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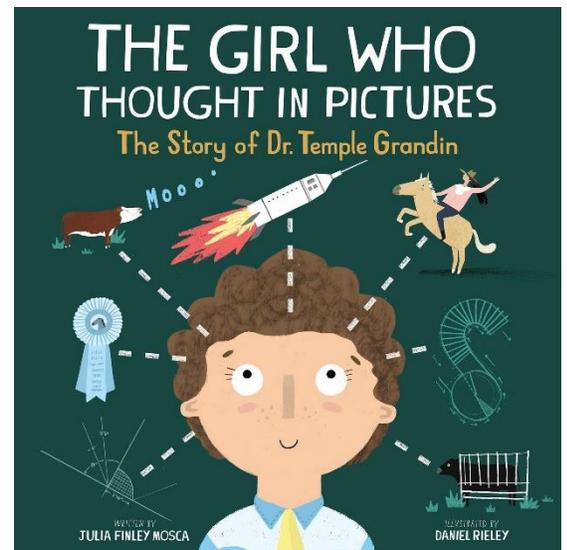
January 2020

The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin

By: Julia Finley Mosca

When young Temple was diagnosed with autism, no one expected her to talk, let alone become one of the most powerful voices in modern science. Yet, the determined visual thinker did just that. Her unique mind allowed her to connect with animals in a special way, helping her invent groundbreaking improvements for farms around the globe!

The Girl Who Thought in Pictures: The Story of Dr. Temple Grandin is the first book in a brand new educational series about the inspirational lives of amazing scientists. In addition to the illustrated rhyming tale, you'll find a complete biography, fun facts, a colorful timeline of events, and even a note from Temple herself! ¹



Did You Know? (Ag Facts) ^{2 - 3}

- The majority of cattle {in North America} are handled in a center track restrainer system that Temple Grandin designed.
- Temple Grandin has been honored as one of Time Magazine's 100 Most Influential People as well as inducted into The Women's Hall of Fame.
- Dr. Grandin has researched many topics regarding humane livestock practices in her time as a professor at Colorado State University.

Discussion Questions

- What is the author's purpose in writing this book?
- Temple's mother told others that she was "different, not less". What did she mean?
- Describe Temple's invention and why it is important to agriculture.

Grade Level(s): 2-5

Purpose: Students will analyze Temple Grandin and her contributions to agriculture as well as working as agricultural engineers to design a corral system that builds upon her research.

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 zone:** 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 (i.e. cattle, sheep, hogs)
- **producer:** someone who raises livestock or crops for others to consume
- **squeeze chute:** a device used to restrain large animals, especially cattle and horses

Background Agricultural Connections

Moving **livestock** can be difficult if you do not understand how the animals 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, 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 the animal's 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 300°. In sheep, the visual field ranges from 191° to 306° 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, a professor at Colorado State University, focuses on animal behavior and has made, and continues to make, 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.

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. The inspiration for 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 that the way animals, especially cattle, are handled and transported can potentially cause stress, pain, and fear. When cattle are moved on wet or slippery slopes or in poorly lit areas, they can be injured. She believes that 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, keeping them free from distractions, dark tight spaces, and shadows which could scare the cattle. Her invention of the curved chute system came from the realization that 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 in a calm manner. Today, half of the cattle in United States and Canadian meat processing plants are handled with equipment that Grandin 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 fancy or simple Western shirts, but her Western shirts are as constant as her passion for agriculture. In 2011, she even wore a Western shirt to the Golden Globe Awards in Hollywood!

Agricultural engineers are 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, irrigation and drainage systems, and soil conservation systems. Agricultural engineers help design methods to decrease labor, which also increases a producer's ability to produce food.

Temple Who? ³

Materials:

- *The Girl Who Thought in Pictures*
- Describe Temple sheet

Procedures:

1. Explain to students that they will hear about a very important scientist today – Dr. Temple Grandin. Explain to students that we are all different – we like different foods, we wear different clothes, and sometimes we act different from one another. Just because someone

acts different does not make them “less” – it makes them unique. We are ALL unique in our own ways. We will learn how Temple Grandin is unique through today’s story. Also, point out that although this book looks fictional, this is actually a NON-FICTION story.

2. Read *The Girl Who Thought in Pictures* to students.
3. Discuss with students the theme of the story. What did the author want us to learn from this story? How did Temple help farmers?
4. Project the “Describe Temple” sheet. Brainstorm words that describe Temple with the class. Students have to explain their adjectives before we add them to the class sheet on the projector.
5. Explain to students that now we have learned all about Temple and her passions, it is time to think about our passions. What types of things are we passionate about in this class? Animals? Plants? Building things? Helping others? Give an example of your own to the class (i.e. Teachers are passionate about children, helping others, etc. This is why they choose careers in education.) In their writing journals, have students write about their passions, and then how they will use it to help others, just as Temple did.

