Think in Pictures: Like Dr. Grandin

Grades 6-8

English Language Arts, Science, Fine Arts, STEM

Objectives

Students will “think in pictures” and become agricultural engineers by designing a corral system that uses the research of Dr. Temple Grandin to move cattle. Students will be challenged to think in pictures as they illustrate agriculture words.

Vocabulary

agricultural engineer— career in which people design farm machinery or help plan farm structures
alleyway— a narrow corridor built for livestock to travel through when being herded from one location to another nearby
flight zones— distance from an animal a handler must maintain for the animal to feel comfortable
handling— the manner in which an animal is treated
livestock— animals raised to produce commodities such as food and fiber (ie. cattle, sheep, hogs)
producers— someone who raises livestock or crops for others to consume
squeeze chute— a device used to restrain large animals, especially cattle and horses

Background

Moving **livestock** can be difficult if you do not understand how they think and move. Livestock handlers want to keep their animals calm when moving them to avoid stress and injury. If there are loud noises or other distractions, such as sights or even smells, many animals will become fearful or hesitant to move. An animal that is afraid can be dangerous for both the animal and the handler. Keeping the area free of distractions can help reduce animal **handling** problems. If the animals are kept calm and feel safe, then they will usually move with little or no effort. Handlers want to keep animals calm so the animals are not negatively impacted. Stressed animals can have lower weight, reduced reproduction rates, and increased sickness.

Cattle **producers** use **alleyways** and **squeeze chutes** to move cattle while doctoring them. By understanding cattle behavior, such as their **flight zones**, along with creating alleyways and chutes with rounded turns and closed sides, producers can keep livestock calm. This greatly reduces animals stress levels while they are being handled. Understanding animal instincts allows producers to handle them easier.

As animals of prey, livestock have wide angle vision which allows them to see predators, as well as handlers. Cattle and pigs have a visual field in excess of 300º. In sheep, the visual field ranges from 191 to 306º depending on the amount of wool on the head. Due to their wide angle vision, they are aware of their surroundings. If the handler is in their blind spot, the animal will turn to see them.

Dr. Temple Grandin, Colorado State University, focuses on animal behavior and makes a huge impact on how livestock are handled. She researches how livestock perceive their environment and helps producers develop livestock handling facilities that help keep animals calm.

Think in Pictures: Like Dr. Grandin

Temple Grandin was diagnosed with autism as a young girl in the 1950s. In 1961, she spent the summer at her aunt's ranch in Arizona. She became interested in the cattle and realized they were visual thinkers, they saw the world in much the same way as her and noticed details in their surroundings most people missed. In fact, Temple often describes herself as someone who “thinks in pictures.” As a senior in high school in 1965, she created her first invention, a squeeze machine. This invention came from cattle chutes that keep cattle calm during vaccinations by squeezing them firmly, like a hug. Temple grew to love animals and earned her master’s degree in Animal Science in 1975. In 1976, she invented the curved chute system for moving cattle. She earned her doctoral degree in Animal Science in 1989. Dr. Grandin was inducted into the National Cowgirl Hall of Fame in 2010 and was also named one of *Time* magazine’s 100 most influential people that year.

Dr. Grandin’s research led her to believe the way animals, especially cattle, are handled and transported can cause pain, stress and fear. When cattle are moved on wet or slippery slopes, or in poorly lit areas, they can be injured. She believes this is cruel and unnecessary. In order to design a better system for handling livestock, she decided to put herself through the handling process. Using her instincts, which are often similar to cattle, she realized cattle prefer pens and chutes with solid sides and well lit areas. This keeps them free from distractions, dark tight spaces, and shadows, all of which could scare them. Her invention of the curved chute system came from the realization cattle tend to move in a circular pattern around their handlers. By designing a system with solid walls, non-slip floors, and a curved walkway allowing cattle to move in a single file line through the alley, cattle are handled calmly. Today, half of the cattle in the United States and Canada meat processing plants are handled with equipment that she designed.

Dr. Temple Grandin travels and speaks to groups about animal behavior. Many professional speakers wear suits, however Dr. Grandin is well known for her unique style. She wears western shirts, often paired with cowboy scarves. She may wear a fancy western shirt or keep it simple, but her western shirts are as constant as her passion for agriculture. In 2011, she even wore a special western shirt to the Golden Globe Awards in Hollywood!

