Think in Pictures: Like Dr. Grandin

Grades 3-5

English Language Arts, Science, Math, Social Studies, 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. They will design a special shirt and scarf and write facts about Dr. Grandin. They will compare inventors and their inventions, creating a timeline with important dates for their lives.

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)

3.4.R.1 4.4.R.1 5.4.R.1	Students will increase knowledge of academic, domain-appropriate, grade-level vocabulary to infer meaning of grade-level text.
3.7.R.1 4.7.R.1 5.7.R.1	Students will analyze the characteristics and effectiveness of a variety of written, oral, visual, digital, non-verbal, and interactive texts to generate and answer literal and interpretive questions to create new understandings.
3.VA.3.2	Use a variety of subjects, basic media and techniques in creating visual art including drawing, painting, weaving, sculpture, ceramics, collage, and mixed media
4.VA.3.2 5.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.

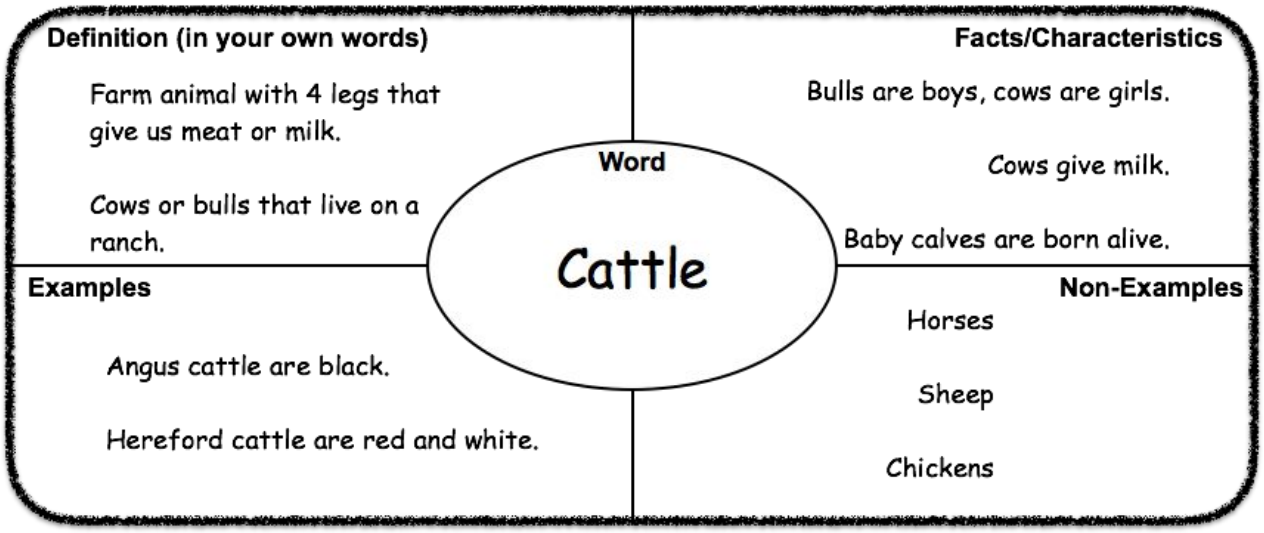
CATTLE cows or bulls kept on a ranch for meat or milk	**FRUIT** a usually sweet food that grows on a tree or bush	**VEGETABLE** a plant or plant part that is eaten as food
RANCHER a person who lives or works on a ranch	**COMBINE** machine that cuts crops & separates seeds from plant	**WHEAT** grain used 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
SHEEP animal with thick woolly coat raised for meat or wool	**HOGS** a pig that is raised for meat	**HORSES** large animal used for riding or carrying/pulling things
LIVESTOCK farm animals kept, raised, and used by people	**SCARF** piece of cloth worn around your neck	**SHIRT** piece of clothing, for the upper body, that has sleeves

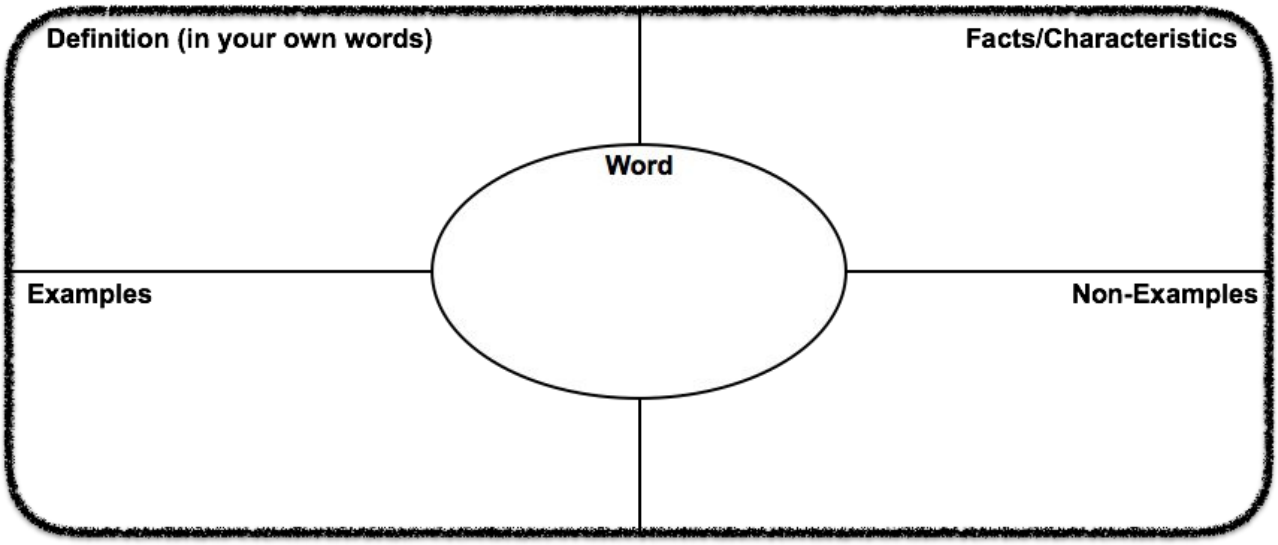
ACRE measure of land area that equals 4,840 square yards	BARN building on a farm used to store animals, or equipment	BISON large, hairy animal with big head, also called buffalo
CHICKENS a bird that is raised for its eggs and meat	DUCKS birds that swim, have flat beak and webbed feet	COTTON white fiber 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	BEEF meat from cattle (ie. steak, hamburger)
GOAT small animal related to sheep, raised for meat/milk	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	TURKEY large bird related to chicken, raised for its meat	FARMER person who runs a farm

