Science | Caribou Anatomy | Lesson Plan

Prepared for NSERC's PromoScience Program by Kutz Research Group at the University of Calgary Faculty of Veterinary Medicine

Unit/Topic: Caribou Anatomy Fabien Mavrot, Kaleigh Eichel on May 26, 2020	Time: 1 days Day 1: 1 hour Grades: 7-12, can be adapted to younger grades

Local Experts:

- Hunters
- Elders
- Wildlife Officer

PromoScience Connection:

This lesson fits into the overarching learning goals associated with wildlife health and monitoring by introducing what healthy organs look like, what they do in the body, and how they work using caribou as the anatomical model, which some students may be familiar with from their personal experiences of hunting.

Expectations: Identify overall or specific expectations from curriculum documents. These are guidelines only and teachers can adapt expectations to their class.

By the end of this lesson, the grades 1-6 students should be able to:

- Grade 1: Unit E: Needs of Animals and Plants
  - 1-1: Bring focus to investigative activities, based on their own questions and those of others
  - 1-4: Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
  - 1–11: Describe some common living things, and identify needs of those living things. Demonstrate an understanding of the basic needs of animals and plants (e.g., the need for food/energy, air, and water); Investigate the characteristics and needs of animals and plants; and Demonstrate awareness that animals and plants depend on their environment to meet their basic needs, and describe the requirements of good health for humans.
- Grade 2: Unit E: Small Crawling and Flying Animals

  - 2-1: Investigate, with guidance, the nature of things, demonstrating an understanding of the procedures followed.
  - 2–4: Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
  - Growth and Changes in Animals: Demonstrate an understanding of the similarities and differences among various types of animals and the ways in which animals adapt to different environmental conditions; Investigate physical and behavioural characteristics and the process of growth of different types of animals; and Identify ways in which humans can affect local animals.
- Grade 3: Unit E: Animal Life Cycles
  - 3–1 Investigate the nature of things, demonstrating purposeful action that leads to observations and inferences.
  - 3–2 Identify patterns and order in objects and events studied; and, with guidance, record observations, using pictures, words and charts; and make predictions and generalizations, based on observations.
  - 3–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
- Grade 4: General Learner expectations
  - 4–1 Investigate the nature of things, demonstrating purposeful action that leads to inferences supported by observations.
  - 4–2 Identify patterns and order in objects and events studied; and record observations, using pictures, words and charts, with guidance in the construction of charts; and make predictions and generalizations, based on observations.
  - 4–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
- Grade 5: General Learner Expectations
  - 5–1 Design and carry out an investigation, using procedures that provide a fair test of the question being investigated.
  - 5–2 Recognize the importance of accuracy in observation and measurement; and, with guidance, apply suitable methods to record, compile, interpret and evaluate observations and measurements.
  - 5–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
  - Human Organ Systems: Demonstrate an understanding of the structure, form and function of the respiratory, circulatory, digestive, excretory, integument, and nervous systems, and the interactions of organs within each system; Investigate the structure, form and function of the major organs of the respiratory, circulatory, digestive, excretory, integument, and nervous systems; and Demonstrate understanding of factors that contribute to good health and a healthy life style

- Grade 6: Diversity of Living Things
    - 6–1 Design and carry out an investigation in which variables are identified and controlled, and that provides a fair test of the question being investigated.
    - 6–2 Recognize the importance of accuracy in observation and measurement; and apply suitable methods to record, compile, interpret and evaluate observations and measurements.
    - 6–4 Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.
    - Diversity of Living Things: Investigate classification systems and some of the processes of life common to all animals (e.g., growth, energy, reproduction, movement, response, and adaptation)

(The NWT Grades K-6 Science and Technology Curriculum (2004))

By the end of this lesson, the grade 7-9 students should be able to:

- "Conduct investigations into the relationships between and among observations, and gather and record qualitative and quantitative data."
- "Analyze qualitative and quantitative data, and develop and assess possible explanations."
- "Work collaboratively on problems; and use appropriate language and formats to communicate ideas, procedures and results."
- Grade 7: Unit A: Interactions and Ecosystems: "analyze ecosystems to identify producers, consumers and decomposers; and describe how energy is supplied to and flows through a food web"
- Grade 8: Unit B: Cells and Systems: "Interpret the healthy function of human body systems, and illustrate ways the body reacts to internal and external stimuli"

