



GEORGIA AQUARIUM

STEAM FORWARD – EPISODE 3

Vet Ops [Teacher Version]

Welcome to STEAM FORWARD!

Vet Ops!

Career: Veterinarian

Episode: Vet Ops

We're at Georgia Aquarium's Correll Center for Aquatic Animal Health. It's a state-of-the-art lab and treatment facility that keeps these thousands of animals healthy and thriving.

How do the technicians and veterinarians care for hundreds of different species? Let's check out some of the cutting-edge technology that helps them get the job done.

During this episode, hosted by Dr. Meisa Salaita, we will explore technology in vet services and see how experts use it.

Veterinarian Dr. Alexa Delaune and Animal Trainer, Andrew Madigan will show us how preventative care is paramount at Georgia Aquarium.

OBJECTIVES: Why am I learning this?

At the completion of this mini-unit, you will be able to:

- Describe the systems found in animal's body
- Understand the role of technology in medicine.

THE ESSENTIALS: ASK & ANSWER

- 🐟 How does an organization like Georgia Aquarium perform preventative care?
- 🐟 How does technology help vets?
- 🐟 How do vets put technology to use?





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Activity 1

Video segment: 0:00 –3:27

Introduction

Before one can treat or examine a patient, the Veterinary Operations team must have a solid understanding of the various systems found in an aquatic animal. Some systems are very simple in certain species where as those same systems are quite complex in other species.

OBJECTIVES: Why am I learning this?

At the end of this lesson, you will be able to:

- Describe the systems found in animal’s body

1. Conduct background research on some of the different system found in an animal’s body.

Body System	Function
Circulatory system	A system that circulates blood and lymph through the body, consisting of the heart, blood vessels, blood, lymph, and the lymphatic vessels and glands.
Digestive System	A group of organs working together to convert food into energy and basic nutrients to feed the entire body. Food passes through a long tube inside the body known as the alimentary canal or the gastrointestinal tract (GI tract).
Excretory System	This system of an organism's body that performs the function of excretion, the bodily process of discharging wastes. The Excretory system is responsible for the elimination of wastes produced by homeostasis.
Nervous System	A network of nerve cells and fibers that transmits nerve impulses between parts of the body.
Skeletal system	The skeletal system includes all of the bones and joints in the body. ... The skeletal system also provides attachment points for muscles to allow movements at the joints. New blood cells are produced by the red bone marrow inside of our bones.
Muscular system	The muscular system is responsible for the movement of the human body. Attached to the bones of the skeletal system are about 700 named muscles that make up roughly half of a person's body weight. Each of these muscles is a discrete organ constructed of skeletal muscle tissue, blood vessels, tendons, and nerves.





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2. Choose two of the body systems above and investigate that system in a fish or shark. How is that system the same or different from that of human? Do sharks or fish possess any unique features that allow them to survive in an aquatic environment?

Answers will vary, however some concepts to consider:

- Fish and sharks have gills instead of lungs for the exchange of gases with the circulatory system.
- From muscular standpoint- each fin on a shark and fish important function. The dorsal fin provides balance to the animal, thus keeping it upright as it swims. The Pectoral fins are used to steer forward movement. The anal fins are used to assist with reproduction. The caudal fin provides forward thrust as well as upward thrust, which, along with the oil content of the liver, helps control the shark's vertical movement. This is different from bony fish because they have a gas-filled bladder instead of an oily-based bladder.
- Fish have bones whereas sharks have cartilaginous skeleton. Why advantageous? Cartilage weights less; therefore requires less energy to propel through the water; more flexible whilst being strong and durable; allows sharks to turn in a tighter radius than other fish.
- Ampullae of Lorenzini: Sharks detect electromagnetic fields of the Earth with their ampullae of Lorenzini (pores that open to tiny bottle-shaped cells that are filled with an electrically conductive jelly) through a "sixth sense" called electroreception. Sharks and rays can detect muscle movement in prey, but studies have shown that paralyzed prey give off enough electrical signals to be detected. This all works because salt water is more conductive than air.
- Sharks have spiral shaped stomach.