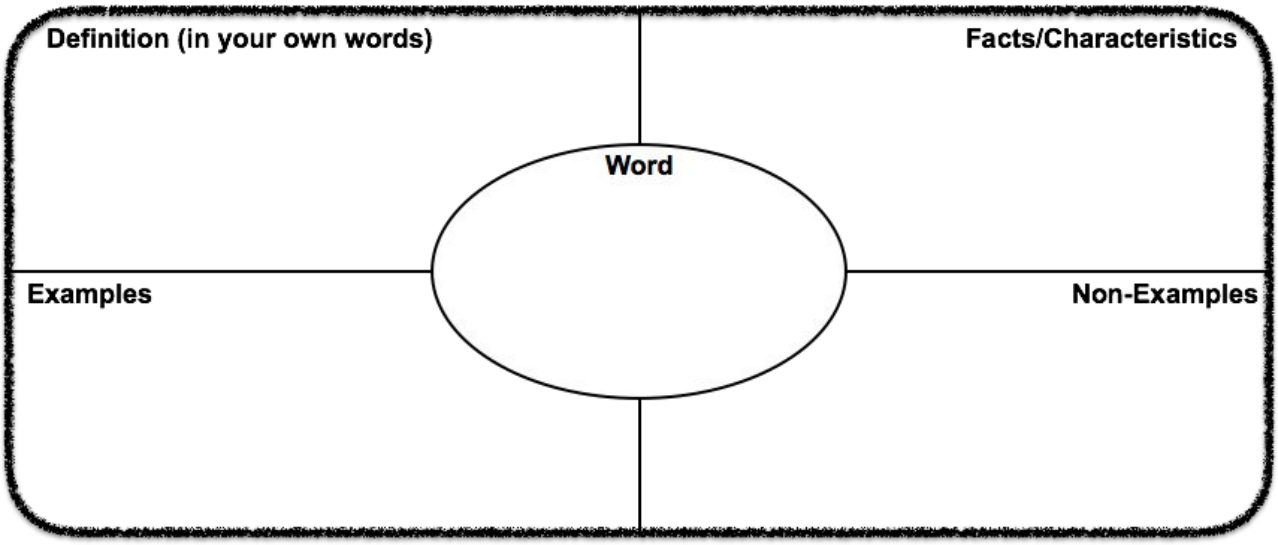
Think in Pictures: Like Dr. Grandin

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

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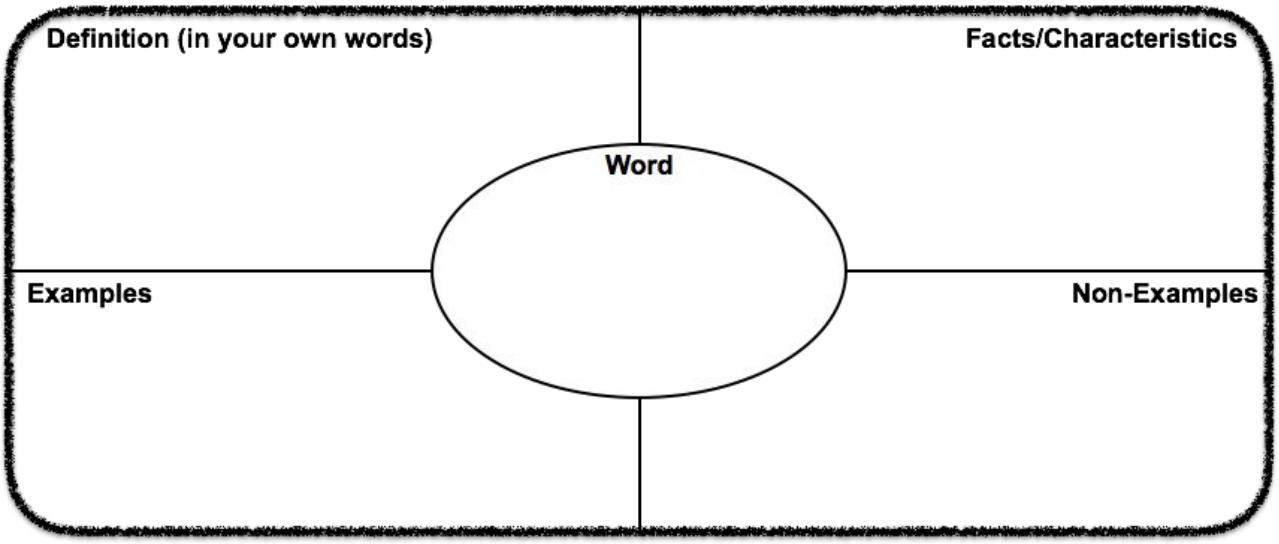
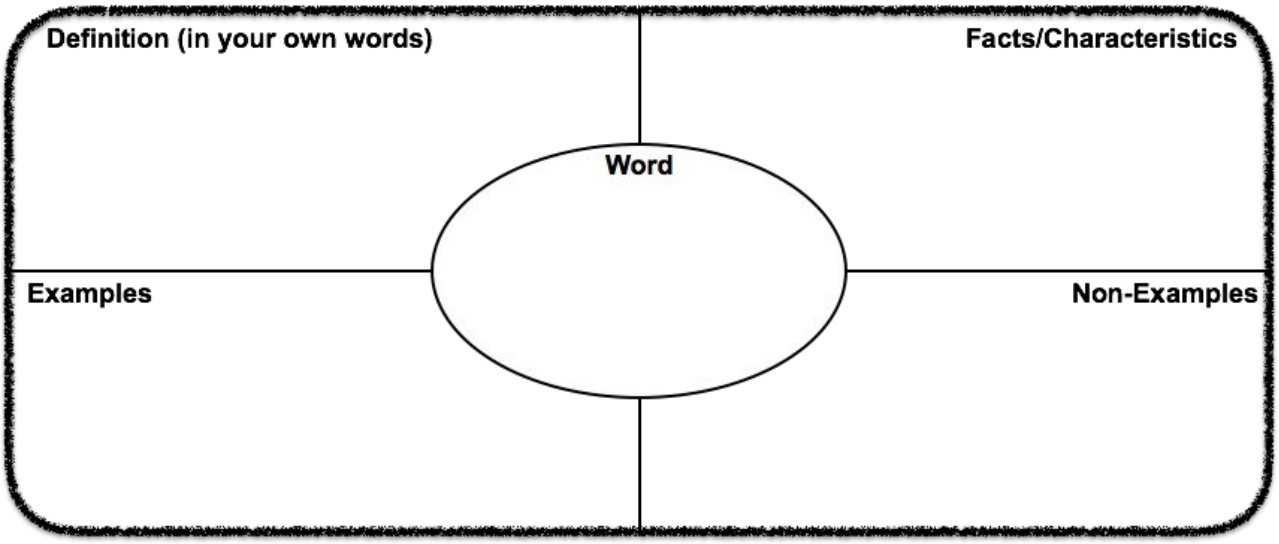
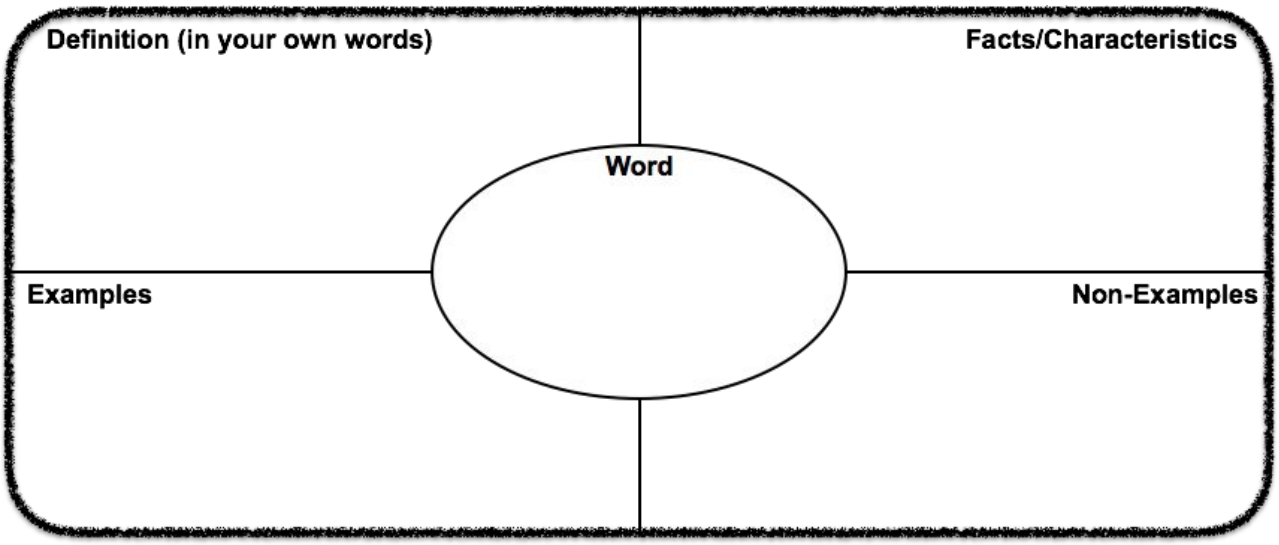






Activity 2: Comparing Inventors, (ELA, SS) 1 50 minute class period

Read about two agricultural inventors, we suggest Temple Grandin and John Deere. Discover the impact their inventions made on agriculture.

Oklahoma Academic Standards

Activity 2: Comparing Inventors (ELA, SS)

3.7.R.2 4.7.R.2 5.7.R.2	Students will compare and contrast how ideas and topics are depicted in a variety of media and formats.
3.SS.3.1	Understand and describe the relationship between historic events and chronology through the creation of basic timelines.

