An Online Animal Science Curriculum for Secondary Students

by

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Chapter 1: Introduction

Throughout the year 2020, it will be remembered for the many changes and challenges that people faced in their daily lives. One of the heavily impacted areas has been the educational system. All ages and grades have seen their schooling move from traditional settings in a classroom to untraditional settings by using virtual classrooms on platforms such as Zoom. Teachers of these students have had to adapt to these changes in teaching quickly, sometimes overnight. With these changes, comes more challenges in how to teach the curriculum in different settings such as in-person or virtual. Each change that a teacher or student goes through adds another level of stress to the unknown future. I have seen firsthand what teachers, students, and parents at all various levels of education go through when thinking about how their school year will be like. There is still much uncertainty on how the school year will end, but as educators, we will need to remain versatile in how we approach teaching our students.

When looking at agricultural education, it has been traditionally taught in an in-person classroom setting. With the change of how schools are operating for the school year, some agricultural educators may not have the in-person teaching component of the classroom available to them. These agricultural educators could incorporate technology into their classrooms to teach their students fully. This could be challenging because the agriculture curriculum has hands-on learning opportunities and relies on experiential learning in some lessons. But teaching agriculture in a virtual setting may have its benefits as well. Students who did not have the opportunity to take an agriculture class previously may have space in their schedule to take it now. The teacher could also reach more students than the classroom space allowed.

Animal science is a popular topic for agricultural education. Many students like to take the class to learn more about their favorite animals or to see if they want to explore career

opportunities such as veterinarians. Having a curriculum that is versatile to be either an in-person classroom setting or a virtual classroom setting would be useful for teaching an animal science-based topic.

Purpose

The purpose of this creative component is to create a virtual introductory animal science curriculum that incorporates experiential learning for secondary students.

The general objectives are to have accessibility to an animal science-based curriculum for secondary students virtually, to have experiential learning opportunities in a virtual curriculum, and to challenge students to think critically in a virtual setting.

Need

Agricultural education curriculum can be limited by classroom setting. While most curriculum can be found to work in an in-person classroom setting, there is a new need for a virtual curriculum for agricultural education due to COVID-19. While several animal science-based curriculum can be found, a truly virtual curriculum that offers experiential opportunities is needed.

Chapter 2: Literature Review

Agricultural education has officially played a role in secondary education ever since the Smith-Hughes Act of 1917 (Roberts and Ball, 2009). Through the years, agricultural education has seen many changes to the setting and curriculum. Agricultural education was started to provide an education to those who worked on a farm. This main principle was intact and evolved until the National Vocational Education Act of 1963 which expanded the Smith-Hughes Act to include a focus on careers away from the farm and on special educational needs. In the 1970s, a change of philosophy was presented to refocus agricultural education which was to focus on employment, course work, and food accessibility (Campbell and Marin, n.d.). Agricultural education continued to change to meet the demands of the times. Now, agricultural education has entered a new informational era where technology plays a significant role in the agricultural system. But it is still as beneficial now to teach agricultural education as it was in the past. Students learn life skills, can connect lessons learning in agricultural education to other classes, and can learn from authentic agricultural opportunities (Knolbloch, Ball, and Allen, 2007).

With COVID-19, the rise of using technology in the classroom has had a significant role in agricultural education and teaching. Online learning which can include hybrid or blended learning has become a popular option to use for teaching instead of the traditional in-person classroom (Nguyen, 2015). As schools consider what formats to use for teaching, online learning becomes more of an option. Schools can opt to teach online for many reasons. Some can be related to cost while other reasons are based on reaching more students. The US Department of Education did a report on nine pathways that can improve the productivity of online learning which include broadening access to more students, actively engaging students, personalizing instruction, creating learning opportunities based on student interests, managing teacher and

student times, rate of learning to increase through motivation, reducing facility costs, reducing salary costs, and reusing materials (Bakia et al., 2012). Many factors need to be considered before placing a class to an online format. The "four pillars" for student success is a method that teachers can gauge how their students will perform in an online course. These include academic support, technology support, health and well-being, and a sense of community (Roddy et al, 2017). Having a teacher that focuses on the "four pillars" will have more student success. The curriculum is another aspect of online learning that is considered especially in COVID-19. Some teachers may already have a curriculum that can be used for in-person and online learning while other teachers may not have that option. Other teachers may need to rely on a previously prepared curriculum that can be used online (Daniel, 2020). While there are still many unknowns for teaching during COVID-19, online learning is a way for teachers to interact with their students and for students to learn in a safe environment.

Experiential learning has been a part of agricultural education in secondary schools since agriculture has been a part of the curriculum (Shoulders and Myers, 2013). Having students go through an experience, reflect on the experience, try to figure out that experience, and do another experience is one of the major learning processes for experiential learning that Kolb theorized (Roberts, 2006). Incorporating experiential learning for agricultural education is an important aspect for students to learn through. Applying Kolb's Model of Experiential Learning Process to an online agricultural education curriculum will be key to allow students to fully grasp the objectives for the course.

Chapter 3: Methods and Procedures

This curriculum was created for agricultural teachers to utilize virtually. While talking to past agricultural teachers, they had recognized the need for more virtual agricultural education classes. This led me to develop the idea to create a virtual animal science curriculum for teachers to use. I also recognize agricultural education needs to have students learn by experience. Kolb's theory of the Experiential Learning Process was added to the curriculum to have the options for students to learn by doing. For the curriculum in total, I wanted to have a virtual experiential animal science curriculum. As a result, COVID-19 hit in March. Throughout the summer, I thought about who the curriculum should be for. After seeking advice from various agricultural teachers, I decided it should be for high school students. This all led up to completing my creative component to finish the requirements for my degree.

While looking to find an online animal science curriculum, it was hard to find an all-in-one curriculum that incorporated experiential learning into the coursework. For this curriculum, worksheets and other ideas for worksheets were collected from university websites, FFA worksheets, and extension programs. The main lesson outlines were based on information from Field and Taylor's *Scientific Farm Animal Production: An Introduction to Animal Science.* The discussion questions were based on the lesson information. Reflection journals were used to complete the experiential learning process.

Chapter 4: Product

This curriculum can be used on any online learning platforms such as Canvas, Blackboard, etc. The teacher can use the lesson outlines to record a lecture and post to the online delivery platform. Each outline can be expanded or shortened to fit what the teacher needs for the class and can have pictures and videos to aid in the learning process. The lesson has worksheets that can be used for grading and would be a part of experiential learning. Discussion questions are also included in the curriculum to aid in understanding the information. A reflection journal can be used to complete the experiential learning process. A final project assignment to be completed by the end of the semester can be used in place of a final exam. Videos could be recorded to explain each of the assignments in more detail. Each topic can be done within a week, and some topics could overlap with other topics.

The basic schedule for a week could be as follows:

Monday – Recorded outline and Worksheets introduction

Tuesday – Open Discussion Questions

Thursday – Discussion Questions Due and Reflection Journal open

Friday – Worksheets and Reflection Journals Due

Topics to be covered in the curriculum include:

1) Introduction to Animal Science
2) Basic Nutrition and Digestion
3) Basic Reproduction
4) Health
5) Companion Animals

6) Equine
7) Dairy
8) Beef
9) Swine
10) Sheep
11) Goats
12) Other Animal Industries

Reflection Journal Information

Each Friday have the students turn in answers to the reflection questions. These questions will be asked each week and should show growth in how they are receiving the information in the lessons. Teachers should explain why this is important to their learning. Reflection helps the student think about what they are learning about. This will help the students become more self-aware and develop more creative thinking. Students will become more active in their learning rather than passive.

Other questions can be added to the reflection journal if needed. Questions to be answered include:

- What is the most important thing I have learned this week?
- What is something that I am most proud of this week?
- What brought me the most satisfaction in your work this week?

Introduction to Animal Science

Objective: To explain the main topics for future topics in class and to explain the expectations for the class

- Introduce class expectations
    - Worksheets
    - Discussions
    - Reflection Journal
- What is Animal Science?
    - Understanding the domestication of animals to help humans
    - Responsibilities of animal husbandry
    - High expectation of animal welfare
- Domestication of Animals
    - Dog
    - Cattle
    - Horse
    - Goat
    - Sheep
- Animal Husbandry
    - Everything that goes into caring for animals
        - Shelter
        - Nutrients
        - Reproduction
        - Health
- Animal Welfare
    - Caring for animals correctly
- A brief look at each species to be covered
    - Companion (Dog, Cat)
    - Equine (Work, Show)
    - Dairy (Product – Milk)
    - Beef (Product – Red meat)
    - Swine (Product – Bacon, etc.)
    - Sheep (Product – Meat, Wool)
    - Goat (Product – Meat, Milk, Mohair)
    - Poultry (Product – Meat, Eggs)
    - Exotics (Fish, Bison, Emu etc.)

Worksheets for the lesson

- Promotional Poster
- USDA

Discussion Questions for the lesson

- What does Animal Science mean to you?
- What are some topics that you are interested in learning about?