Agricultural engineers are also important to livestock producers. They often assist producers in designing livestock handling areas using the research from Dr. Grandin. They help producers apply basic science and engineering principles as they develop these livestock facilities. Often, agricultural engineers design machinery such as tractors and implements, animal housing or handling facilities, and even irrigation or drainage systems to help with soil conservation. Agricultural engineers help design methods to decrease labor, which also increases a producer’s ability to produce food.

***Lesson modified from California Foundation for Ag in the Classroom*

Additional Reading

Grandin, Temple, *Temple Grandin How the Girl Who Loved Cows Embraced Autism and Changed the World*, Houghton Mifflin Harcourt, 2012

Grandin, Temple, *Temple Grandin's Guide to Working with Farm Animals*, Storey Publishing, 2010

Guglielmo, Amy, How to Build a Hug: Temple Grandin and Her Amazing Squeeze Machine, Atheneum Books for Young Readers, 2018

Mosca, Julia Finley, *The Girl Who Thought in Pictures The Story of Dr. Temple Grandin*, The Innovation Press, 2017

Websites

https://www.grandin.com/references/new.corral.html

www.grandinlivestockhandlingsystems.com

www.grandin.com

http://www.grandin.com/videos/videos.html

https://www.templegrandin.com/

https://youtu.be/lfsh6sojAvg

https://www.biography.com/inventor/john-deere

Activity 1: Thinking in Pictures, (ELA, Fine Arts) 1 50 minute class period

Temple Grandin often describes herself as someone who "thinks in pictures." For this activity, students will be challenged to think in pictures as they illustrate agriculture words.

Oklahoma Academic Standards

Activity 1: Thinking in Pictures (ELA, Fine Art)

6.4.R.1 7.4.R.1 8.4.R.1	Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text.
6.7.R.1 7.7.R.1 8.7.R.1	Students will determine the intended purposes of techniques used for rhetorical effects in written, oral, visual, digital, non-verbal, and interactive texts to generate and answer interpretive and applied questions to create new understandings.
6.VA.3.2 7.VA.3.2 8.VA.3.2	Use observation, memory, and imagination in creating original works of art.

Materials:

- Activity 1 **"Thinking in Pictures Word List,"** (or create your own) and cut into cards
- Activity 1 Worksheet 1 or 2 **"Thinking in Pictures Frayer Model"**
- One minute sand timer, or other timer
- Drawing board and marker, or paper
- Video Thinking in Pictures the Temple Grandin Story: https://www.youtube.com/watch?v=4Kc3yD48CmQ

Procedures:

1. Watch the video "Thinking in Pictures the Temple Grandin Story." Discuss what it would be like to think in pictures.
2. Discuss the words and their definitions on the **"Thinking in Pictures Word List."**
3. Use the **"Thinking in Pictures Frayer Model"** to teach unfamiliar vocabulary words.
4. Discuss what it would be like to "think in pictures." Say words from **"Thinking in Pictures Word List."** Ask students to share what they see in their mind. Make sure everyone realizes there are not right or wrong ways to think; we all think differently.
5. Divide into two teams. Each person will take turns being the team illustrator.
   —Set the timer for 3-5 minutes and both teams will draw at the same time. For each new word, a new person should draw. Teams will keep track of how many words they guess correctly, and the team with the most correct words will win. The teams should have the same words to illustrate, but might not draw them in the same order.