Materials:

- Books: "*The Girl Who Thought in Pictures The Story of Dr. Temple Grandin,"* by Julia Finley Mosca and *"John Deere, That's Who!"* by Tracy Nelson Maurer
- Activity 2 Reading Pages **"Comparing Inventors: Dr. Grandin's Life"** & **"Comparing Inventors: John Deere's Life"**
- Activity 2 Worksheet 1 "**Timeline of Dr. Temple Grandin's Life"** & Worksheet 2 **"Comparing Inventors Timeline"**
- Worksheet 3 **"Venn Diagram"**

Procedures:

1. Construct a timeline with dates for both Dr. Grandin and John Deere (or two other inventors) to show important dates in their lives.
2. Complete **"Venn Diagram"** to show similarities/differences between inventors and inventions.

Temple Grandin was born on August 29, 1947 in Boston, Massachusetts. She did not talk until she was three and a half years old. At the age of two, doctors said that Temple had autism. Autism often makes it hard for someone to talk or know how others are feeling.

Temple loved math and science, but school was hard. Other children made fun of her for being different. When she was 14, she threw a book at a classmate and was expelled from school. In 1961, she spent the summer at her aunt's ranch in Arizona. Her aunt had cattle and Temple liked them. Temple often says that she "thinks in pictures." She saw that cattle think like her. Cattle see details around them that most people miss.

In 1965, Temple created her first invention, a squeeze machine. This idea came from cattle chutes she saw on her aunts ranch. Cattle chutes keep cattle calm while giving them shots by holding them firmly. Temple's squeeze machine holds people firmly, like a hug.

Temple Grandin's Squeeze Machine

Temple earned a college degree in psychology in 1970, and a master's degree in animal science in 1975. In 1976, she invented the curved chute for moving cattle. The curved system keeps cattle calm. She earned her doctoral degree in animal science in 1989.

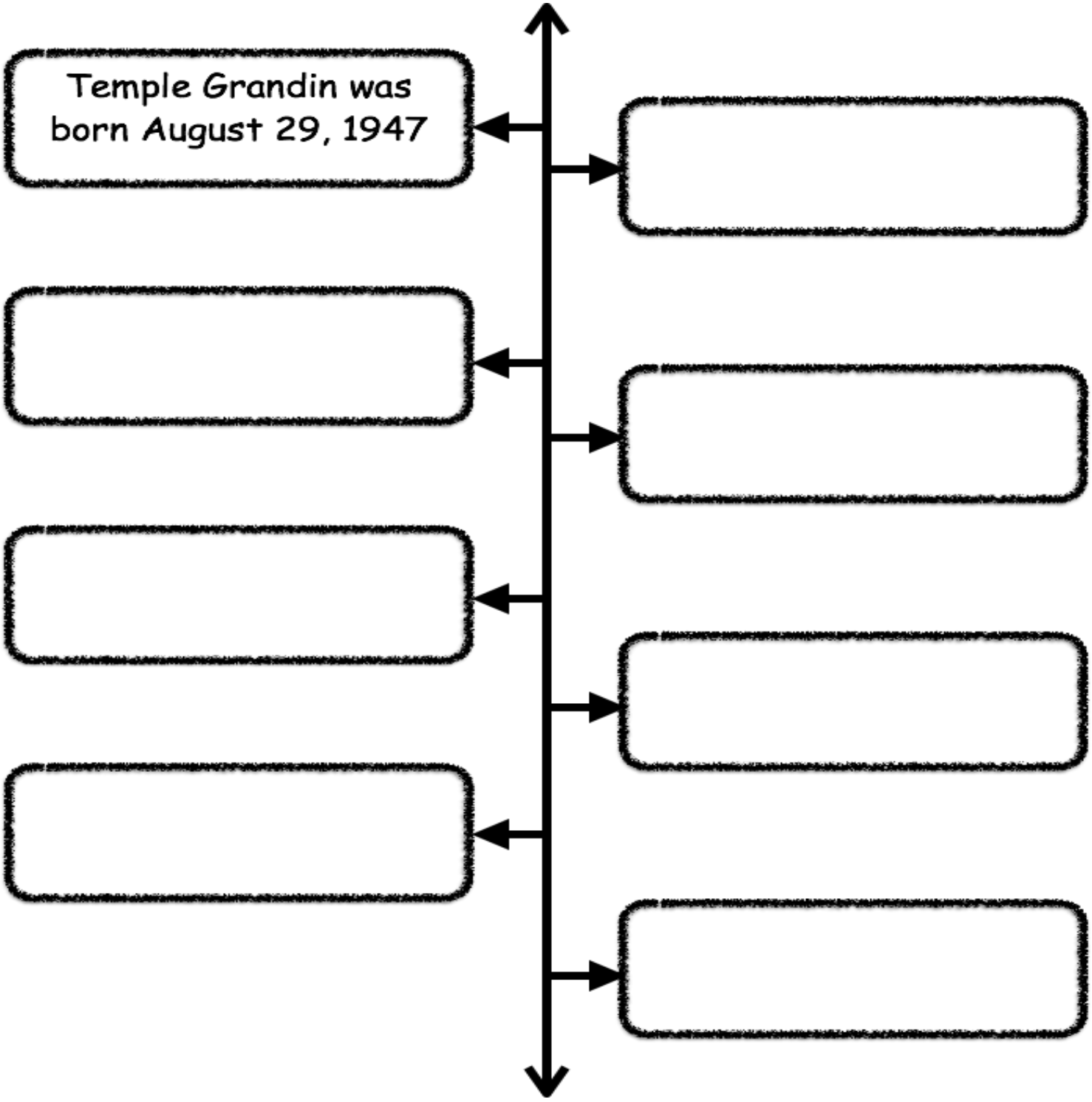
Dr. Grandin was inducted into the National Cowgirl Hall of Fame in 2010 and was also named one of *Time* magazine's 100 most influential people that year. Today, more than half of the cattle in the U.S. are handled using her curved chute design. This allows ranchers to keep their cattle calm as they doctor them. Dr. Grandin is a professor at Colorado State University.