Reflection Journal

Basic Nutrition and Digestion

Objective: To explain the basics of nutrition for monogastric and ruminant animals, to recognize the energy requirements of maintenance, growth, and lactation, and to identify the different types of feed

- What is the most important nutrient?
    - Water
- Other important nutrients
    - Carbohydrates
    - Fats
    - Proteins
    - Vitamins
    - Minerals
- All feed is used for energy
    - The main two energy sources are carbohydrates and fats
    - Some energy is used lost in feces, urine, gases, and body heat
    - Leftover energy goes to body maintenance, growth, lactation, and production (fattening, egg production)
- Feedstuffs (Add photos of each)
    - Dry roughage (hay, straw, fodder, stovers)
    - Ranges, pasture plants, green forages
    - Silage (corn, legume, grass)
    - Energy feeds (cereal grains, mill by-products, fruits, nuts, roots)
    - Protein supplements
    - Mineral supplements
    - Vitamin supplements
    - Nonnutritive supplements
- Digestion
    - The mechanical and chemical breakdown of feed
- Carnivore
    - Eat meat (cats, dogs)
- Herbivore
    - Eat vegetation (cattle, horses, sheep, goats, poultry)
- Omnivore
    - Eat both (humans, swine)
- Monogastric digestive system (Add diagram of a swine digestive system)
    - Main sections: mouth, esophagus, small intestine – duodenum, large intestine (colon).
    - Horses have a cecum which allows them to further digest fiber.
- Ruminant animal digestion (Add ruminant digestive system diagram)
    - Cattle, sheep, goats
    - Main sections: mouth, esophagus, four stomach compartments – rumen, reticulum, omasum, abomasum – small intestine, large intestine
    - Rumen
        - Largest compartment covered with papillae (helps with absorption, small fingerlike projections lining the rumen)

        - Filled with microorganisms (bacteria, protozoa) for digestion and fermentation
    - Reticulum
        - Honeycomb structure for the muscle to move the rumen to digest more feed
    - Omasum
        - Many folds to squeeze out liquid and absorption
    - Abomasum
        - Operates like a monogastric stomach
- Rumination
    - Cud – bolus of feed
    - Regurgitation of a bolus of feed from the rumen to the mouth for more chewing
- Body maintenance
    - Nutrients needed to keep the body functioning
- Priority order of where nutrients go
    - Body tissue repair
    - Control of body temperature
    - Energy to keep vital organs functioning
    - Water balance maintenance
        - All other nutrients go to growth, fattening, reproduction, lactation, egg production, wool production, or work
        - Anything above body maintenance requires more energy and nutrients
- Growth
    - This occurs when more protein is being made than broken down (building body tissues, bones, etc.)
    - Calcium, phosphorus two minerals supplement as they are used for growing animals
    - Iodine and selenium are needed to be supplemented because they are most likely deficient
    - Vitamin D is needed for the body to use calcium and phosphorus properly
- Fattening
    - The energy needed to store fat
- Reproduction
    - More nutrients are needed to grow a fetus and mating reproduction functions
- Lactation, egg-laying, wool production, work
    - More nutrients are needed above maintenance to produce

Worksheets for the lesson:

- Feed Label
- Monogastric digestion
- Ruminant digestion

Discussion questions

- Research either one forage or one concentrate and post what you find about it. Reply to at least two of your classmates.

- Why do animals need nutrients?
- How is the energy obtained from feed nutrients?

Reflection journal

Basic Reproduction

Objectives: To classify the parts and functions of female and male reproduction and to explain the hormones of the reproductive system.

A large part of animal science is the study of reproduction which is how an animal can produce offspring

- Female reproductive organs
    - Most species have similar structures but there are some differences in the size of some parts
- Primary structures and functions (add female reproductive anatomy diagram)
    - Ovary
        - Produce ova or eggs and hormones estrogen and progesterone
        - An ovum or egg is carried inside a follicle until ovulation
        - The follicle then turns into a corpus luteum following ovulation
        - Ovulation – the release of the egg or ovum
    - Oviduct
        - Connected to the ovary and uterus
        - Transportation of the ova or egg to the sperm
        - Fertilization of the ova or egg occurs here
    - Uterus
        - The fertilized egg or embryo attaches here to begin development and stays until birth
        - Embryo – a fertilized egg
        - Parturition – the process of giving birth
    - Cervix
        - Located between the uterus and vagina
        - Prevent the uterus from contracting the disease and being contaminated
    - Vagina
        - The female organ of copulation
        - The birth canal at parturition
    - Poultry has a very different reproductive tract with the egg being placed outside the body.
- Male reproductive organs (add male reproductive anatomy diagram)
    - Testicles
        - There are two testicles held in the scrotum
        - Produces sperm to fertilize the ova
        - Produces the hormone called testosterone
    - Scrotum
        - Holds the testicles
        - Temperature control for the sperm lower than body temperature
    - Epididymis
        - Storage, maturation, and transportation of sperm
    - Vas deferens
        - Transportation tube from the epididymis to the urethra
    - Urethra
        - The large canal through which the penis goes through to the outer body

- Penis
  - Organ of copulation
  - The passageway for semen and urine
- Hormones
  - The endocrine system controls reproduction through hormonal signals
  - Hypothalamus and anterior pituitary gland are the main structures that control the ovaries and testicles.
  - Hypothalamus produces gonadotropin-releasing hormone (GnRH).
  - GnRH signals the anterior pituitary gland to produce follicle-stimulating hormone (FSH) to produce a follicle with an egg. The anterior pituitary produces luteinizing hormone (LH) to cause ovulation.
  - Estrogen is released as the follicle grows to stimulate GnRH and sexual behavior.
  - After ovulation is caused by LH, the corpus luteum will produce progesterone which inhibits follicle-stimulating hormone and luteinizing hormone.
  - If the egg is fertilized, the corpus luteum will continue producing progesterone to maintain the pregnancy.
  - If the egg is not fertilized, the corpus luteum will go away and the process will start over again.
  - Estrus/heat – the time where the female is ready to be bred
  - The whole process is called an estrous cycle
- Testosterone – produced by the testicles, stimulate the production of sperm
- Artificial insemination – semen is deposited in the female reproductive tract by artificial techniques rather than by natural mating
- Embryo transfer – an embryo is removed from the donor's reproductive tract and transferred to the recipient's reproductive tract
- Gametogenesis – production of sex cells by the ovaries and testicles
- Oogenesis – the production of ova
- Spermatogenesis – the production of sperm
- Fertilization – the union of the sperm and egg

Worksheets:

- Hormones and Structures
- Female reproductive system
- Male reproductive system

Discussion questions

- What are the two functions of the female gonads or ovaries?
- What are the two functions of the male gonads or testicles?
- Why is artificial insemination used in many animal species?

Reflection journal

Health

Objectives: To classify what disease is and how to prevent it, to explain how to detect sick animals, and to explain what vital signs are

- Many factors go into keeping animals healthy. That is the main goal for caretakers of animals – to keep animals healthy
- Mortality rate – the rate of death
- Morbidity rate – the rate of sickness
- While the loss of animals due to death is high, a sickness that is ongoing in a herd can have a bigger economic loss
- Disease
    - Any deviation from normal health
    - Non-infectious
        - Caused by non-living agents (not contagious)
    - Infectious
        - Caused by living organisms such as bacteria, viruses, protozoa, fungi (contagious or not contagious)
    - Contagious
        - Able to be transmitted from animal to animal
- Causes of disease
    - Microbes
        - Bacteria, protozoa, fungi, viruses
        - Cause 60% of disease outbreaks in animals and humans
    - Parasites
        - Organisms that live on or in another living organism
            - Ectoparasites – external parasites (lice, fleas, ticks)
            - Endoparasites – internal parasites (located in stomach, intestines, lungs, liver)
    - Other causes
        - Nutritional deficiency, metabolic disorders, trauma, toxins, congenital defects, degenerative diseases, cancer
- Frequency of disease
    - Sporadic – single animal, widely scattered
    - Endemic – present constantly in a location
    - Epidemic – attacking many animals in a region at the same time, rapidly spreading
    - Pandemic – a widespread epidemic disease
- Prevention
    - Biosecurity
        - Avoid the introduction of diseased or infected animals, increase specific disease resistance, increase overall disease resistance, minimize exposure to disease agents
    - Good management
        - Proper nutrition, record analysis, sanitation, ventilation, facility management, stress minimization, trained personnel
    - Veterinarian planning

        - Farm walkthrough, vaccination schedule, proper use of biologics and pharmaceuticals
- Using biologicals (vaccines) and pharmaceuticals (drugs)
    - Administration (Add diagrams)
        - Topically – applied to the skin
        - Orally – through feed or pills
        - Injections into the body
        - Intranasally – product delivered through breathed air
    - Types of injections (Add diagrams or videos)
        - Subcutaneous – Under the skin but not in muscle
        - Intramuscular – directly into the muscle
        - Intravenous – into a vein
        - Intramammary – in through the teat canal
        - Intraperitoneal – in the peritoneal (abdominal) cavity
        - Intrauterine – through the cervix
- Detection
    - Visual observation
        - Loss of appetite
        - Listless or depressed
        - Droopy ears
        - Hunched appearance
        - Separated from others
        - Coughing, wheezing, labored breathing
        - Stiff movement
    - Vital signs
        - Body temperature, respiration rate, heart rate

Animal	Temp (F)	Pulse (beats/min)	Respirations (breaths/min)
Cattle	101.5-107.5	60-80	12-36
Horse	98-101.5	28-42	8-16
Sheep	101.5-104	70-90	12-20
Swine	101-103	60-90	10-20

        - Obtain measurements while the animal is calm
    - Mucous membranes
        - Pink – normal
        - Red – engorged vessels
        - Blue or purple – cyanosis (cardiac or pulmonary disease)
        - Moist vs dry
    - Capillary refill time
        - How fast color returns to the mucous membrane after gentle pressure is applied
        - Indicator of blood perfusion to peripheral tissues
    - Skin tent test
        - Can be used to assess hydration status

Worksheets:

- Biosecurity
- Injections
- Zoonotic Diseases

Discussion questions

- What is the definition of a disease?
- What is a contagious disease?
- What are some steps to stop the spread of disease?

Reflection journal

Companion Animals

Objectives: To explain the basics of companion animals, to classify the uses of companion animals, and to describe what to look for in healthy animals

- Dogs, cats, small mammals – rabbits, ferrets, guinea pigs, and pet fish
- Use
    - Mostly used for pleasure and companionship
- Pet ownership (AVMA, n.d.)

