation remind you of? Is there already a real animal that could survive the type of environment you created your animal for?

APPLY:

Animals live in all different types of places and there are many, many characteristics

animals have that enable them to survive. Survival often is not easy for animals and some of them die because they are not as well suited for their environment as others of their same species or even other animals. The healthiest animals with the most advantages characteristics survive and are able to pass their traits on as they reproduce. Over time, desirable characteristics are the ones to survive through the species and characteristics that are a disadvantage do not get passed down. Eventually, two animals that came from the same ancestor but that live in different habitats can be quite different from each other.

Engineers use inspiration from the natural world as they look for ways to solve problems. There are many solutions to the same problem and people work to determine which solution is the best to use based on effectiveness as cost. As we observe and learn from animals we can continue to find solutions to problems we encounter.

EXAMPLES OF HABITAT VARIATIONS:

Shelter:
- Heavily forested
- Hot and sandy with small, dry vegetation
- Sandy ocean shoreline
- Open, grassy plains
- High, cold, and rocky mountains

Food:
- Local vegetation
- Insects
- Fast mammals
- Inside hard shells
- Scavenger

Water:
- Lots of saltwater, no freshwater
- No running water, only underground or in plants and animals
- Freshwater streams
- Frequent rainfall but no bodies of water

Predator:
- Humans
- Bird of Prey
- Large, fast animal
- Reptiles

Other Activities

- Identify features of the habitat of where you live and what animals also live there.
- Use *Guide to Skulls and Bones* and go on a bone hunt.
- Write out a food chain that includes you. How many different food chains are you a part of?
- Use the *Food Chain Discovery Kit* and copy and do the activities on p. 4-7
- Learn about and endangered or at risk species in your area. See if there is a way you can help preserve it.

Contents of Food Discovery Tote

- *Food Chain Discovery Kit* Booklet
- Skull Replicas
    - Coyote
    - Jackrabbit
    - barn owl
    - meadow vole
    - rattlesnake
- *Guide to Skulls and Bones*

Three Dimensions, Utah Science Standards, and Intended Learning Outcomes

Note: These applications of National and State Science Standards are not comprehensive. They are meant to serve as suggestions. While only standards for elementary levels have been listed, standards for more advanced grade levels can also be applied. Additionally, this tote is an excellent tool to facilitate inquiry for any age group.

THREE DIMENSIONS

K-2-ETS1-2. Engineering Design (Activity 4: Designed for a Habitat)

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Science and Engineering Practices:

- Develop a simple model based on evidence to represent a proposed object or tool.

Disciplinary Core Ideas:

- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people.

Crosscutting Concepts:

- The shape and stability of structures of natural and designed objects are related to their function.

K-LS1-1. Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web)

Use observations to describe patterns of what plants and animals (including humans) need to survive.

Science and Engineering Practices:

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions.
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- All animals need food in order to live and grow. They obtain their food from plants or from other animals. Plants need water and light to live and grow.

Crosscutting Concepts:

- Patterns in the natural and human designed world can be observed and used as evidence

K-ESS2-2. Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment (Activity 2: Skull Adaptations, Activity 4: Designed for a Habitat)

Construct an argument supported by evidence for how plants and animals (including humans) can change the environment to meet their needs

Science and Engineering Practices:

- Construct an argument with evidence to support a claim.

Disciplinary Core Ideas:

- Plants and animals can change their environment.

Crosscutting Concepts:

- Systems in the natural and designed world have parts that work together.

K-ESS3-1. Interdependent Relationships in Ecosystems: Animals, Plants, and their Environment (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat)

Use a model to represent the relationship between the needs of different plants and animals (including Humans) and the places they live.

Science and Engineering Practices:

- Use a model to represent relationships in the natural world.

Disciplinary Core Ideas:

- Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.

Crosscutting Concepts:

- Systems in the natural and designed world have parts that work together

1-LS1-1 Structure, Function, and Information Processing (Activity 4: Designed for a Habitat)

Use materials to design a solution to a human problem by mimicking how plants and/or animals use their external parts to help them survive, grow, and meet their needs.

Science and Engineering Practices:

- Use materials to design a device that solves a specific problem or a solution to a specific problem.

Disciplinary Core Ideas:

- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flours, fruits) that help them survive and grow.
- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external

inputs.

Crosscutting Concepts:

- The shape and stability of structures of natural and designed objects are related to their function(s).
- Every human-made product is designed by applying some knowledge of the natural world and is built using materials derived from the natural world.

1-LS1-2 Structure, Function, and Information Processing (Activity 2: Skull Adaptations, Activity 4: Designed for a Habitat)

Read texts and use media to determine patterns in behavior of parents and offspring that help offspring survive

Science and Engineering Practices:

- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world.
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive.