Think in Pictures: Like Dr. Grandin

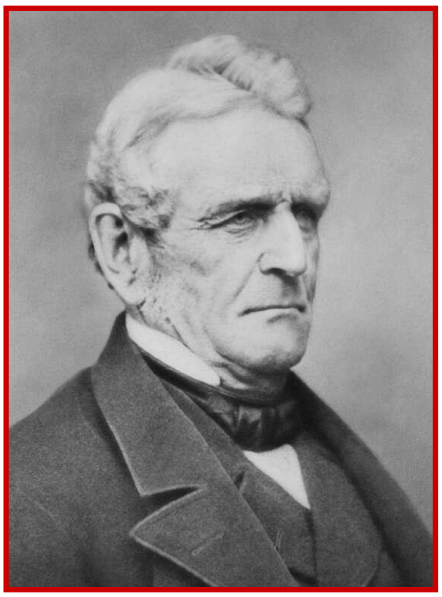
Activity 2 Worksheet 1: Timeline of Dr. Temple Grandin's Life

Name: _____ Date: _____

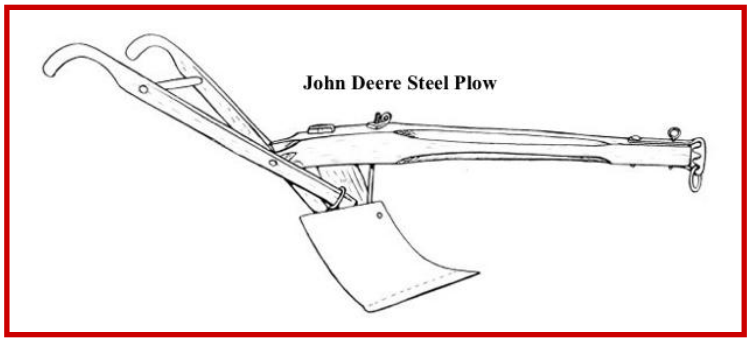
Complete the timeline of Dr. Grandin's life. Include important dates such as: When she lived on her Aunt's ranch, when she graduated college, when she was inducted into the National Cowgirl Hall of Fame. Research her life, as necessary, to complete the timeline.



John Deere was born on February 7, 1804 in Rutland, Vermont. In 1821, he became an apprentice to a blacksmith. In 1826, he became a blacksmith. John was a hard worker and was smart. He was able to find work easily. There were a lot of farmers who needed him to work on their farm Equipment.



In 1836, John Deere moved his family to Illinois. John Deere started his own business in 1837. He named it Deere and Company and he made farm equipment. As farming spread across the nation, farmers in Illinois had a hard time plowing the heavy, sticky prairie soil. They were using cast iron plows made for Vermont. These plows were made for light, sandy soil.



John Deere came up with the idea for a plow that would work in the sticky soil. It was shaped so that it could clean itself as it cut furrows, or rows, in the soil. In 1837, he created his stainless steel plow using a broken saw blade. By 1841, John was selling 100 plows a year. By 1850, his company was making about 1,600 plows a year. The company also made other farm tools.