	Dog	Cat
Percent of households with pet	38.4	25.4
Number of households with pet	48,255,413	31,896,077
Total population	76,311,305	58,385,725

	Rabbit	Ferret	Fish
Number of households with pet	1,534	326	10,475
Total population	2,244	501	76,323

- Dog breeds
    - Most common dog breed of 2019 (AKC Staff, 2020)
        - Labrador retriever
        - German shepherd
        - Golden retriever
        - French bulldog
        - Bulldog
        - Poodle
        - Rottweiler
        - Pointer
        - Pembroke welsh corgi
- Cat Breeds (Leonardi, 2013)
    - 95% of cats are domestic shorthair and domestic longhair cats
    - Other breeds are more exotic
        - Persian, Maine Coon, Siamese, American Shorthair, Abyssinian, Exotic Shorthair, Ragdoll, Burmese, and Himalayan
- Other Uses
    - While most companion animals are used as pets, some dogs and cats have other jobs to do
    - Cats
        - Known for catching rodents and keeping the pest population low
    - Dogs (Stregowski, 2019)
        - Service dogs, therapy dogs, police dogs, military, working dogs, detection dogs, search and record dogs, herding dogs
        - Service dogs

        - Specially trained dogs to assist people with disabilities
        - The ADA (American with Disabilities Act) has guidelines that dogs must follow
        - Examples: guide dogs for the blind, mobility assistance dogs, seizure and other medical assistance dogs hearing dogs for the deaf
        - Breeds: Labrador Retriever, Golden Retriever, Standard Poodle, German Shepherd
- Therapy dogs
    - Although these dogs are trained, they are not recognized as service dogs
    - Offer emotional support to sick or injured people, can go to schools and daycare facilities
    - Trained to be even-tempered, well-socialized, well-trained, and non-fearful
    - All dogs can be therapy dogs if they have the right temperament
- Police dogs
    - Specifically trained to assist police and other law enforcement personnel in the line of duty
    - Breeds: German Shepherd and Belgian Malinois
- Military working dogs
    - Similar to police dogs
    - Assist with military personnel
    - Jobs include trackers, sentries, scouts, and search and rescue
    - Breeds: German Shepherd, Dutch Shepherds, Belgium Malinois
- Detection dogs
    - Exceptional senses of smell to sniff out a particular substance or group of substances
    - Common substances: illegal drugs, explosives, blood, human remains, cancer, low blood sugar, insects, cadavers, animal feces
    - Used in law enforcement, wildlife biology, healthcare, truffle hunting
    - Breeds: Beagles, Labrador Retriever, Golden Retriever
- Search and rescue dogs
    - Great agility and exceptional senses of smell and hearing
    - Highly trained and used in tracking, specialized search, avalanche rescue, cadaver location
    - Breeds: Labrador Retriever, Golden Retriever, Border Collie, Leonberger, German Shepherd
- Herding dogs
    - Work with livestock such as sheep and cattle
    - May be born with herding abilities to the herding breed groups, but can receive additional training that can be used for competitions
    - Breeds: King Shepherds, Border Collies, Black Mouth Curs, and Icelandic Sheepdog

- Health
    - Pets can become sick through infectious agents
        - Viruses, bacteria, Parasites – Internal (roundworms, tapeworms), External (fleas, ticks), vector-borne diseases (heartworm
    - Dogs
        - Parainfluenza (virus)
        - Bordetella (bacteria)
        - Canine Parvovirus – prevention: vaccination, herd immunity, sanitation
    - Cats
        - Feline Panleukopenia Virus (decrease in white blood cells)
        - Feline Leukemia Virus (immune suppression, cancer)
        - Feline Immunodeficiency Virus (immunity suppression)
            - Prevention: vaccination, sanitation of wounds
    - Pet Health Evaluation and Physical Examination
        - Exam every 6 to 12 months
            - All body systems, medical condition, dental assessment, parasites, age and breed considerations, pain assessment, body condition scores

Worksheets

- Handling of animals
- Dog breeds
- Safety

Discussion questions

- Why do people like having pets in their households?
- What is an interesting job that dogs have that you did not know about?
- What animals do you have in your household? If you do not, what kind of pet would you want?

Reflection Journal

Equine

Objectives: To classify the basic breeds and uses for horses and to explain the basics in nutrition, health, and reproduction

- The horse population in the US (Broadway, 2020)
    - American Horse Council Horse Populations
        - Horse Owners – 1,013,746
        - Horse Population – 7,246,835
    - National Agriculture Statistic Service
        - Horse Farms – 459,526
        - Horse Population – 2,847,289
- Breeds
    - Popular Light Horse breeds
        - Quarter horse, Paint, Thoroughbred, Tennessee Walking, Standardbred, Arabian Appaloosa, Pinto, Morgan American Saddlebred
    - Popular Draft breeds
        - Belgian, Percheron, Clydesdale
    - Popular Pony breeds
        - Miniature, Welsh, Shetland
- Uses
    - Short racing, showing, stock work, pleasure riding, 3 and 5 gaited, driving, harness racing, long racing, riding by children, and heavy pulling
- Conformation of the horse
    - For the horse, the most important part is their feet and legs
        - Main parts of the front leg
            - Point of shoulder, knee, pastern, cannon, and foot
        - Main parts of the rear leg
            - The hip, femur, stifle, tibia, fibula, hock joint, cannon, fetlock, pastern, and foot
        - Hoof
            - Essential to care for and to keep the horse sound and serviceable
    - Unsoundness – any defect that interferes with the usefulness of the horse
    - Blemish – a defect that detracts from the appearance of the horse
- Gaits of a horse
    - Walk
    - Trot
    - Pace
    - Gallop
    - Canter
    - Rack
    - Running walk
- Health
    - Sanitation is key to prevent disease and parasites in horses
    - Disease
        - Tetanus – prevention through vaccine

        - Strangles – bacterial disease; fever, nasal discharge, swollen lymph nodes, rattling sounds; bacterin is available
        - Influenza – common respiratory disease
        - West Nile Virus – transmitted by mosquito or bird; vaccine available
        - Parasites – pinworms, bots, strongyles, Ascaris worms
- Reproduction
    - Estrous cycle every 21 days
    - Heat lasts for 5-7 days
    - Length of gestation is 340 days (11 months)
- Digestion
    - Horses mainly eat forages with grain available for more energy
    - Where is food digested
        - Stomach 10% digestible capacity
        - Small intestine 60-70% protein and carbohydrate digestion
        - Cecum 80% fiber digestion
        - Large intestine 60% digestible capacity

Worksheets

- Equine Safety and Behavior
- Virtual Horse Farm Tour
- Horse Color and Descriptions

Discussion Questions

- Why is having unsoundness in a horse bad?
- Why do you think horses have many gaits?
- Why do you think people use horses for pleasure more than for working?

Reflection Journal

Dairy

Objectives: to classify the breeds and uses of dairy cattle, to explain what milk is made of and the products that come from milk, and to describe the importance of a clean milking environment

- Statistics (USDA, *Milk Production,* 2020)
    - Number of Dairy Cows in the US
        - 9.35 million
    - Milk Production
        - 18.6 billion pounds
    - Production per cow
        - 1,944 pounds
- Breeds
    - Ayrshire, Brown Swiss, Guernsey, Holstein, Jersey, Milking Shorthorn, Red and White
- Use
    - The main use is milk production
    - A cow will produce 3,500 lbs. of milk in her lifetime
    - Equal to about 200,00 glasses of milk (*Dairy Cattle Information,* n.d.)
- Composition of milk
    - 88% water
    - 3-4% fat
    - 4.8% lactose
    - 3.3% protein
    - Minerals and vitamins
- Milk products
    - Fluid milk, cream cheese, butter, ice cream, nonfat dry milk, eggnog
- How much milk does it take to make a pound of...
    - Butter – 21.8lbs
    - Whole milk cheese – 9.23lbs
    - Evaporated milk – 2.1lbs
    - Condensed milk – 7.4lbs
    - Ice cream (1 gal) – 12.0lbs
    - Cottage cheese – 7.2lbs
    - Nonfat dry milk – 2.15lbs
- Homogenization – the process of making fat globules in milk the same size
- Pasteurization – a process of exposing milk to a temperature that destroys all pathogenic bacteria but does not diminish the nutritional value
- Milk consumption
    - Trending higher – butter and cheese 1- mozzarella, 2 – cheddar
    - Lower consumption – fluid milk, yogurt, ice cream
- Health
    - Zoonotic disease – a disease that can affect both animals and humans
    - Tuberculosis and brucellosis are two zoonotic diseases that can be transmitted to humans through milk
    - Mastitis
        - Inflammation and infection of the udder

        - It destroys mammary tissue and impedes milk production
        - Costs the farmer money in treatments and lost production
        - After milking is when the teat end is most susceptible to bacteria entering the udder
- The milking procedure is important for the prevention of bacteria in the udder
    - Clean the udder
    - Attach the milking unit within 1 minute
    - Minimize air leaking during milking
    - Post-milking teat dip
- Milking parlor types
    - Robotic
    - Rotary
    - Parallel
    - Tandem
    - Herringbone
- Mammary Glands – The Udder
    - Exocrine system – external secretion of milk transported through ducts
    - The cow has four main glands that end with teats
    - Alveoli – secretory tissue of the mammary gland
        - Milk is collected into the alveolus lumen and moves during the milking process to the gland cistern and streak canal.
    - Oxytocin is the hormone that helps milk go through the udder during the milking process
- Reproduction and Gestation
    - Estrous cycle - 21 days can range 14-29 days
    - Heat (estrus) – 18 hours range 12-30 hours
    - Gestation length – 285 days
- Dry Cows
    - The milking period for a cow is not a full year
    - Farmers follow 305 days of lactation with 60 days of being not milked or dried off to allow the body time to adjust for parturition
- Nutrition for lactating cows
    - Requirements vary in the stages of lactation
    - 2.5 times more energy is needed above maintenance for milk production
    - A total mixed ration (TMR) is used to give lactating cows a mix of chopped hay, silage, and concentrates in a balanced diet

Worksheets

- Dairy Breeds and Anatomy
- Virtual Dairy Farm Tour
- Milk

Discussion Questions

- Why do cows produce so much milk?
- How do you think farmers can prevent mastitis?