Crosscutting Concepts:

- Patterns in the natural and human designed world can be observed, used to describe phenomena, and used as evidence.

2-LS4-1 Interdependent Relationships in Ecosystems (Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat)

Make observations of plants and animals to compare the diversity of life in different habitats.

Science and Engineering Practices:

- Make observations (firsthand or from media) to collect data which can be used to make comparisons
- Scientists look for patterns and order when making observations about the world.

Disciplinary Core Ideas:

- There are many different kinds of living things in any area, and they exist in different places on land and in water.

3-5-ETS1-1 Engineering Design (Activity 4: Designed for a Habitat)

Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on material, time, or cost.

Science and Engineering Practices:

- Define a simple design problem that can be solved through the development of an object, too, process, or system and includes several criteria for success and constrains on materials, time, or cost.

Disciplinary Core Ideas:

- Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account.

Crosscutting Concepts:

- People's need and wants change over time, as do their demands for new and improve technologies.

3-LS4-3 Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat)

Construct and argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.

Science and Engineering Practices:

- Construct and argument with evidence.

Disciplinary Core Ideas:

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change.

3-LS4-2 Inheritance and Variation of Traits: Life Cycles and Traits (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 4: Designed for a Habitat)

Use evidence to construct an explanation for how the variations in characteristics among individuals of the same species may provide advantages in surviving, finding, mates, and reproducing.

Science and Engineering Practices:

- Use evidence (e.g., observations, patterns) to construct an explanation.

Disciplinary Core Ideas:

- Sometimes the differences in characteristics between individuals of the same species provide advantages in surviving, finding mates, and reproducing.

Crosscutting Concepts:

- Cause and effect relationships are routinely identified and used to explain change.

4-LS1-1 Structure, Function, and Information Processing (Activity 2: Skull Adaptations, Activity 4: Designed for a Habitat)

Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

Science and Engineering Practices:

- Construct an argument with evidence, data, and/or a model.

Disciplinary Core Ideas:

- Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.

Crosscutting Concepts:

- A system can be described in terms of its components and their interactions.

5-PS3-1 Matter and Energy in Organisms and Ecosystems (Activity 1: Oh Deer!, Activity 3: Part of the Food Web)

Use models to describe that energy in animals' food (used for body repair, growth, motion, and to maintain body warmth) was once energy from the sun.

Science and Engineering Practices:

- Use models to describe phenomena.

Disciplinary Core Ideas:

- The energy released from food was once energy from the sun that was captured by plants in the chemical process that forms plant matter.
- Food provides animals with the materials they need for body repair and growth and the energy they need to maintain body warmth and for motion.

Crosscutting Concepts:

- Energy can be transferred in various ways and between objects.

5-LS2-1 Matter and Energy in Organisms and Ecosystems (Activity 1: Oh Deer!, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat)

Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.

Science and Engineering Practices:

- Develop a model to describe phenomena.
- Science explanations describe the mechanisms for natural events

Disciplinary Core Ideas:

- The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can

survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem.
- Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gases, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment.

Crosscutting Concepts:
- A system can be described in terms of its components and their interactions.

UTAH SCIENCE STANDARDS

K-Grade 2

Standard 1 (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat):
- The Processes of Science, Communication of Science, and the Nature of Science. Students will be able to apply scientific processes, communicate scientific ideas effectively, and understand the nature of science.

Standard 4 (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat):
- Life Science. Students will gain an understanding of Life Science through the study of changes in organisms over time and the nature of living things.

Grade 3

Standard 2 (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat):
- Students will understand that organisms depend on living and nonliving things within their environment.

Standard 5 (Activity 1: Oh Deer!, Activity 3: Part of the Food Web):
- Students will understand that the sun is the main source of heat and light for things living on Earth.

Grade 4

Standard 5 (Activity 1: Oh Deer!, Activity 2: Skull Adaptations, Activity 3: Part of the Food Web, Activity 4: Designed for a Habitat):
- Students will understand the physical characteristics of Utah's wetlands, forests, and deserts and identify common organisms for each environment.

Grade 5

Standard 5 (Activity 2: Skull Adaptations, Activity 4: Designed for a Habitat)):

- Students will understand that traits are passed from the parent organisms to their offspring, and that sometimes the offspring may possess variations of these traits that may help or hinder survival in a given environment.

INTENDED LEARNING OUTCOMES (ILO'S):

1. Use science process and thinking skills.
2. Manifest science interests and attitudes.
3. Understand important science concepts and principles.
4. Communicate effectively using science language and reasoning.
5. Demonstrate awareness of the social and historical aspects of science.
6. Understand the nature of science.