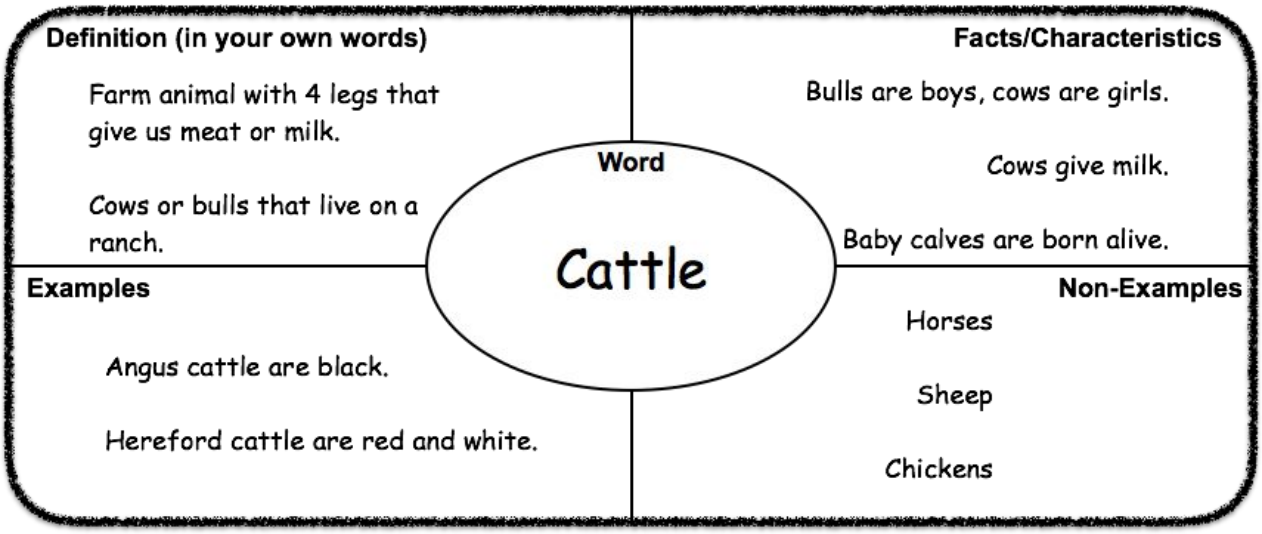
CATTLE cows or bulls kept on a ranch for meat or milk	**FRUIT** a usually sweet food that grows on a tree or bush	**VEGETABLE** a plant or plant part that is eaten as food
RANCHER a person who lives or works on a ranch	**COMBINE** machine that cuts crops & separates seeds from plant	**WHEAT** grain used to make flour for breads, cookies, etc.
HARVEST the activity of gathering crops from the field	**GARDEN** area of ground where plants (ie. vegetables) are grown	**CATTLE CHUTE** stall for holding cattle safely while they're examined
SOIL the top layer of earth in which plants grow	**WATER** liquid that falls from clouds as rain, and forms ponds, streams, lakes	**INSECTS** small animal with 6 legs, body formed of 3 parts and may have wings
WEATHER air and atmosphere at a particular time and place	**TRACTOR** large vehicle that is used to pull farm equipment	**GRAIN** the seeds of plants (ie. wheat, corn) used for food
CULTIVATE to prepare and use soil for growing plants	**LOGGING** to cut down trees in an area for wood	**SHIPPING** act or business of sending goods to people, stores
LIVESTOCK farm animals kept, raised, and used by people	**SILO** tower that is used to store grain for farm animals	**BARGE** large boat with flat bottom used to carry goods on rivers and canals