(Science Grades 7-8-9 Program of Studies 2003 (Updated 2009, 2014) by Alberta Education)

By the end of this lesson, Grade 10-12 students will:

- "Conduct investigations into relationships between and among observable variables and use a broad range of tools and techniques to gather and record data and information"
- "Work collaboratively in addressing problems and apply the skills and conventions of science in communicating information and ideas and in assessing results"
- "Formulate questions about observed relationships and plan investigations of questions, ideas, problems and issues"
- Unit A: Living Systems Respond to Their Environment: "Analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health"

- Unit D: Human Systems:
    - 1. explain how the human digestive and respiratory systems exchange energy and matter with the environment
    - 2. explain the role of the circulatory and defence systems in maintaining an internal equilibrium

(Biology 20-30 Program of Studies 2007 (updated 2014) by Alberta Education)

- Unit A: Living Systems Respond to Their Environment: "Analyze how the human circulatory system facilitates interaction between blood cells and the external environment and investigate cardiovascular health"

(Science 10 Program of Studies 2005 (updated 2014) by Alberta Education)

- Unit C: Investigating Matter and energy in Living systems: "Describe, in general terms, the exchange of matter by the digestive and circulatory systems, the functional relationship between the two systems and the need for a healthy diet and lifestyle", "Describe disorders of the digestive and circulatory systems as imbalances induced by genetic, lifestyle and environmental factors"

(Science 14-24 Program of Studies 2003 (updated 2014) by Alberta Education)

Learning Goals: Describe what the students are expected to learn. Share goals with students.

Students will learn the basic structure, function, and location of caribou organs through the use of lessons and an activity in which students place organs in the correct location on a large felt caribou and discuss what would happen to the caribou during a hunt if it is shot in different locations. The organs discussed are: heart, lungs, diaphragm, reticulum, rumen, omasum, abomasum, small and large intestines, pancreas, liver, kidneys, bladder, bones, brain, and spinal cord.

Success Criteria: Describe from a student's perspective what attainment of a learning goal looks like.

- Able to participate in discussion about health and express their own opinions, observations, and experiences about wildlife health
- Able to set up a sampling experiment and identify larvae under a microscope.
- Able to calculate percentage and proportion and discuss why scientists take many samples from a population.
- Able to participate in the Health Risk card game and demonstrate understanding of environmental factors that influence health and identify different pathogens that affect caribou.
- Able to identify several different ways that hunters and researchers assess animal health
- Able to discuss why it is important to monitor wildlife health

Pre-assessment: Describe links to prior knowledge
Previous personal experiences hunting. Tie in to the curriculum and body systems.

Learning Environment: Describe the setting including groupings and management strategies
Environment: Classroom or lab with a sink, computer, projector for PowerPoint. Whiteboard and dry erase markers. **Equipment and Materials are available and prepared:** ● Felt caribou and felt organs, even better yet: plastinated or 3D model organs as well, maybe a goat or sheep if you don't have plastinated caribou
Management considerations: **Safety:** Wear personal protective equipment (PPE) for all lab activities. Wash hands with soap at the end of each lab session. **Accommodations:** Students will be reminded that they need to work well with the individual they choose and if their grouping is not working out, they will have to work independently (for students who would prefer to work independently, additional worksheets and clipboards will be on hand). Teacher will circulate and monitor students to ensure understanding. o For students with processing issues and or ESL/ELL students, considering making pairs that will provide these students with a lab partner that will help them to be successful. o For students with high levels of anxiety, particularly OCD, consider providing a copy of the lab for students to look over prior to the lesson or discuss with the student which questions will be asked so that the student can prepare for discussions involving bacteria growth and cleanliness - For students with ADHD, ADD or other focus issues, consider "chunking" the lessons and spreading them out so that one part occurs before a recess/ break and the second part occurs after recess/ break, with a brief recap to reinforce ideas from the first part of the lesson ● This lesson is designed for grades 7-12. The lesson can be adapted for grades 1-6 by using simpler language to explain organ systems (guts), and focussing on observation skills in their own bodies.