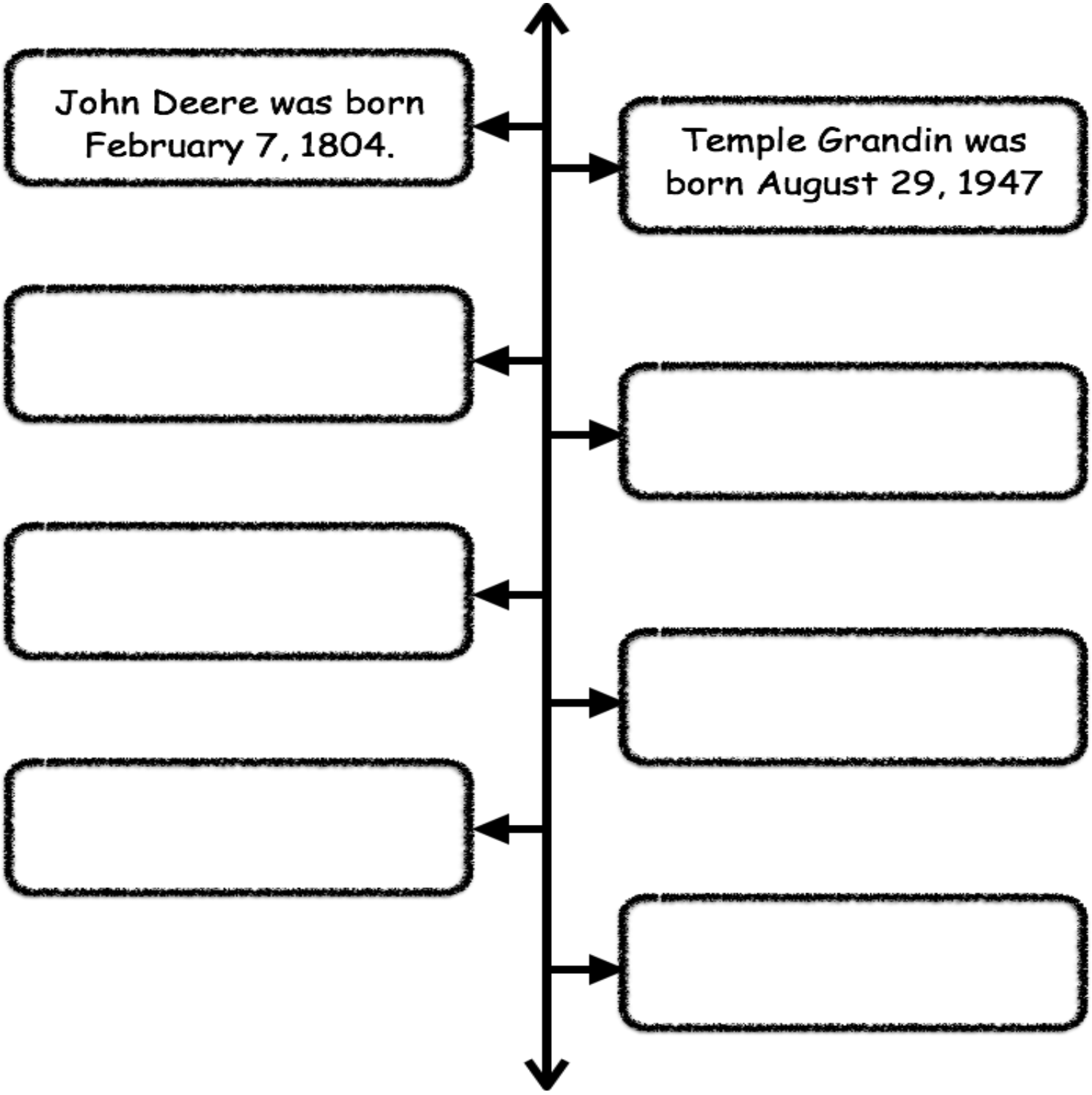
When John Deere's son, Charles, became old enough, he ran the company. John Deere died May 17, 1886.

Think in Pictures: Like Dr. Grandin

Activity 2 Worksheet 2: Comparing Inventors Timeline

Name: _____ Date: _____

Complete the timeline comparing the lives of two agriculture inventors: John Deere and Temple Grandin. Use the left side for John Deere and the right side for Dr. Temple Grandin. Include important dates for their inventions.