- Why do you think cows need more nutrients to produce milk?

Reflection Journal

Beef

Objectives: To classify the breeds and uses of beef cattle, to explain the main products of beef cattle, and to recognize where beef cattle grow and develop on different farm types

- Statistics (Knight, 2020)
  - Total cattle in the beef system
    - 94.4 million head
  - Cow-calf operations
    - Average herd size 43.5 head
  - Cattle feeding operations
    - More than 95% of farms have 1,000 head or less
  - Beef exports
    - 1 – Japan
    - 2 – South Korea
    - 3 – Mexico
    - 4 – Canada
    - 5 – Hong Kong
  - Beef Imports
    - 1 – Canada
    - 2 – Australia
    - 3 – Mexico
    - 4 – New Zealand
    - 5 – Nicaragua
- Breeds
  - More than 250 breeds
  - Top popular breeds
    - Black Angus, Charolais, Hereford, Simmental, Red Angus, Texas Longhorn, Gelbevieh, Holstein, Limousin, Highlands, Belted Galloway, Brahman, Shorthorn Belgian Blue
- Use and Products – Red meat
  - Main cuts in beef cattle
    - Round, sirloin, short loin, rib, chuck, foreshank, brisket, short plate, flank
  - USDA Grade Standards for beef
    - Quality Grades – measure consumer palatability characteristics
      - Prime, choice, select, standard, commercial, utility, cutter, canner
    - Quality grade is based on marbling and maturity
      - Marbling – the level of intramuscular fat present in the ribeye between the 12^{th} and 13^{th} rib
      - Maturity - the age of the carcass
    - Yield grade – measures the amount of fat, lean, and bone in the carcass high – 1, 2, 3, 4, 5 – low
- Traits
  - Beef producers rely on certain traits when choosing what to breed for
  - Most economically important traits

        - Reproductive performance, weaning weight, postweaning growth, feed efficiency, carcass merit, longevity, conformation, freedom from genetic defects
        - Reproductive performance – a combination of factors which include ease of becoming pregnant again, weaning calves quicker, and improvement by crossbreeding
        - Weaning weight – milking and mothering ability of a cow as reflected by the weight when weaned from the mother
        - Postweaning growth – growth from weaning to finished weight
        - Feed efficiency – a pound of feed required per pound of live weight gain
        - Carcass merit – measured by quality grades and yield grades
        - Longevity – the length of productive life
        - Conformation – form, shape, and visual appearance of the animal
        - Genetic defects – culling the animals which present any genetic defects such as double muscling, soled hooves (syndactyly), contracted tendons (arthrogryposis), and osteoporosis is the logical way to prevent these from happening
- Breeding
    - A herd improves genetics through sire selections
    - Sire summaries that are used are Expected Progeny Difference (EPD) and accuracy (ACC)
    - EPD – a measurement of genetic potential based on the individual's performance and the performance of related animals such as the sire, dam, and other relatives
    - Accuracy – a measure of the expected change in the EPD as additional progeny data become available
    - Crossbreeding – mating animals from genetically diverse groups within a species
    - Heterosis – performance of offspring that is greater than the average of the parents
- Operations
    - Cow-Calf Producers
        - Main goals
            - Breeding cows and improving genetics
            - Calving live calves and weaning calves at the right time
            - Selling calves based on weight
            - Repeating the process each year
        - Other goals
            - Maintain correct weight for cows, limiting calving difficulty (dystocia), maintain high weaning weights, high amounts of forage available in the pasture, hay, or silage
    - Stocker-Yearling Production
        - Marketing is important for this stage in production as producers both buy and sell their cattle. Other factors include forage availability, trucking, and health
        - The main goal is to obtain the most amount of weight without much economic loss.
        - Buy weaning aged cattle and grow until starting the finishing weight

    - Feedlot Types
        - Commercial – over 1,000 head capacity
        - Farmer-Feeder lots – less than 1,000 head capacity
    - Feedlot Management
        - Facilities – upkeep, storage for feed
        - Cost of cattle – how much cattle cost to be placed in the facility
        - Feed costs – how much feed is needed to gain weight
        - Nonfeed costs – other costs that are not feed
- Reproduction and Gestation
    - Puberty – 6-18 months
    - Estrous cycle – 21 days
        - Range – 17-29 days
    - Estrus (heat) – 18 hours
        - Range – 12-30 hours
    - Gestation length – 285 days
    - Dystocia – calving difficulty
        - A calf can have an abnormal presentation when parturition comes
        - The manual turning of the calf can put the calf in the proper position with front feet first then head
        - A vet may need to do a caesarian procedure in worst-case scenarios
- Digestion and Nutrition
    - Beef cattle are ruminants. They rely on forages to gain weight, to lactate, and to develop a calf
    - Different ages and usages of a beef animal will have different levels of energy demand
    - Body condition scores are important to recognize as producers can visually see the weight being gained or lost. Observing body conformation is how producers see this.
- Health
    - The main areas of concern for health are around calving times and whenever cattle are moved
    - Calving time
        - Hard birthing (dystocia) – calf can come through the birth canal incorrectly creating problems for the cow and calf
        - Weather can affect health causing pneumonia
        - Dehydration leads to scours and deficiency in nutrients
    - Cattle movement
        - Stress can induce sickness – the most common is pneumonia
        - Minimizing stress while transporting can lead to less sickness

Worksheets

- Dystocia
- Beef Retail Cuts
- Beef Cattle Operations

Discussion Questions

- Why is there an emphasis placed on sire selection in beef breeding?
- Why is crossbreeding used?
- What is the largest cost when finishing beef cattle to market weight and why is it that?

Reflection Journal

Swine

Objectives: To classify the breeds and terminology used in the swine industry, to recognize what products swine are used for, and to describe the operations used to raise swine from birth to market

- Statistics (USDA, *Quarterly Hogs and Pigs,* 2020)
    - Total hogs in the US – 79.1 million head
        - Breeding animals – 6.33 million head
        - Market hogs – 72.8 million head
    - Top countries for US pork exports (Haley, 2019)
        - 1 – Mexico
        - 2 – Japan
        - 3 – Hong Kong/China
        - 4 – Canada
    - Canada accounts for the majority of pork imports through live hogs
- Breeds
    - Top swine breeds
        - Berkshire, Duroc, Landrace, Spotted, Chester White, Hampshire, Poland China, Yorkshire
- Terminology
    - Barrow – castrated male
    - Gilt – a female who has not had a litter of piglets
    - Sow – a female who has had a litter of piglets
    - Boar – intact male used for breeding
    - Stag – castrated male but done later in age
    - Farrowing – the time of birth for a gilt or sow
- Use and Product
    - Pork is the main product that swine are raised to produce
    - Wholesale cuts of pork
        - Leg/ham, loin, blade shoulder, jowl, arm shoulder, spareribs, side
    - Traditional grades for barrows and gilts
        - Quality characteristics of the lean
        - Expected combined yields of the four lean cuts (ham, loin, blade shoulder, picnic shoulder)
    - Two quality grades for pork – Acceptable and Unacceptable
- Traits and Breeding
    - Preferred traits for sows and boars include sow productivity, growth rate, feed efficiency, carcass traits, structural soundness
        - sow productivity – economic importance as it measures the sow's litter size, number weaned per litter, 21-day litter weight, and number of litters per sow per year
        - Growth rate – how well swine can get to 250 lbs.
        - Feed efficiency – pounds of feed required per pound of gain
        - Carcass traits – estimate the pounds or percentage of acceptable quality lean pork in the carcass

        - Structural soundness – the capacity of breeding and slaughter animals is to withstand the rigors of confinement rearing and breeding
        - Free from genetic defects such as cryptorchidism (retention of one or more testicles in the abdomen), hernias, inverted nipples, and pale, soft, and exudative (PSE) carcasses
    - Genetic improvement through sire selection and sow selection
        - Indexes are created to help breeders improve their stock
        - Sow productivity index, terminal sire index, maternal line index are some of these indexes
    - Crossbreeding is used in swine to improve the genetics
        - Two types of crossbreeding systems
            - Rotational cross – two or more breeds are used as the females with a different boar breed
            - Terminal cross – two breed single or rotational cross female is mated to a boar of a third breed
            - A combination crossbreeding system that can be used is a rota-terminal crossbreeding – combines a three-breed rotational system and the terminal system
- Swine Operations
    - Basic rotation in the swine industry
        - 1 – breeding and gestation
        - 2 – farrowing to finish
        - 3 – nursery (weaning to 30-70 lbs.)
        - 4 – finishing to market weights of 223-300 lbs.
    - Five main types of swine operations
        - Farrow to finish – the breeding herd is on the farm, pigs are produced and fed to complete weight (steps 1-4)
        - Farrow to feeder pig production – producer does breeding, gestation, weaning, and nursery
        - Feeder pig finishing – purchases feeder pigs, feeds them to market weight, and sells them (step 4)
        - Farrow to weaner – pigs managed from birth to weaning age then moved to a finisher
        - Seedstock – house and raise breeding boars and gilts
- Reproduction and Gestation
    - Gilts start their estrous cycle by 5 months
    - Two-thirds of the breeding in the swine industry is done by artificial insemination
    - On average, 10 piglets can be farrowed per litter
    - Length of gestation is 16 weeks
- Health
    - Mastitis, metritis, agalactia are some problems that may occur with farrowing
        - Mastitis – inflammation of the mammary gland
        - Metritis – inflammation of the uterus
        - Agalactia – inadequate milk supply
    - Scours (diarrhea) may occur in piglets
- Nutrition and Digestion

    - Pigs are monogastric and do not ferment feeds as cattle do to digest feeds
    - Different energy requirements are needed at the different stages of life and sex like breeding boars, lactating sows, the gestation period of gilts and sows, finishing pigs and weaned piglets

Worksheets

- Anatomy of a pig
- Swine breed sorting
- Swine reproduction

Discussion Questions

- Why is there a strong emphasis on breeding traits in swine?
- Why are there many different types of operations to raise swine?
- Why is artificial insemination used in the swine industry?