Instruction	
Day 1	
Time 5 minutes	Follow the PowerPoint "Minds on": Today, we are going to look inside a caribou and learn about their organs. Has anyone looked inside a caribou before? What do you remember seeing?

5 minutes	**Research connection:** Explain how it is important to understand how organs work and what healthy organs look like so you know if an animal is sick if you see it behaving a certain way or the organs look different. This is important in monitoring wildlife health with the help of hunters who collect samples from their hunts. **For example, if you found a caribou that can't run as fast as the other caribou, what organs might be causing the caribou to run slower?** Possible answers to discuss: Injury to the bones or muscle, something in the lungs making it hard to breath (such as lung worms), injury to the heart muscle such as bacteria on the heart valves so the heart can't pump blood to the muscles who need oxygen to work, maybe something wrong with the brain so the animal can't balance properly, or maybe the spine is injured so the spinal cord can't send signals from the brain to the muscles…
35 minutes	**"Minds on":** Build a caribou Questions to ask while you go through organs: where is it? What is it made out of? What does it do? Can you eat it or make something out of it? Is there another name for it? As you go through each organ, pull out the felt piece and pass it around. If you have plastinated versions, even better! External anatomy terms Thorax: Heart, Lung, Diaphragm Abdomen: Reticulum, Rumen, Omasum, Abomasum, Small Intestine, Large Intestine, Pancreas, Liver, Kidney, Bladder Skeleton: bones, vertebrae Brain and spinal cord. After all the organs have been passed around, students can work as a group to place the felt organs on the correct place on the caribou. The instructor can give hints by asking students what the organ is, what it does, and where it is in their own body.
15 minutes	**"Action Piece" and Community connection: Wildlife Officer** Activity 1: Let's Go Caribou Hunting Once the caribou is assembled, hang it on the board and students can take turns shooting the caribou with a nerf gun. Discuss what would happen to the caribou depending on where it was shot.
5 minutes	**"Consolidate": What did we learn today?** We learned about how animals breath with their lungs and diaphragm, we learned about the heart, we learned about the digestive system with the stomach, intestines, liver, and pancreas. We learned about how wastes are removed by the kidneys. And we learned about how the brain sends signals down the spinal cord. Then we went caribou hunting and learned the best places to shoot a caribou. **EXIT TICKET:** What is your favourite organ, why?

Assessment (data collection)/Evaluation (interpretation of data)

This is an introductory module and students are encouraged to participate in all activities.

Additional Resources:

https://www.ucalgary.ca/caribou/index.html
https://www.yumpu.com/en/document/read/5582883/ryan-brook1-susan-kutz2-peter-flood3-christoph-muelling2-

i Some resources may not be authorized but are provided to identify potentially useful ideas for teaching and learning. The responsibility to evaluate these resources rests with the user.

ii All website addresses listed were confirmed as accurate at the time of publication but are subject to change.

Activity 1: Let's Go Caribou Hunting

Materials (per student group of 10-20 students):

- Fabric caribou and organs
- NERF gun

Instructions:

Organizational Task & Activity	Time (min)	Teaching Cues & Key Points
Identify the body parts	10	1. Have all the students gather around a table 2. Lay out all the body parts and have the students identify each one. What are their functions? Which system does it belong to? Etc.
Locate the body parts	10	1. Have the students place the body parts on the caribou. Where does it belong? 2. Correct the placement of the body parts
Hunt the caribou	10	1. Have the students pretend that they are going hunting. Where do they hit the caribou? What then happens to the caribou? Is this the best place to target while hunting? Why/why not? 2. If they hit the jaw/nose region, the caribou may escape and die later. This results in meat wastage. 3. If they hit the: Brain, it will result in a quick death but wastes the brain which could have been used in tanning or eaten as a delicacy and could waste a trophy; Neck (more specifically the cervical vertebrae), it results in a fast death with no meat wastage; Shoulder or rump area, the caribou will probably be crippled and will die later. This results in meat wastage; Heart, it will result in a quick death but wastes the heart (can't be eaten); Lungs, it is a quick and effective death; and Abdomen, slow, messy death, the caribou may escape and there is a lot of meat contamination.

Resources: https://www.ucalgary.ca/caribou/index.html

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