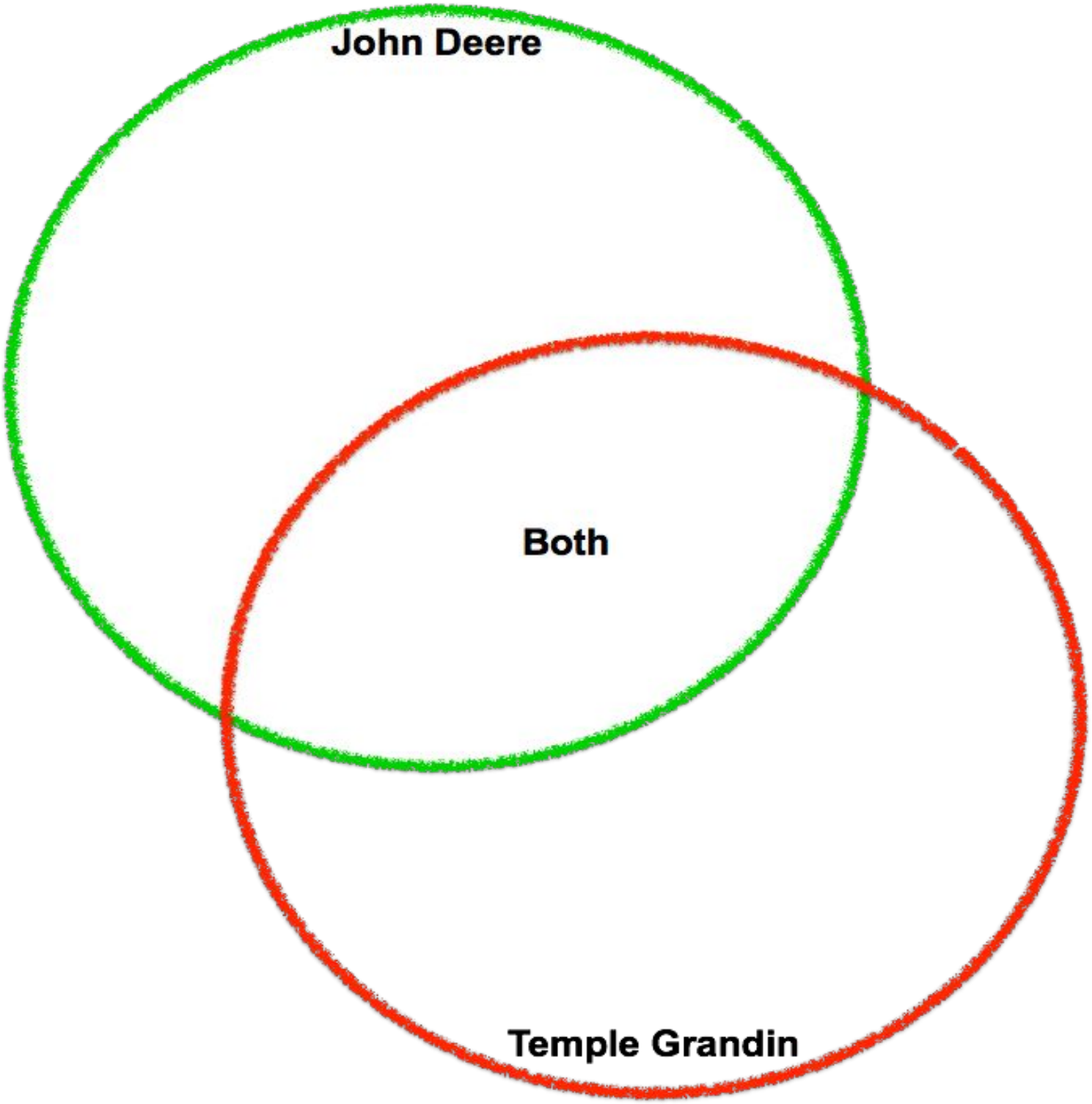


Think in Pictures: Like Dr. Grandin

Activity 2 Worksheet 3: Comparing Inventors Venn Diagram

Name: _____ Date: _____

Compare the lives of two agriculture inventors: John Deere and Temple Grandin. Use the top circle for John Deere and the bottom circle for Dr. Temple Grandin. Include ways they are alike in the center circle.



Activity 3: 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 3: Cattle Flight Zones (ELA)

3.2.R.1 Students will locate the main idea and key supporting details of a text or section of text.

4.2.R.4 Students will begin to paraphrase main ideas with supporting details in a text.
5.2.R.3

3.3.R.7 Students will ask and answer inferential questions using the text to support answers.
4.3.R.7

Materials:

- Activity 3 Reading Page: **"Cattle Flight Zones"**
- Activity 3 Worksheet 1: **"Cattle Flight Zones Reading Comprehension"**
- Video Understanding Flight Zones: https://www.youtube.com/watch?v=Iwu8Ncrl0z0

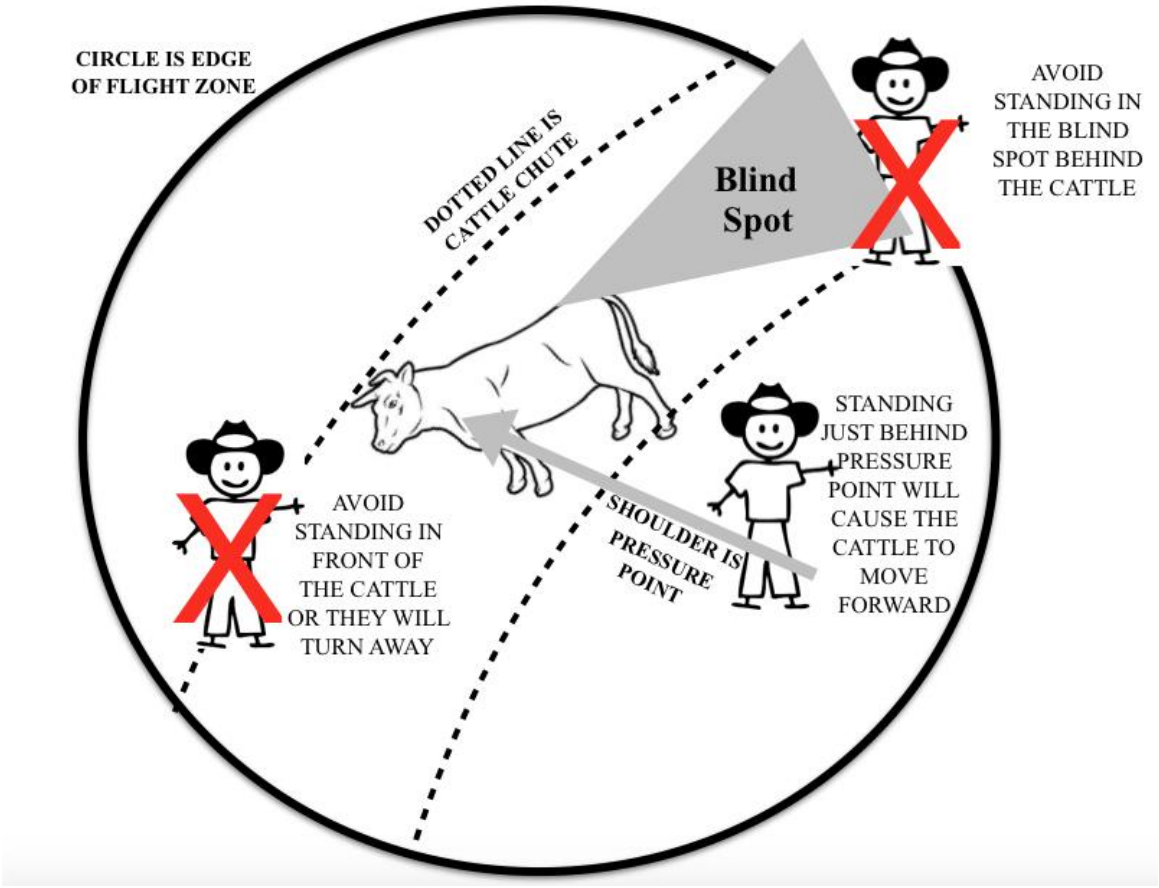
Procedures:

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 3 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) What is the main idea of the "Cattle Flight Zones" reading page?