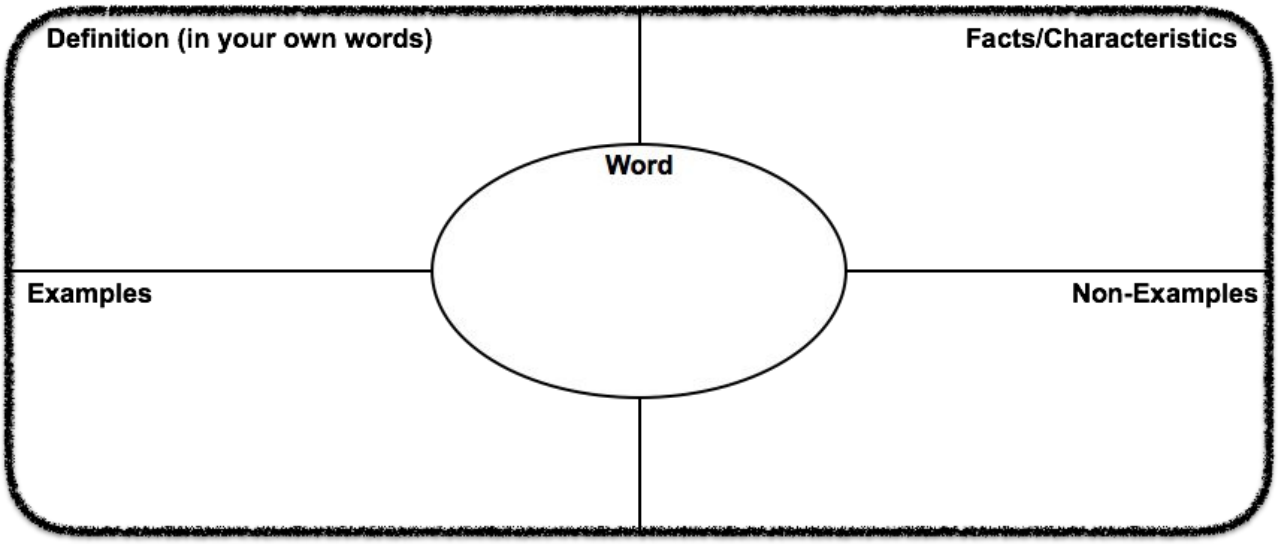
ACRE measure of land area that equals 4,840 square yards	**PRUNING** cutting off the branches of trees and bushes	**BISON** large, hairy animal with big head, also called buffalo
FISHERY business that catches and sells fish	**FARMER'S MARKET** market where local farmers sell products directly to consumers.	**COTTON** white fiber that grows on a plant, used to make cloth
INVENTOR person who invents things for a living	**SEEDS** part of a plant which can grow in to a new plant	**VETERINARIAN** person trained to give medical care to animals
FEEDLOT area where livestock are fed or fattened up	**ORCHARD** place where people grow fruit trees	**VACCINATION** to give a vaccine to prevent infection by a disease
DROUGHT long period of time with very little or no rain	**DAIRY** a farm that raises cattle and produces milk	**GREENHOUSE** building with glass walls/roof to grow plants in
FIBER thin thread of natural or artificial material used to make cloth, paper, etc.	**HERD** group of animals that live or are kept together	**MANURE** solid waste from farm animals used to make soil better for growing plants
MILK white liquid produced by cattle to feed their young	**IRRIGATION** to supply land with water by using artificial means	**FARMER** person who runs a farm