Reflection Journal

Sheep

Objectives: To classify the breeds and terminology of sheep, to recognize the products of sheep, and to explain the producer types of sheep

- Statistics (USDA, *Sheep and Goats,* 2020)
    - Total sheep in the US – 5.20 million head
        - Breeding sheep – 3.81 million head
        - Market sheep and lambs – 1.39 million head
    - Wool production
        - 24.0 million pounds of wool collected
        - 3.32 million head shorn for their wool
        - Average price per pound of wool $1.89
- Terminology
    - Lamb – young sheep
    - Ram – intact male
    - Ewe – female sheep
    - Wether – castrated male
    - Flock – a group of sheep
    - Yearling mutton – market sheep at a year old
    - Mutton – market sheep over a year old
- Uses for sheep
    - Wool (ewe breeds)
    - Meat (ram breeds)
    - Dual (both wool and meat)
- Breeds
    - Sheep breeds for wool
        - Rambouillet, Debouillet, Merino, Corriedale, Targhee, Finnsheep
    - Sheep breeds for meat
        - Suffolk, Hampshire, Shropshire, Oxford, Southdown, Montadale, Cheviot
    - Sheep breeds for both wool and meat
        - Dorset, Columbia, Lincoln, Romney
- Product
    - Lamb wholesale cuts
        - Leg, loin, rib, shoulder, neck, foreshank, breast
    - Sheep are broken into categories by age and sex
        - Lamb, yearling mutton, mutton
        - Male, female, wether
    - Quality grades
        - Based on conformation, maturity, flank streaking (streaks of fat within the flank muscle)
            - Prime, choice, good, utility, cull
    - Yield grades
        - Based on fat thickness over the loin eye muscle
            - High – 1, 2, 3, 4, 5 – low
- Wool
    - How wool grows

        - Wool fibers grow from follicles within the outer layers of skin
        - The fibers cling together by the cuticle
            - Outer layer – cuticle
            - Inner core – medulla
            - Medium and coarse wool have a medulla, fine wool does not
        - Waves in wool fibers are called crimp. Due to hard and soft material in the cortex. Categories: bold, intermediate, dim
        - Fibers that do not have crimp are called kemp and reduce the value of the wool
    - Factors that affect wool
        - Proper nutrition
        - Breeding – improve fleece weight, staple length, fineness, uniformity of length
    - Classes and grades of wool
        - Grades
            - American grade – fine, ½ blood, 3/8, ¼ blood, low ¼ blood; describes the fiber diameter
            - Spinning count system – how much wool (hanks) can be spun from 1 lb. of wool; hanks = 560 yards; 80 hanks = fine, 36 hanks = coarse
            - Micron diameter method – most accurate measurement; takes averages of several fibers
            - Fine wool breeds – Merino, Rambouillet
            - Coase wool breeds – Cotswold, Lincoln, Romney
            - Medium wool breeds – Targhee, Southdown, Corriedale, Columbia, Panama, Romeldale, Shropshire, Hampshire
        - Classes
            - Staple, French combing, clothing
    - Production of wool
        - Greasy wool – wool or fleece shorn once each year from sheep
        - Scoured wool – the washing and rinsing of wool to remove grease, dirt, and other impurities
        - Use of wool – cloth and carpets
- Producer types
    - Purebred breeder
        - Growing sheep to reach their growth potential
        - determine the genetic productivity of commercial operations
    - Commercial slaughter lamb producers
        - Have a feed and pasture system set to breed ewes, raise weaned lambs, and finish weaned lambs to market weight
    - Commercial feeder lamb producers
        - Insufficient pasture grounds so fed out until market weight in the fall
    - Commercial feedlot operator
        - Fed a concentrate diet of corn and limited fiber to reach market weight
- Sheep facilities and equipment

    - Pastureland – essential for typical farm operation and is made of a mix of alfalfa, grasses, clover, and ryegrass
    - Fencing – mostly woven wire fence is used to contain animals
    - Corral and chutes – necessary for proper maintenance of the flock in disease management, breeding, weaning, and ear tagging
    - Shelter – not as necessary due to wool but some are needed for pregnant ewes
    - Lambing equipment – special pens called lambing jugs are used to protect lambs until they are strong enough to be released to the rest of the flock with the mothers
    - Feeding equipment – hay feeder, creep feeder for additional concentrates for lambs but not for the ewes
- Breeding
    - Breeding season is in the fall
    - Puberty – 5-12 months of age
    - Estrous cycle – 16 days
    - Estrus – 30 hours
    - Gestation length – 147 days
    - Can be bred via hand mating like artificial insemination or pasture mating which is having the ram with the ewes in the pasture
    - Crossbreeding can be used to improve genetics
- Nutrition and Digestion
    - Pregnant mature ewes
        - The first half of pregnancy – roughages
        - The second half of pregnancy – concentrates and good quality roughages
    - General requirements
        - Energy, protein, salt, iodine, phosphorus, vitamin A, D, E, sometimes selenium
- Other management practices
    - Castration – the process of removing the testicles
    - Docking – shortening the tail to improve health
    - Shearing – the removing of wool with scissors or shears
    - Crutching – removal of wool around the tail and between the rear legs
- Health
    - Common sheep diseases and parasites
        - Enterotoxaemia – overeating disease
        - *E. coli* complex (*E. coli, clostridium perfringens,* rotavirus) – causes enterotoxaemia, vaccinations to the ewes prevents it
        - Lamb dysentery – wet weather causes this with *C. perfringens*, vaccination to the ewes
        - Footrot – helped by trimming feet. Most common and most serious for sheep
        - Sore mouth – a virus that affects lambs
        - White muscle disease – deficiency in selenium
        - Shipping fever – the stress of transportation can cause sickness
        - Internal parasites – more serious, the body is compromised and cannot gain energy, coccidiosis, stomach worms, nodular worms, liver flukes,

lungworms, roundworms, tapeworms –and identification of feces can prevent parasites and using a dewormer can treat parasites

Worksheets

- Sheep production facility
- Sheep shearing
- Vet assisting - sheep

Discussion Questions

- Why are there wool and meat sheep breeds?
- Why are there purebred producers?
- Why are sheep only bred in the fall?

Reflection Journal

Goats

Objectives: To explain the use and terminology for goats and to recognize what products goats produce

- Statistics (USDA, *Sheep, and Goats,* 2020)
    - Total goat population in the US – 2.66 million head
        - Breeding goats – 2.18 million head
        - Market goats - 474,000 head
    - Class breakdown
        - Meat – 2.05 million head
        - Milk – 430,000 head
        - Angora – 137,000 head
- Uses for goats
    - Meat
    - Dairy
    - Angora
    - Cashmere
    - Pygmy
    - Goats mostly thrive on browse and forbs (brushy plants and broadleaf plants)
- Terminology
    - Cabrito – goat meat
    - Kidding – giving birth to kids
    - Kid – baby goat
    - Doe – female goat
    - Buck – male goat
    - Polled – genetically chosen to be born without horns
- Types of goats
    - Meat goats
        - Breeds – Spanish, Boer, West African Dwarf
        - Primarily used for meat and skins
        - More popular in Africa and the Middle East
    - Dairy goats
        - Breeds – Toggenburg, Saanen, Alpine, Nubian, LaMancha, Oberhasli
        - Milk is more readily digestible than cow's milk
            - All carotene is converted to vitamin A
        - Very similar to cow's in efficiency feed conversion to milk
        - Structures of the mammary gland are the same only difference is that goat have two glands whereas cows have 4
    - Angora goats
        - Production areas – Turkey, South Africa, Texas, Missouri, Arkansas, Pacific Northwest
        - Do not do well on traditional pasture
        - Do better on brushy plants and rough areas
        - The main production is mohair which is similar to wool
            - Only shorn every 2-3 years so that the hair can grow to 2-3 feet long

- Classes of mohair
    - Flatlock – wavy
    - Tight lock – ringlets the full length of the fibers
    - Open fleece – fluffy
- Cashmere goats
    - Areas – central Asia recently in the United States
    - Main production – cashmere fiber
        - Extremely fine and highly valued fiber
        - Yield per animal 0.05-2 lbs.
        - World estimated production – 3,000 to 4,000 tons per year
- Pygmy goats
    - Areas – Africa, Caribbean, United States
    - Mostly used for pets and showing
    - Raised for meat and milk because of high disease resistant in Africa

- Management
    - Fencing – important because goats like to escape
        - Types of fencing – woven wire, electric fence, barbed wire
        - Catch pens are used for herd maintenance
    - Equipment
        - Dehorner for non-polled animals, hoof shears and knife for hoof maintenance, ear tags, ear tattoos, emasculator for castration
    - Milking
        - Can use a milking stanchion for goats to be milked by hand or by milking machine
        - Udder cleanliness is important for goats like dairy cattle. The teats need to be post-dipped after milking with an iodine solution to prevent disease.
- Breeding
    - Season of breeding – September, October, and November
    - Estrous cycle – 15-18 days
    - Estrus – 1-3 days
    - Gestation – 150 days
    - Lactation – 7 to 10 months
    - Twins are the most common to have
- Nutrition
    - The largest part of the diet – roughage
        - Grains can be supplemented when lactating and pregnant
        - Protein is needed more for growing and lactating goats
        - Deficiencies in phosphorus, selenium, and iodine can occur and may need to be supplemented
- Health
    - Major diseases for goats
        - Johne's disease – goats become unthrifty, emaciated, unproductive
        - Caseous lymphadenitis – infected lymph nodes
        - Caprine arthritis encephalitis (CAE) – the central nervous system will shutdown
        - Enterotoxaemia – overeating disease caused by *C. perfringens*

- Tetanus – *Clostridium tetani* enters wounds and causes death
- Mastitis – inflammation of the udder
- External parasites – lice, mites
- Internal parasites – stomach worms, coccidiosis, giving a dewormer will stop internal parasites

Worksheets

- Breeds and Terminology
- Anatomy
- Health

Discussion Questions

- Why are there so many uses for goats?
- Why is goat's milk easier to digest?
- Why are parasites detrimental to the health of goats?