3. Share your results with the rest of the class.




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Activity 2

Video segment: 3:32-5:53

Introduction

Depending on the body part and medical issue, different types of technology can be used to assess and guide treatment. Let's look at x-rays and ultrasounds. X-rays are a type of electromagnetic radiation, similar to visible light. Electromagnetic radiation travels as waves. Waves can be described by their **wavelength** – the distance between to crests or troughs of the way. They can also be described by their **frequency** – the number of waves per second. Wavelength and frequency are related to one another. The higher the frequency, the shorter the wavelength. X-rays are higher energy than visible light.

Ultrasounds work by computing images from echoes received from high frequency sounds waves sent into the body. The sound waves reflect and refract at the interfaces between tissues of different densities.

Objectives:

At the end of this lesson, you will be able to:

- Understand how different technologies are used to help scientists and doctors
1. Based on this information, compare and contrast x-rays and ultrasounds. Provide support for your answer.

X-ray technology is used to examine dense objects like bone or cartilage inside the body. It works because the wave passes through soft tissues but not hard tissues like bones or metal objects that might have been ingested.

Ultrasound is a medical imaging tool that uses sound waves to see the inside structures of animals. Sound waves can be described with wavelengths and frequency, just like light waves. Unlike x-rays which pass through most soft tissue, sound waves will travel through material of a similar density until it strikes a boundary. At the boundary, some waves are reflected back while others keep traveling. Those that reflect back are detected by the machine. Some of the waves that keep traveling will be reflected at the next boundaries between tissues. This lets the machine make a real-time picture of tissues inside a body.





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2. Based on what you have learned, Identify the technology (and why) you would use to investigate potential problems with each system.

Body System	X-ray or Ultrasound	Why you would use this technology
Digestive System	both	<p>One would use an ultrasound to see less dense objects such as soft tissue. It also allows one to “see” the system in action verses a still shot an x-ray would give.</p> <p>One would use an x-ray if the medical concern involves a more dense object such as metal object in a stranded/rescue animal</p>
Skeletal system	x-ray	One would use an x-ray to see more dense objects such as bones.
Cardiovascular system	ultrasound	One would use an ultrasound to see less dense objects such as soft tissue. It also allows one to “see” the system in action verses a still shot an x-ray would give.

3. For each of the images below, state whether you think it came from an x-ray or an ultrasound. State your evidence to support the claim.





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In The Field

What better way to bring STEAM FORWARD alive than to meet an expert at Georgia Aquarium? Here, you will learn more about the background and experience it takes to be a member of the STEAM TEAM. Let's get up close and personal!

MEET AN EXPERT

Meet: Dr. Alexa Delaune

What college or university did you attend?

University of Kansas for undergraduate and University of Florida for veterinary school

What were your major(s)?

B.S. Organismal Biology, B.A. Spanish – undergraduate

Do you have any advanced degrees? If so, what degree?

Yes, Doctor of Veterinary Medicine (DVM)

What is the most exciting part of your job at Georgia Aquarium?

Working with so many different species!

What advice do you have for students interested in doing what you do?

Get good grades, get practical (hands-on) experience, make good connections, work hard, get a well-rounded education, and take every opportunity you can get for experience in the field

What is something surprising or unexpected about your career path?

How much time we have to spend writing records, answering emails, scheduling things with other departments, and talking to people – way more time than actual animal time!

What do you say to students who ask “Why am I learning this?”

A solid background in science, math, and technology is crucial for being a good veterinarian. As an aquatic veterinarian you need to know how to properly calculate drug doses and calculate water volumes. Many of our diagnostics tools are very technologically advanced – digital radiographs, ultrasounds, CT scans, etc. It is important to have a good understanding of how they work so you can use them properly. In addition, a knowledge of animal's natural history and physiology is crucial as there are so many species differences. You can't always use the same medications on each species and if you need to do surgery you must know their anatomy very well so you can make sure you're operating on the correct organ!