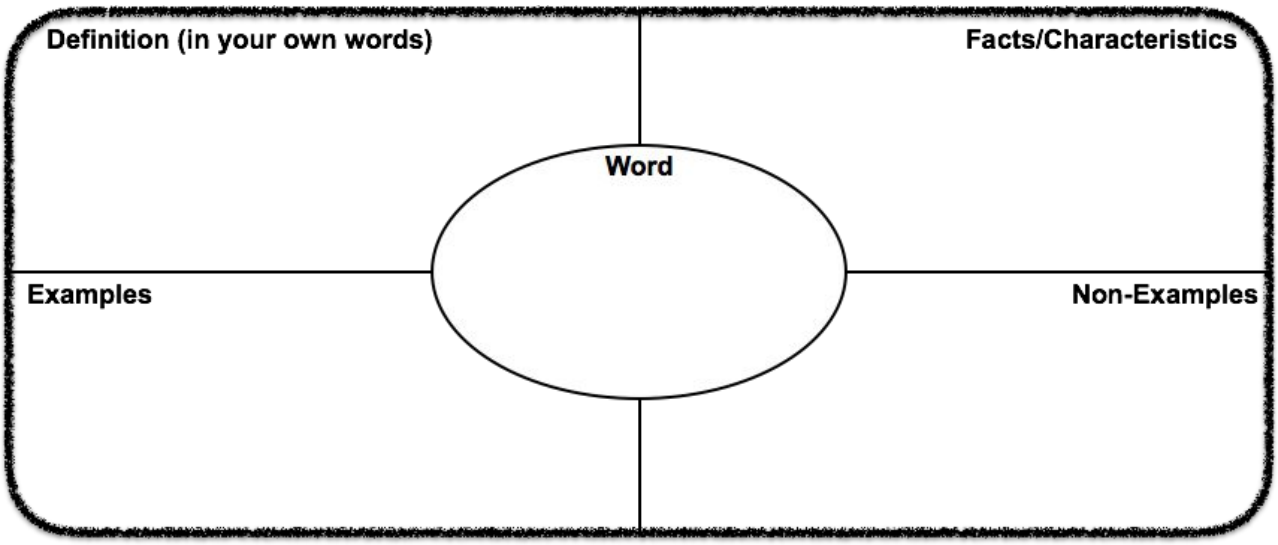
Think in Pictures: Like Dr. Grandin

Activity 1 Worksheet 1: Thinking in Pictures Frayer Model

Name: _____ Date: _____



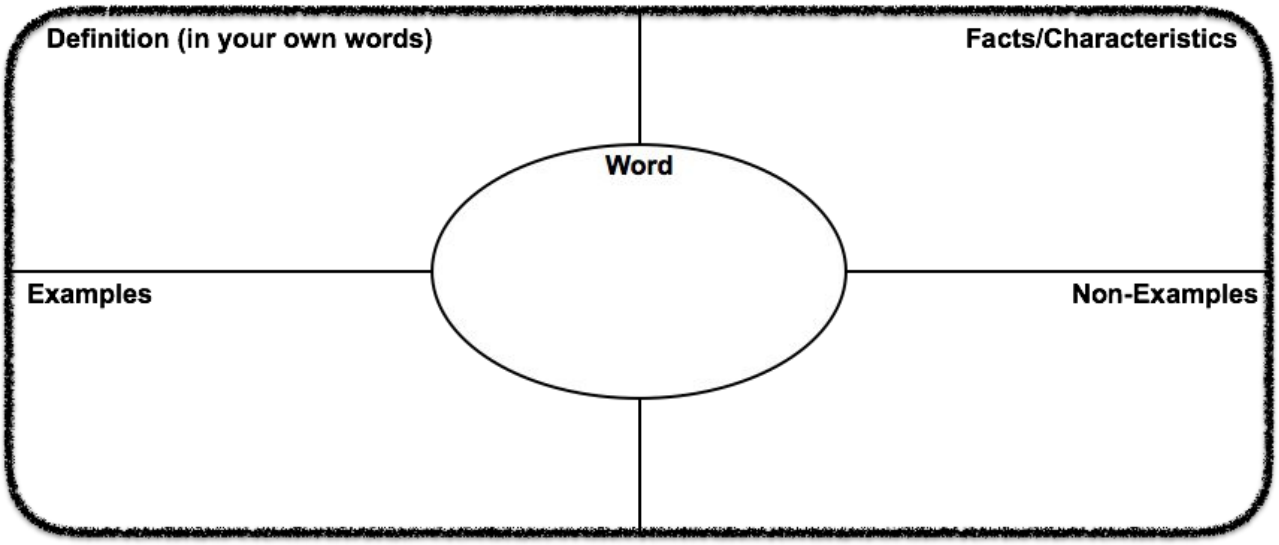


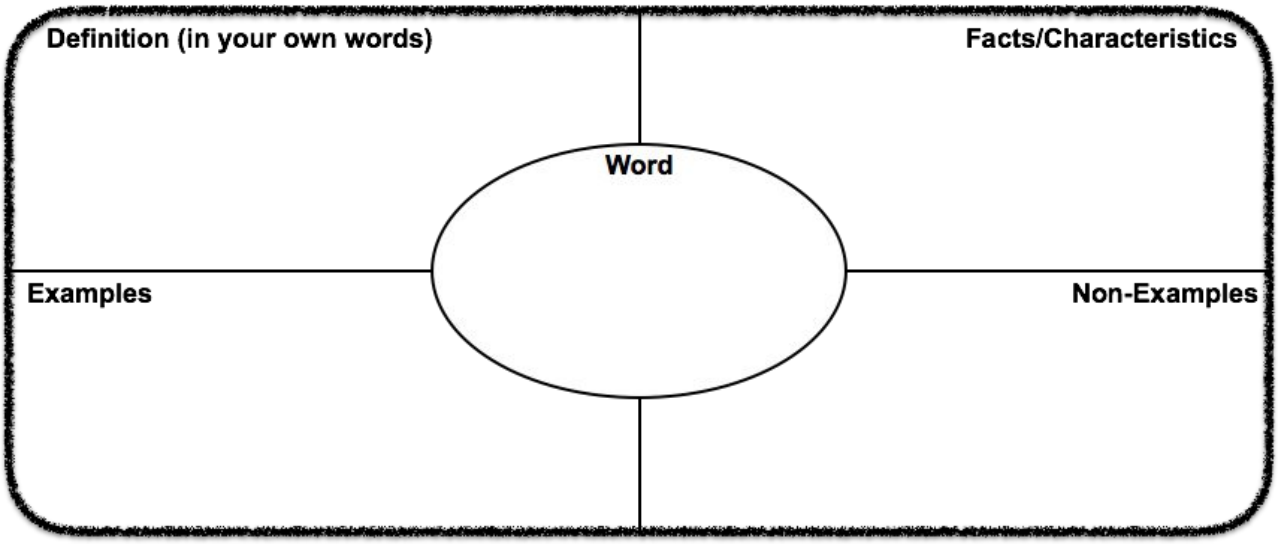


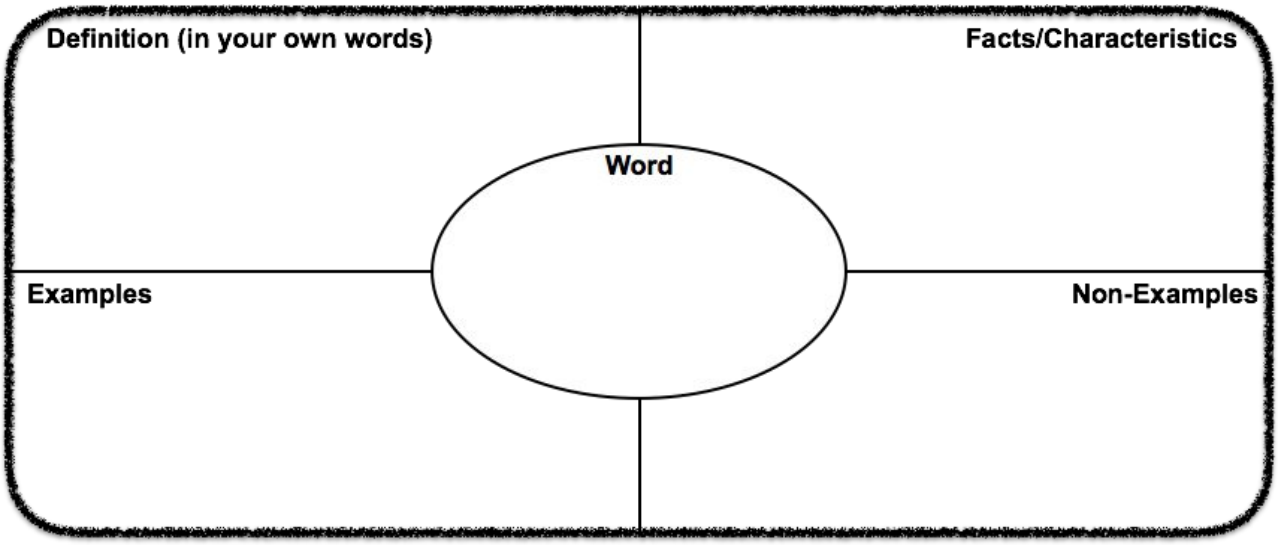
Think in Pictures: Like Dr. Grandin

Activity 1 Worksheet 2: Thinking in Pictures Frayer Model

Name: _____ Date: _____







Activity 2: Cattle Flight Zones, (ELA) 1 50 minute class period

To move cattle forward, you need to know where the flight zone and point of balance are. This reading activity will help students better understand how cattle move.

Oklahoma Academic Standards

Activity 2: Cattle Flight Zones (ELA)

6.3.R.6 Students will analyze the structures of texts (e.g., compare/contrast, problem/solution, 7.3.R.6 cause/effect, claims/evidence) and content by making complex inferences about texts to 8.3.R.6 draw logical conclusions from textual evidence.