Reflection Journal

Poultry

Objectives: To classify the types of poultry, to explain the products of poultry, and to recognize the types of poultry management

- Statistics
    - Total broiler chicken population in the US – 9.68 billion (USDA, *Hatchery Production 2019 Summary*, 2020)
    - Total turkey population in the US – 26.1 million
    - Total laying hen population in the US – 340 million
    - Total broiler production – 44.602 billion pounds (USDA, *Livestock, Dairy, and Poultry Outlook*, 2016)
    - Total turkey production – 5.738 billion pounds
    - Total egg production – 99.1 billion eggs (United Egg Producers, 2020)
    - Laying hen lays 294 eggs per year
- Types of poultry
    - Chickens, turkeys, geese, ducks, pigeons, peafowls, guineas
    - Chickens
        - Class – a group of birds developed in the same geographical areas
            - Major classes: American, Asiatic, English, Mediterranean
        - Breed – a subdivision of class composed of birds of similar size and shape
        - Variety – a subdivision of class composed of birds of the same feather color and type of comb
        - American – White Plymouth Rock, Wyandotte, Rhode Island Red
        - Asiatic – Brahma, Cochin
        - English – Australorp, Cornish, Orpington
        - Mediterranean – Leghorn
    - Turkeys
        - 8 varieties – Bronze, Narragansett, White Holland, Black, Slate, Bourbon Red, Small Beltsville White, Royal Palm
        - Breeds used commercially – Small White, Broad White
        - The most common variety used for meat is white
    - Ducks
        - The most popular breed is the white Pekin
            - Mostly used for meat
        - Egg production breed – Khaki Campbell
    - Geese
        - Meat production breeds – Embden, Toulouse, White Chinese, Pilgrim
- Breeding
    - Turkeys
        - Females mature at 30 weeks of age
            - Hens artificially inseminated
        - 1 tom (male turkey) can produce semen for 10 hens
        - A hen will produce on average 88-93 eggs in 25 weeks
        - All eggs are used for hatching and not consumption
    - Chickens
        - Quantitative traits are focused on when breeding

        - Egg production, egg characteristics, growth, fertility, hatchability
    - Qualitative traits
        - Color, comb type, abnormalities, sex-linked characteristics
    - Qualitative traits are easier to choose for or more predictable than quantitative traits
    - Quantitative traits are harder to progress due to low heritability
    - Mass selection – the genetic practice of using the best males and best females
    - Family selection – offspring of a mating is considered a family and selection of birds used is due to performance
- Incubation and Hatching
    - Incubation – the time that elapses from the time an egg is placed into an incubator until the young is hatched
    - Temperature is critical to be maintained at 99.5-100.0 degrees F for successful hatching of eggs
    - Humidity controlled at 60-65% is needed to reduce evaporation
    - Eggs need to be positioned with the large end up
    - Turning the eggs periodically prevents the embryo from sticking to the shell
- Broiler Housing
    - Cleaning and disinfecting between groups of birds is key to prevent disease
    - Litter is used to absorb moisture from feces and other liquids
    - Floor space is calculated to the correct capacity to prevent too much or too little space for birds to have access to feed and water
    - Feeder space for birds is adjusted depending on age and type of bird
    - Fountain waterers are used 1 per 100 birds, more can be added
    - Lighting can help with the growth rate
- 10 to 20-week facility
    - Confinement rearing is used to raise replacement birds
    - Three types of systems: solid floors, slatted floors, or wire floors or cages
    - Floor space is important in all systems to have birds grow correctly
    - 15-18% protein feed to promote balanced growing
    - Water consumption is critical especially during rising temperatures
    - Lighting can be controlled to stimulate physiological cycles
- Laying Hens
    - Very similar settings of raising to the 10 to 20-week poultry systems
    - Systems for egg collections are added to the floor type housing
    - Cage operations are most commonly used by commercial producers
    - Many different styles of cages including free-ranging, and stacked housing
- Housing requirements
    - Temperatures – 55 to 75 degrees F
    - Moisture – no excess moisture as it can cause illness
    - Ventilation – provide adequate fresh air, remove excess moisture, maintain the proper temperature. Exhaust fans and air-intake management are common parts of the ventilation systems.
- Nutrition
    - The feed is fed as a complete mixed ration

    - Correct diet formulation is needed for optimum broiler and turkey growth
    - Stress will limit feed intake
    - Cereal grains, grain by-products, fats, are the main energy feeds
    - Protein is most important in poultry feeds
- Avian Influenza
    - A highly contagious strain of H5N1
    - Biosecurity is extremely important to prevent the spread to other facilities
- Products
    - Meat
        - Broiler chickens are the most common bird for meat consumption
        - Classes for meat chickens are based on size, weight, and age at the time of processing
            - Broiler – a chicken raised specifically for meat
            - Poussin – a 1 pound or less bird that is less than 24 days old
            - Fast food-oriented broiler – birds weighing between 2 lb. 6 oz. and 2 lb. 14 oz. and less than 42 days old
            - 3's and up – birds weigh between 3 to 4.75 lbs. and between 40 to 45 days old. This is the birds sold in stores
            - Roaster – birds weighing 5 to 8 lbs. and between 55 and 60 days old
            - Broilers for deboning – males weighing 7 to 9 lbs. and 47 to 56 days old
            - Capon – surgically castrated males 14-15 weeks old and 7 to 9 lbs.
            - Heavy hens – 15-month-old past breeder layer hens 5 to 5.5 lbs.
            - Cornish game hens – birds less than 30 days old and weighs 2 lbs.
        - Grades for poultry meat
            - High – US grade A, US grade B, US grade C – low
    - Egg
        - Composition
            - Albumen – egg white
            - Yolk – the yellowish colored center of the egg
        - Quality standards for eggs
            - Exterior quality factors – cleanliness of shell, soundness of shell, shape
            - Interior quality factors – albumen thickness, condition of yolk, size and condition of air cell, abnormalities
            - Candling - visually appraising the eggs wile light is shone through the egg
        - Consumer egg grades
            - US grade AA, US grade A, US grade B

Worksheets

- Poultry industry
- Health
- Eggs

Discussion Questions

- Why is the incubation period for eggs so important?
- Why is excess moisture bad to have in production facilities?
- What role do quantitative traits play in the breeding of chickens?

Reflection Journal

Other Animal Industries

Objectives: To explain the basics of aquaculture, bison, elk, ostrich, and emu industries

- Aquaculture
  - Five fish breeds raised in the US
    - Catfish, trout, salmon, tilapia, hybrid striped bass
  - Catfish
    - Four states in the US main producer: Alabama, Arkansas, Louisiana, Mississippi
    - Catfish are sold either fresh or frozen
      - The majority sold as fillets then whole then nuggets or steaks
    - Spawn – fish laying eggs
    - Hatch in 3 to 5 days
    - Fish generally live in farm managed ponds
  - Trout
    - The most popular farm-raised trout breed is rainbow trout
    - The main producer in the US is Idaho
    - Incubator systems are used to hatch eggs
      - Three main kinds
      - Vertical tray incubator, California tray incubator, upwelling incubator
    - Transfer to grow out tanks or raceways to finish to market weight
  - Tilapia
    - Adapted from Africa and the Middle East came to the United States in the 1950s
    - The top producing states are Idaho and California
    - Warm water temperatures around 79 to 90 degrees F are needed to raise tilapia
    - Mouth brooders – the female deposits eggs into a prepared nest on the floor of the pond. The male will then fertilize the eggs and the female will collect the fertilized eggs in her mouth until they hatch
    - Raised in a pond-culture system
      - other alternatives of raising are cage or tank production systems
  - Health
    - Parasites can occur if proper management of the environment is not done
    - The most common causes of the disease include bacteria, viruses, fungi, parasites
- Bison
  - Small population raised on private farms
  - The wild population of around 20,000 head found on public lands in the US and Canada
  - Mostly raised for meat to be promoted to restaurants and events
  - Nutritional programs are important for optimum growth and production
- Elk
  - Newer introduction to the US
  - Raised as breeding animals

    - Sold for antlers, meat, and velvet from males
    - Velvet is sold to Asiatic markets
- Ostrich
    - From Africa and the largest living bird
    - Products: meat, hides, feathers, eggshells
    - Produce 30 to 50 eggs per year
        - Each egg can weigh 3 to 3 ½ lbs.
- Emu
    - From Australia and not as large as an ostrich
    - Products: meat, leather, oil, feather, carved eggs
    - Produce 30 to 40 eggs per year
        - Each egg can weigh 1 to 1 ½ lb.
- Many other animal industries could be added to the outline if the teacher desires to such as llamas, camels, or buffalo

Worksheets

- Seafood
- Fishing
- Bison

Discussion questions

- Why are there only a few breeds of fish used in the United States?
- Why is health important to manage fish?
- Why is bison management in the United States important?

Reflection journal

Chapter 5: Final Reflection

When I graduated from Michigan State University, I had hoped to get a job within MSU Extension. I had applied to multiple job openings and went through the interview process, but never received a job. I did receive a temporary position with my local extension office, but I knew that job had an end. I reflected on what I could do to improve my job prospects, and that is when I landed getting my master's degree. I knew I wanted to something different than what I majored in for my undergraduate degree but still be in the agricultural industry. That is when I found the program of agricultural education at Iowa State University. I knew this program would help me gain a different set of skills that could apply what I had learned in my undergraduate degree in teaching to other people.

