

PUZZLERS

#29 | RUMINANT DIGESTION



Puzzle

Demonstrate the flow of food in a ruminant digestive system.

Standards & Connections

NGSS.3-5-ETS1, NGSS.MS-ETS1

Background:

Monogastric animals, such as pigs, poultry, and humans, only have a single-chambered stomach. Ruminants, such as cattle, sheep, and goats, are hoofed mammals that have a unique four-chambered digestive system that allows them to more easily eat roughages like grass and hay. Ruminant stomachs have four compartments: the rumen, the reticulum, the omasum, and the abomasum. Rumen microbes ferment feed and produce volatile fatty acids, which are the cow's main energy source. Food travels through different parts of the stomach for rumination, back up to the mouth (as a cud) for further chewing, and then back again so that the grass or grain can be broken down enough for nutrients to be available when the food travels to the intestines. By better understanding how the digestive system of the ruminant works, livestock producers can better understand how to care for and feed ruminant animals.¹

Suggested Materials:

Computer with Internet access, text/print resources, paper, coloring supplies, string, thick fishing line, tape, scissors, colored water



IDENTIFY

Share the background information with the students, then share the puzzle to be solved. Determine constraints (e.g., time allotted, space, materials provided, etc.) and divide students into small groups.



IMAGINE

Ask a series of questions to help students brainstorm solutions to the puzzle. Encourage students to list all ideas – don't hold back! Before moving on, make sure each group selects a solution that fits within the constraints.

Ask: How can you solve this puzzle? Which of your ideas can you build a prototype for given the constraints?



DESIGN

Students diagram the prototype, identify the materials needed to build the prototype, and write out the steps to take. Students describe the expected outcomes.

Ask: What steps will you take to create your solution? What do you expect your solution to look like and be able to do?





CREATE

Students follow their design plan and build their prototypes. Monitor their progress and remind them about how much time they have.



TEST & IMPROVE

Students evaluate their creation and compare it with the expected outcomes. Students seek areas of improvement and make changes where needed.



SHARE

Students share their solution to the puzzle and communicate lessons learned.

Ask: What was your biggest takeaway? What would you do differently?

Additional Resources:

For more background information on this topic, please visit www.purpleplow.org.



Students may need more guidance on the digestive system before they start their project.

¹ Mississippi State University Extension. (2018). Understanding the ruminant animal digestive system. Retrieved from <http://extension.msstate.edu/publications/publications/understanding-the-ruminant-animal-digestive-system>