Materials:

- Activity 2 Reading Page: **"Cattle Flight Zones"**
- Activity 2 Worksheet 1: **"Cattle Flight Zones Reading Comprehension"**
- Video Understanding Flight Zones: https://www.youtube.com/watch?v=Iwu8Ncrl0z0

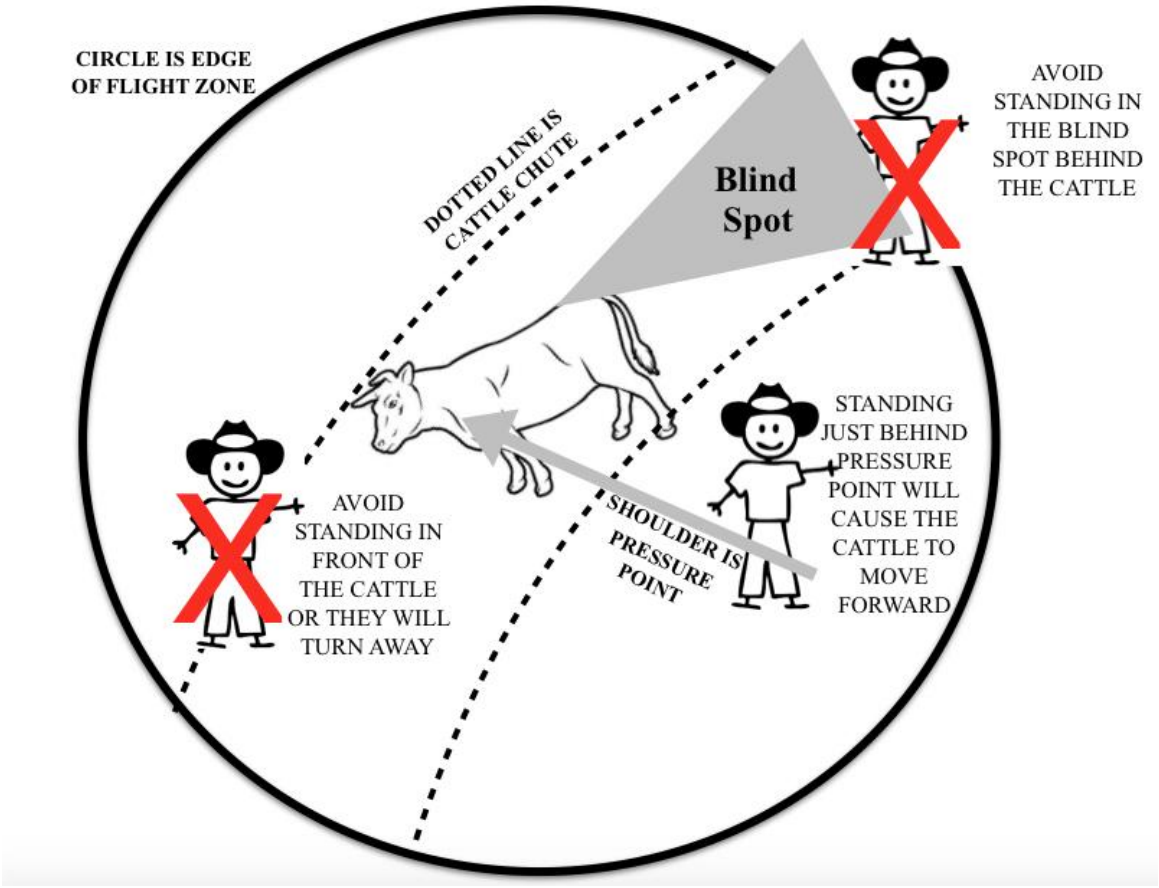
Procedures:

1. Show Video "Understanding Flight Zones."
2. Discuss cattle movement and how entering and exiting the flight zone affects their movement.
3. Pass out the reading page "**Cattle Flight Zones"** and **"Cattle Flight Zones Reading Comprehension"** to evaluate students' understanding of the flight zone and point of balance.

Dr. Grandin talks to cattle owners about how to move cattle calmly. She teaches the owners how to know where the **flight zone** and **point of balance** are for the cattle. The flight zone is how far from the animal a person must stay to keep the animal calm. The picture below shows the flight zone and point of balance for cattle. For cattle, the point of balance is the shoulder. The outer circle is the edge of the flight zone. You can find the flight zone by slowly walking up to the animal. Walking up to an animal's head increases its flight zone. If a person is in the flight zone the animal will move away.