When I started the agricultural education program, I had taken no classes or had much experience in teaching other than what I had done in MSU Extension in prior internships. I knew I had many things to learn and that it was not going to be easy. Some classes were challenging in that I felt something was missing because I did not have much experience in FFA where most of my classmates were currently teaching. But at the same time, I knew I was learning many things about how teaching works and what I wanted my teaching style to be. Through all of the classes I took, it led me to realize that agricultural education is not just about what can be taught through extension or school settings. Agricultural education could be used in almost every setting.

All of the classes I took for my master's degree made me realize that agricultural education is bigger than just extension and high school classes. A few of the classes in the program helped me appreciate what agricultural education does for everyone. In AGEDS 533, I learned the philosophies of teaching and learning and how people learn and how people teach

others. This class opened my eyes to see how I learn and how I want to teach others. The class also laid a strong foundation in knowing how people learn which will help me as I move forward in my future careers. Another class that impacted me was AGEDS 550. I had a basic understanding of what agricultural education encompassed, but this class helped me understand the large impact that agricultural education has in the United States. In society, each person can have a part in agricultural education whether they realize it or not. This thought had the largest influence on me. I could reach people every day about agricultural education even if it were something small.

Through writing this curriculum, I have realized that this is a small part of preparing a classroom. There are still the steps of reviewing the curriculum before teaching it, preparing the materials such as pictures and videos to aid in the learning environment, and most importantly teaching the subject to the students. I hope that this curriculum would be useful to many teaching online as there is still so much uncertainty regarding schools being taught in-person or online.

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Appendix A: Worksheets

- Introduction to Animal Science
  - Promotional Poster
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Virtual-Learning--Ag-Promo-Poster.docx
  - USDA
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/USDA-Agency-Research.docx
- Nutrition
  - Feed Label
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Feed-Label-Activity-Sheet.docx
  - Monogastric Digestion
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/AFDMLP3.docx
  - Ruminant Digestion
    - Link: http://www.stippah.k12.ms.us/userfiles/399/Classes/2131/week%205%20anr.pdf?id=6377
- Reproduction
  - Hormones and Structures
  - Female Reproductive Anatomy
  - Male Reproductive Anatomy
- Health
  - Biosecurity
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/BiosecurityArticle-1.docx
  - Injections

  Link: www.mpsaz.org › class2 › files › proper_injections_lab
  - Zoonotic Diseases
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Zoonotic-Diseases-Activity-Sheet.docx
- Companion Animals
  - Handling of animals
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Canine-and-Feline-handling-.docx
  - Dog breeds
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/vet-assisting-1-week-2-online-.docx
  - Safety
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Vaccinations.zip
- Equine
  - Equine Safety and Behavior

        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Safety-and-Behavior-Wkst.docx
    - Virtual Horse Farm Tour
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/4_2-Virtual-Horse-Farm-Tour.pdf
    - Horse Color and Descriptions
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Horse-Colors-and-Descriptions.zip
- Dairy
    - Dairy Breeds and Anatomy
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Dairy-Industry---Breeds-and-Anatomy.docx
    - Virtual Dairy Farm Tour
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Jo-Bo-Holstein-Virtual-Field-Trip.zip
    - Milk
- Beef
    - Dystocia
    - Beef Retail Cuts
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Beef-Industry-Meat-Cuts-and-By-Products.docx
    - Beef Cattle Operations
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Beef-Industry---Cattle-Operations.docx
- Swine
    - Anatomy of a Pig
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/AFDMLP2.docx
    - Swine Breed Sorting
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/AFDMLP1.docx
    - Swine Reproduction
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Swine-Breeding-Worksheet-(Online).docx
- Sheep
    - Sheep Production Facility
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Sheep-farm-report.docx
    - Sheep Shearing
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Sheep-Shearing.docx
    - Vet Assisting – Sheep
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/vet-assisting-2--week-2-online.docx
- Goats
    - Breeds and Terminology

    - Anatomy
    - Health
- Poultry
    - Poultry Industry
        - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/AFDMLP8.docx
    - Health
    - Eggs
        - Link: https://www.uen.org/lessonplan/download/28224?lessonId=1179&segmentTypeId=6
- Other Animal Industries
    - Seafood
        - Link: https://www.aurumscience.com/environmental/7b_fishing/seafoodwatch.html
    - Fishing
        - Link: https://www.aurumscience.com/environmental/7b_fishing/studyguide.html
    - Bison
        - Link: http://woolaroc.org/caffeine/uploads/files/the_north_american_bison.pdf
- Final Project
    - Link: https://aec.ifas.ufl.edu/media/aecifasufledu/teacher-repository/Livestock-Choice-Board.zip

Hormones and structures

What reproductive hormones are produced by the pituitary gland?

What hormone is released by the brain to signal to the pituitary gland to release the above 2 hormones?

What is FSH?

What 2 actions are the result of FSH?

What is LH?

What is the result of FSH and LH working together?

What does LH do?

What is the main function of progesterone?

Which hormone develops the corpus luteum, the yellow body?

Which hormone prevents FSH and LH production?

What are the 2 main functions of the testes?

Besides sperm production, why is testosterone important?

Where are sperm produced and matured?

What are the 2 main functions of the scrotum?

What is the ideal temperature for sperm production?

Arrange the following events in the ovarian cycle in the order in which they occur. Put the numbers in the correct order in the boxes below.

1. Luteinizing hormone secreted by the anterior pituitary gland

2. Ovulation of mature ovum

3. Progesterone secreted by corpus luteum

4. Follicle-stimulating hormone (FSH) secreted by the anterior pituitary gland

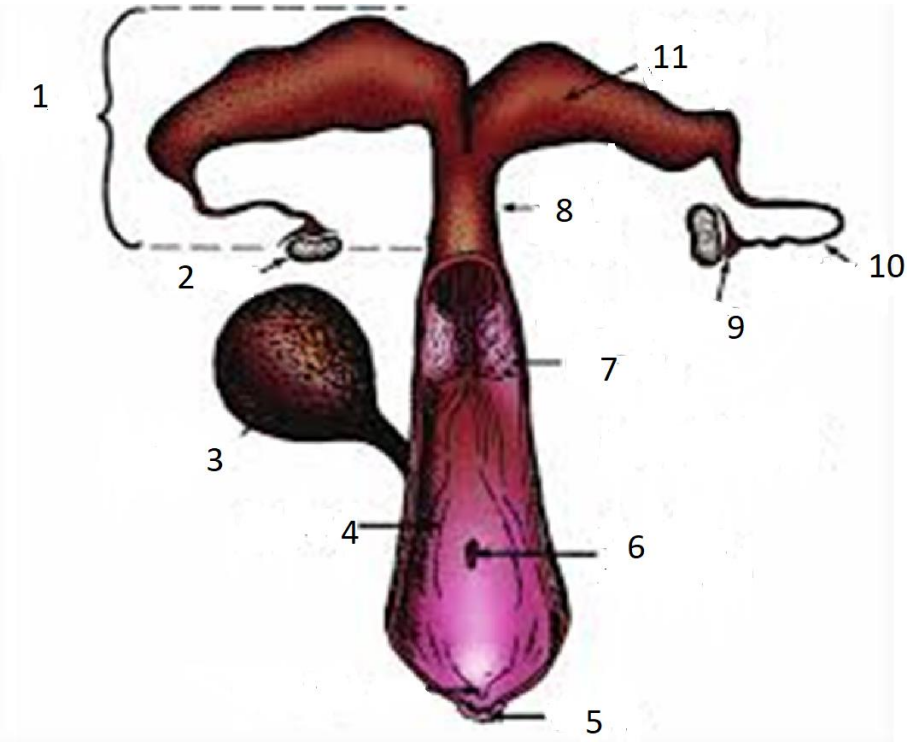
5. Corpus luteum develops

6. Ovum develops in the follicle

7. Estrogen secreted by follicle cells

Female reproductive anatomy

Fill in the structures



1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.

Matching:

____ External opening to the reproductive tract.

____ Acts as a passageway to the uterus for sperm and keeps foreign materials out during pregnancy.

____Location of the development of the fertilized egg.

____Carries the egg from the ovary to the uterus and is the site of fertilization.

____The site through which male semen is deposited into the female reproductive system.

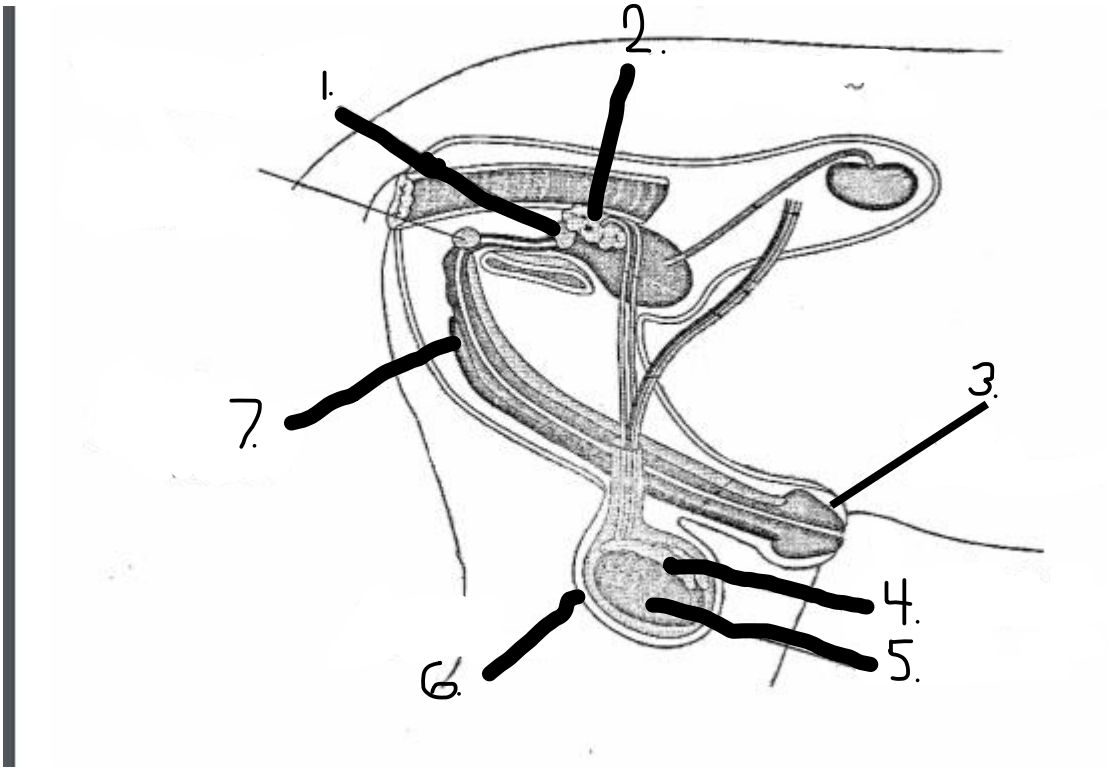
____Where the egg attaches and the fetus develops.

