ANIMAL SCIENCE

Puzzling digestion

Focus question	How are animal digestion systems similar and different?
Learning target	Students will compare and contrast the observable characteristics between cattle, chicken, and hog digestion systems.
Vocabulary	Mouth, esophagus, stomach, rumen, crop, gizzard, small intestine, large intestine, proventriculus, ceca, cloaca, rectum, omasum, reticulum, abomasum

HS-LS1–2 From Molecules to Organisms: Structures and Processes

Performance expectation HS-LS1–2	**Classroom connection:** Students construct animals using paper pieces to observe similarities and differences in function between livestock animals.

Science and engineering practices

Developing and Using Models	**Classroom connection:** Students will construct animal representations while working together in a group.

Disciplinary core ideas

LS1.A: Structure and Function	**Classroom connection:** Students will identify the various structures that are similar and different between the animals, identifying the functions of each.

Cross-cutting concepts

Systems and Systems Modeling	**Classroom connection:** Students will identify digestive systems within each animal and how they are similar and different: mouth, esophagus, stomach, rumen, crop, gizzard, small intestine, large intestine, proventriculus, ceca, cloaca, rectum, omasum, reticulum, abomasum.

Background

Cattle are livestock animals that originated from the Near East and the Indian subcontinent. Cattle have been selectively bred over the past 10,000 years to provide meat (beef) and milk for human use. Cattle are primarily divided into two types, beef cattle and dairy cattle. Beef cattle are smaller framed and have higher muscle density. Dairy cattle are larger framed, have a lower muscle density and produce high volumes of milk daily for human consumption. They must produce a calf each year in order to produce milk.

Hogs have been selectively bred over the past 9,000 years for human consumption. Sows can have up to two litters per year with 1–14 piglets per litter. Weanlings are raised with the sow for the first three weeks of their life before moving on to a larger facility to mature. Hogs can grow to maturity in six months from birth.

Chickens have been selectively bred for over 3,500 years and are the most numerous domesticated animal in the world. Chickens have been selectively bred to provide both eggs and meat for human consumption. Egg layers can produce an average of 280–300 eggs per year and start laying eggs around 18 weeks of age. Meat chickens develop quickly and can grow to maturity in six weeks.

Cattle, hogs, and chickens have different nutritional requirements and have specialized digestive systems that help break down food for their needs. Cattle are ruminants that break down hard to digest cellulosic materials. Hogs and chickens are omnivores and can eat both plant and animal products.

Prior knowledge

In order to successfully complete this activity, students should have a basic knowledge of animals and what they need to grow. They also should be able to work collaboratively to put together a complete animal from multiple pieces.

Suggested timing

One class period

Materials

- Puzzle pieces (one complete animal for each group of 4 students)
- Scotch tape (one roll per group)

Teacher preparation

Make enough copies of the puzzles as needed for class size. Before class begins, lay out pieces of the puzzle, blank side up in a large pile or spread out in the hall.

Differentiation

Other ways to connect with students with various needs:

- **Local community:** A field trip to a local farm can give students experience with actual animals and the height differences, growth habitat, and other physical features that are not apparent on the 2D drawings. If a farm is not feasible, a video showing the animals will allow students to see differences in size and characteristics.
- **Students with special needs (auditory/visual/language/reading):** Pair students with varying abilities. If it is possible to visit a farm, students can experience the smell of raising livestock, the size of the animals, and the feed that they eat.
- **Extra support:** Have the students zoom in with a farmer or feed nutritionist to learn more about the nutritional needs of livestock animals.

- **Extensions:** Students may investigate other animals (sheep, goats, horses , turkeys, rabbits) that are grown in their local areas to see what the differences are in reproduction, birth, energy needs, production capacity, lifespan, etc.

Assessments

Rubric for assessment

Skill	Developing	Satisfactory	Exemplary
Use a model to illustrate differences between three livestock animals	Student was unsuccessful in working in a group to complete a model of an animal.	Student was successful in working in a group to complete a model of an animal.	Student was successful in working in a group to complete a model of an animal and identify different systems within their animal.
Identify the structures and functions within an animal	Student was unable to correctly identify the structures and their functions within an animal.	Student was able to correctly identify the structures and their functions of parts within an animal.	Student was able to correctly identify the structures and their functions of parts within an animal and describe how those parts are connected.
Identify the systems within an animal	Student was unable to identify the organs within the animal's digestive system.	Student was able to name one organ within the animal's digestive system and describe how it worked.	Student was able to name multiple organs within the animal's digestive system and describe how they worked.

Rubric for self-assessment

Skill	Yes	No	Unsure
I completed a model with my group.			
I can identify the structures and functions of an animal's digestive system using the vocabulary given.			
I can identify and describe the organs within the digestive system of an animal and how they interact.			