The dotted line represents a curved chute. A chute is an alleyway that people use to walk cattle to a pen. For most animals the point of balance is at their shoulder. When the handler stands at or behind the point of balance, the animal will move forward. They will back up if you stand in front of the shoulder. Avoid standing at the head of an animal and poking it's rear. You should also not stand in the animals blind spot, which is behind them. When a herd, or group, of cattle are moved in pastures and large pens, their behavior is usually different because they are not in a small pen. The flight zone may be different for a herd of cattle in pastures.

Calm livestock can be harder to move because they no longer have a flight zone. These animals can often be led using a halter or feed bucket. When animals are used to the person and the person stays calm, the animal learns to trust them.



Think in Pictures: Like Dr. Grandin

Activity 2 Worksheet 1: Cattle Flight Zones Reading Page

Name: _____ Date: _____

After reading "Cattle Flight Zones," respond to the following questions. When making logical inferences, reference the text to support your answer.

1) Use information from the "Cattle Flight Zones" reading page to compare/contrast moving calm cattle vs cattle in a pasture.

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2) Explain in your own words how to find the flight zone of cattle and the importance of the point of balance.

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3) What problems might a handler have when moving cattle in a pasture?

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Activity 3: Curved Cattle Chute, (STEM) 1-3 50 minute class periods

Temple Grandin's invention of the curved chute system came from the realization that cattle tend to move in a circular pattern around their handlers. She designed a system with solid walls and a curved walkway that allowed cattle to move in a single file line through the alley.

Oklahoma Academic Standards

Activity 3: Curved Cattle Chute (Science, Math)

8.PS2.3	Ask questions about data to determine the factors that affect the strength of electric and magnetic forces.
8.PS2.5	Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

Oklahoma Career Tech Middle School STEM Standards

Duty A: Demonstrate Understanding of the Design Process

A.01	Describe and apply the design process to solve a real world problem.
A.04	Evaluate possible design solutions to identify the one that best meets the design criteria and constraints.
A.05	Use appropriate tools/equipment to construct a model or prototype of the solution.
A.06	Test prototype by collecting and analyzing data.
A.07	Redesign to optimize solution.

Materials:

- Paper Plates with high edges, scissors, glue, tape
- Cardstock, yarn, straws, construction paper, pipe cleaners (to represent fencing materials)
- Magnets glued to blocks (to represent cattle) and a magnetic wand
- Video Design of Curved Cattle Chutes: https://www.youtube.com/watch?v=EZ1VzDSmsNk

Procedures:

1. Pass out "Engineering Process" sheets, found on the AITC website under Classroom Resources: https://www.agclassroom.org/ok/resources_classroom/engineering.php
   —Walk through the Engineering Process together.
   —Problem: The cattle need moved from pasture through cattle chute to doctor them.
   —Students will work as a team, using the Engineering Process to design cattle chutes.
   —Guidelines for the chute design (at this time do not specify a curved chute):
      —Should have at least 3 turns causing cattle to change directions.
      —End with a squeeze chute or pen to collect cattle.
      —The chute should start wide and narrow as it reaches the squeeze chute or final pen, requiring cattle to move through in a single file line.

2. After teams have worked through the Engineering Process, give teams paper plate and supplies. Explain the challenge is to create a cattle chute, from their design ideas, for the magnetic block "cattle" to move through. How are they able to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact?
3. After the prototypes are built and tested, allow time to share designs presenting Engineering Process findings to each other. How does the motion of the block cattle compare to live cattle moving and processing information as they respond to the chute and/or distractions?
4. Show video "Design of Curved Cattle Chutes." Discuss cattle movement and chute design. How do cattle use their senses to process information? Discuss how the chute on the video is similar/different from their designs.
5. Challenge students to modify their chutes to create a chute that follows Dr. Grandin's design: solid walls, curved alleyways which narrow, but not a duplicate of the chute in the video.
6. Optional: Students can design three dimensional cattle chutes using Google SketchUp or other online program.