____Produces ova through meiosis during embryo development.

Matching Answer Bank
a. Cervix
b. Ovary
c. Vagina
d. Oviduct
e. Cloaca
f. Uterus
g. Magnum
h. Vulva
i. Infundibulum
j. Isthmus
k. Uterine Horns

Male Reproductive Anatomy

Fill in the Parts



1
2
3
4
5
6
7

Matching

____1. The organ that delivers semen to the female reproductive tract

____2. Where sperm are produced

____3. The tube that carries sperm from the epididymis to the urethra.

____4. The tube that carries both sperm and urine down the penis.

____5. Organs that contribute 90% of the semen.

____6. Tubules where sperm are stored.

A. Accessory glands;
B. Epididymis;
C. Vas deferens (sperm duct);
D. Penis;
E. Seminiferous tubules;
F. Urethra

Milk

Milk Composition - Name the parts of milk

1.

2.

3.

4.

5.

6.

How many pounds are in a gallon of milk?

What is pasteurization?

What is homogenization?

What are the classes of milk and give an example of each?

1.

2.

3.

4.

What is the most popular type of cheese?

How much milk does it take to make a pound of cheese?

Parturition of Beef Cattle

What is parturition?

What is a way to check that a cow is pregnant?

In days, what is the gestation length of a beef cow?

What is the average weight of a calf at birth?

What is the calf weight taken at birth?

What are the 3 stages of parturition?

Stage 1:

Stage 2:

Stage 3:

Describe 3 presentations that are difficult to deliver when a cow is calving

What is the safest way to remove a calf that is too large?

What is dystocia?

What is the first mile given by a female following delivery of her calf, which is high in antibodies that protect the calf from invading microorganisms?

Goat breeds and terminology

Matching

1. I am a goat breed that is characterized by the acute size of my ears. Some say I have no ears, but in fact, they are less than two inches long.

2. I am known as a “feral” goat, that was brought over by Spanish explorers like Coronado. I would have been placed in states like Texas and Oklahoma during the early 1540s. Another name for me is a “brush goat”.

3. I am raised mainly for my high-quality mohair.

4. My coat color is white to cream color. I am a dairy goat with erect ears that point forward. I am medium to large in size.

5. I have long floppy ears that normally hang down about two inches past my jaw. I am a strong, large framed dairy goat.

6. I am the fast-growing, meat-type goat with a brown head and white body. I originated from South Africa.

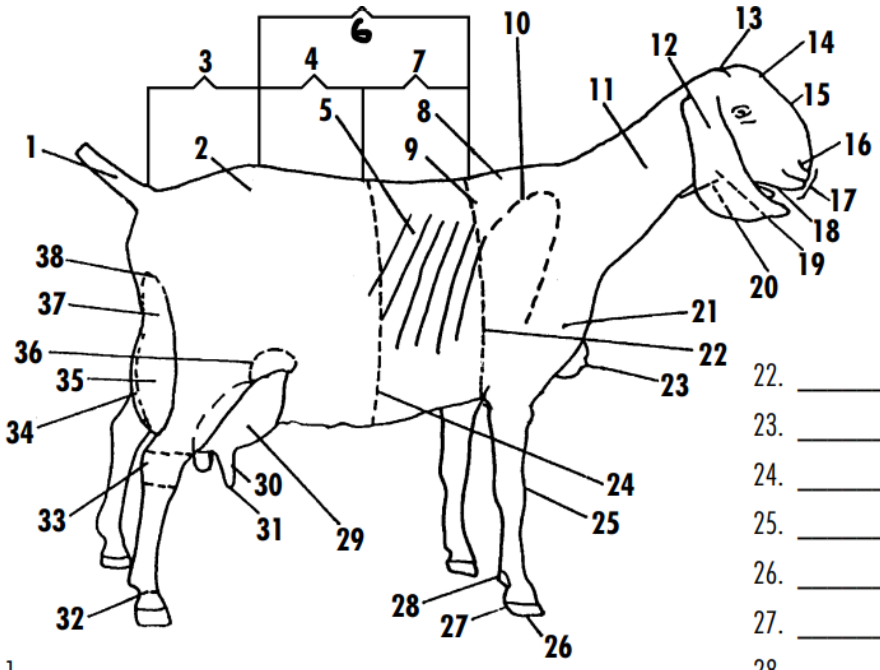
Word Bank: Spanish, Saanen, Angora, Nubian, LaMancha, Boer

Fill in the Blank

1. A _____ is a female goat at any age.
2. A _____ is a male goat at any age.
3. A _____ is a goat of either gender under one year of age.
4. A _____ is a male goat or sheep that was castrated when it was young.
5. _____ is the process of a goat giving birth.
6. _____ is hair taken from angora goats and used to make products such as clothing.
7. The Pygmy Goat is mostly used as a _____

Goat Anatomy

Fill in the blanks with the correct anatomy:



1. _____
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26. _____
27. _____
28. _____
29. _____
30. _____
31. _____
32. _____
33. _____
34. _____
35. _____
36. _____
37. _____
38. _____

Diseases of Goats

Write a paper on one of these topics:

1: Common diseases and parasites of goats

2: Prevention and control practices for parasites of goats

3: Create a program to reduce diseases and parasites

Poultry Health Management

Write a one page paper on one of the topics:

1: Common diseases of poultry

2: Factors that can lead to disease in poultry

3: Common parasites of poultry

4: Symptoms of disease in poultry

Label the correct egg part

1.

2.

3.

4.

5.

6.

7.

8.

Word Bank

air cell

germinal disc

vitelline membrane

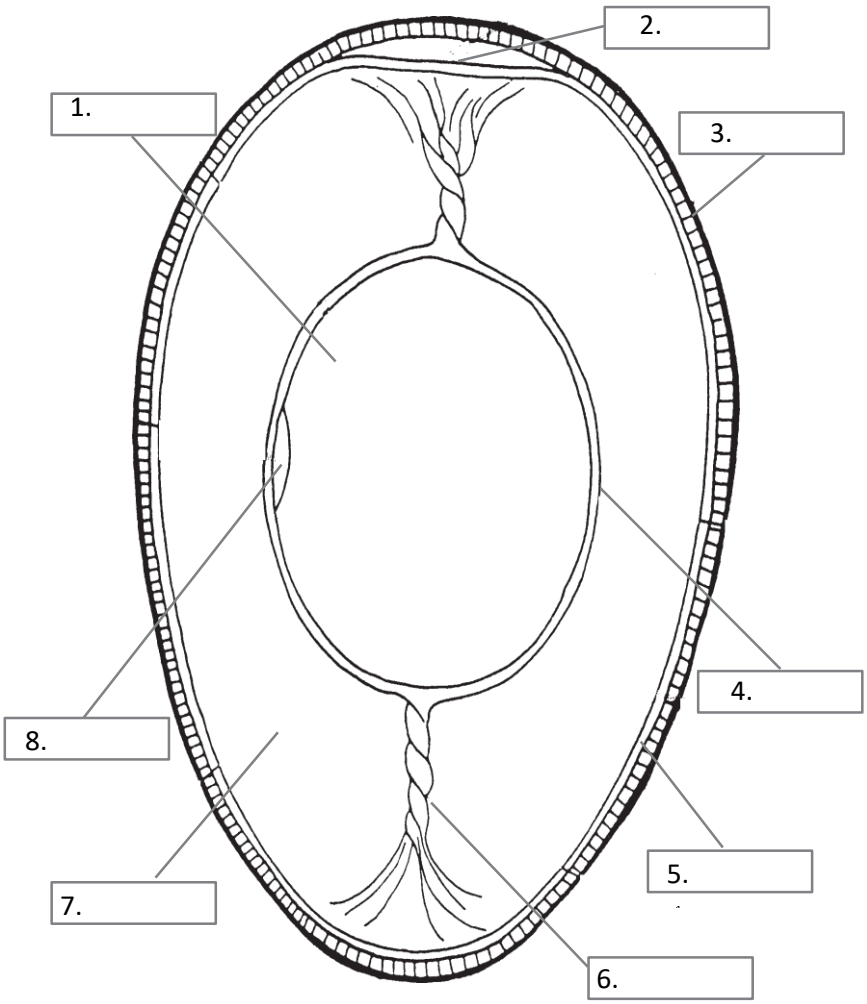
albumen or white

membranes

yolk

chalaza

shell



The North American Bison

Fill out the definitions with regards to bison

1. Bison –
2. Cloven Hoof –
3. Bull –
4. Cow –
7. Great Plains –
8. Nomad –
9. North America –
10. Asia –
11. Blue Gramma -
12. Buffalo Grass -
13. Pictogram –
14. Preservation –
15. Biome –
16. Beringia –

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