_____

_____

_____

2) What details support the main idea?

_____

_____

_____

3) Explain in your own words how to find the flight zone of cattle.

_____

_____

_____

4) Do you think it would be easier to move calm cattle or cattle who are not used to people? Explain your answer.

_____

_____

_____

5) Why would it be more difficult to move cattle in a pasture?

_____

_____

_____

Activity 4: 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 4: Curved Cattle Chute (Science, Math)

3-PS2-2	Make observations and/or measurements of the object's motion to provide evidence that a pattern can be used to predict future motion.
4-PS3-3	Ask questions and predict outcomes about the changes in energy that occur when objects collide.
4-LS1-2	Use a model to describe that animals' receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.
4.GM.2.1	Measure angles in geometric figures and real-world objects with a protractor or angle ruler.
5.GM.3.1	Measure and compare angles according to size.
3.GM.2.3 4.GM.2.4 5.GM.3.2	Choose an appropriate instrument and measure the length of an object to the nearest whole centimeter (or 1/4 -inch or 1/16-inch).

Materials:

- Paper Plates with high edges, scissors, glue, tape
- Cardstock, yarn, straws, construction paper, pipe cleaners (to represent fencing materials)
- Marbles (to represent cattle)
- 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 marble "cattle" to move through.
3. After the prototypes are built and tested, allow time to share designs presenting Engineering Process findings to each other. What happened to the marbles motion when it hit the wall? Can the motion be predicted? Was there a change in energy? How does this compare to cattle processing information and responding 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. Students will measure the length and width of their alleyways and measure the angle of their turns and compare their designs. Which angles worked best to turn the "cattle?" Do the length and width of the alleyways affect the cattle movement? What is the widest it can be to only allow one "calf" to pass through at a time?

Activity 5: Design Western Shirt/Scarf, (ELA, Fine Arts) 2 50 minute class periods

Temple Grandin wears western shirts, often paired with cowboy scarves. She prefers the shirts over t-shirts. In 2011, she even wore a special western shirt to the Golden Globe Awards in Hollywood!

Oklahoma Academic Standards

Activity 4: Curved Cattle Chute (Science, Math)

3.3.W.2 4.3.W.2	Students will write facts about a subject, including a main idea with supporting details, and use transitional and signal words.
5.3.W.2	Students will introduce and develop a topic, incorporating evidence (e.g., specific facts, examples, details) and maintaining an organized structure.
3.3.W.3 4.3.W.3	Students will express an opinion about a topic and provide fact-based reasons as support.
5.3.W.4	Students will show relationships among facts, opinions, and supporting details.
3.VA.3.2	Use a variety of subjects, basic media and techniques in creating visual art including drawing, painting, weaving, sculpture, ceramics, collage, and mixed media.
4.VA.3.2	Use observation, memory, and imagination in creating original works of art.
5.VA.2.3	Identify how the visual arts are used by artists and designers in today's world, including media arts, and the popular media of advertising, television, and film (e.g., fashion designer).

Materials:

- Video Temple Grandin & Her Cowboy Shirts: https://www.youtube.com/watch?v=379knneYABI
- Activity 5 Worksheet 1: **"Favorite Clothing Bar Graph"**
- Activity 5 Worksheet 2: **"Design a Western Shirt and Scarf"**

Procedures:

1. Show the Video "Temple Grandin and Her Cowboy Shirts."
   —Discuss her shirts and scarves and what makes them special.
   —Discuss facts they have learned about Temple Grandin such as: her inventions, her thinking, her autism, her impact on agriculture.
2. Discuss what today's students wear. Collect classroom data to create a bar graph. Students will choose one of the following options as their favorite shirt:
   —Short sleeve t-shirt
   —Long sleeve t-shirt
   —Polo shirt
   —Button down dress shirt
   —Western style shirt
   —Other
3. Quick Write: Write five facts and five opinions about Temple Grandin or write vocabulary words from lesson.
4. Create: Design western shirt and scarf. Make each one unique.
5. Pair/Share: Each student will share their shirt and scarf with a partner and explain the reason for the design. Each student will share quick write facts and opinions with their partner and decide the best one to share with the class.

Think in Pictures: Like Dr. Grandin

Activity 5 Worksheet 1: Favorite Shirt Bar Graph

Name: _____ Date: _____

Poll your classmates to determine which shirt is their favorite. Each person should choose one of the following options.

SHORT SLEEVE T-SHIRT	LONG SLEEVE T-SHIRT	POLO STYLE SHIRT	BUTTON DOWN DRESS SHIRT	WESTERN STYLE SHIRT	OTHER _____

Think in Pictures: Like Dr. Grandin

Activity 5 Worksheet 2: Design a Western Shirt

Name: _____ Date: _____

Temple Grandin wears western shirts, often with a western scarf. Design a special shirt for Dr. Grandin. Write 5 facts and 5 opinions about Dr. Grandin on the back.

Think in Pictures: Like Dr. Grandin

Activity 5 Worksheet 3: Design a Western Scarf

Name: _____ Date: _____

Temple Grandin wears western shirts, often with a western scarf. Design a special scarf for Dr. Grandin. Write 5 facts and 5 opinions about Dr. Grandin on the back.