Cattle Flight Zones²

Materials:

- [Understanding Flight Zones](#)
- *Cattle Flight Zones Reading Page*
- *Cattle Flight Zones Comprehension Sheet*

Procedures:

1. Show the video [Understanding Flight Zones](#) to help students understand what a flight zone is and how it affects the comfort of the animals.
2. Discuss cattle movement and how entering and exiting the flight zone affects their movement.
3. Pass out a *Cattle Flight Zones Reading Page* and a *Cattle Flight Zones Reading Comprehension Sheet* to each student. Ask the students to do a close reading of the reading page and then complete the comprehension sheet.

Curved Cattle Chute²

Materials:

- [Engineering Process Handout](#)
- [Design of Curved Cattle Chutes](#)
- Paper plates with high edges
- Scissors
- Glue
- Tape
- Card stock
- Yarn
- Straws
- Construction paper
- Pipe cleaners
- Marbles

Procedures:

1. Present the following scenario to the students: *A local cattle operation has a problem. They need to move their cattle from pasture through a cattle chute to doctor them, but the cattle are afraid to walk through the chute.*
2. Explain to the students that their job is to design a cattle chute using the following guidelines:
 1. The chute should have at least 3 turns causing the cattle to change directions.
 2. The chute should end with a squeeze chute or pen to collect cattle.
 3. The chute should start wide and then narrow as it reaches the squeeze chute or final pen, requiring the cattle to move through in a single-file line.
3. Pass out an *Engineering Process* handout to each student. Walk through the engineering process as a class.
4. Organize the students into small groups and have each group work as a team to design a cattle chute using the Engineering Process.
5. Provide each group with a paper plate, scissors, glue, and tape and access to card stock, yarn, straws, construction paper, and pipe cleaners to construct their prototypes. Give each group marbles to represent the cattle who will be moving through the chute.
6. After the prototypes are built and tested, allow time for the groups to share their designs. Ask the students to consider the following:
 1. What happened to the marble's motion when it hit the wall?
 2. Can the motion be predicted?
 3. Was there a change in energy?
 4. How does this compare to how cattle process information and respond to the chute and/or distractions?
7. Show the video [Design of Curved Cattle Chutes](#).
8. Discuss cattle movement and chute design. How do cattle use their senses to process information? Discuss how the chutes on the video are similar and different from the student designs.
9. Challenge the students to modify their projects to create a chute that follows Dr. Grandin's guidelines—solid walls and curved alleyways which narrow—but do not duplicate the chute shown in the video.
10. Have the students measure the length and width of their alleyways and the angle of their turns and then compare their designs. Ask the students to consider the following:
 1. Which angles worked best to turn the cattle?
 2. Does the length and width of the alleyways affect the cattle movement?
 3. What is the widest the chute can be to only allow one calf to pass through at a time?

Extension Activities: ⁴

- Invite a local rancher to your class to discuss their livestock facilities. Ask the rancher to share a diagram of their corral and identify areas that are working well, and areas that could be improved. Your county Farm Bureau may be able to connect you to a local rancher.
- Learn more about livestock facilities by visiting a local ranch, auction yard, or feedlot. Ask your tour guide to explain how their facilities keep animals calm and safe. If appropriate, have students employ Temple Grandin's unique way of thinking by moving through the system to understand the animal's perspective.

- Further explore the contributions of Temple Grandin by watching the full-length film, *Temple Grandin* (2010, PG). As students watch the movie, have them record the challenges and successes she encounters as she designs facilities for animals.
- Have students research the educational background and skills required to be an agricultural engineer.

Suggested Companion Resources:

- [Beef Cattle in the Story of Agriculture](#) (Book)
- [Careers in Agriculture](#) (Book)
- [John Deere, That's Who!](#) (Book)
- [The Most Magnificent Thing](#) (Book)
- [Compliments of Cattle Poster](#) (Poster, Map, Infographic)
- [Into the Outdoors: Beef Farming](#) (Multimedia)

Sources/Credits:

1. Mosca, Julia Finley. *The Girl Who Thought In Pictures*. Innovation Press, 2017.
2. [Oklahoma Ag in the Classroom](#)
3. [Swimming in Second](#)
4. [California Ag in the Classroom](#)

Suggested SC Standards Met:

English/Language Arts:

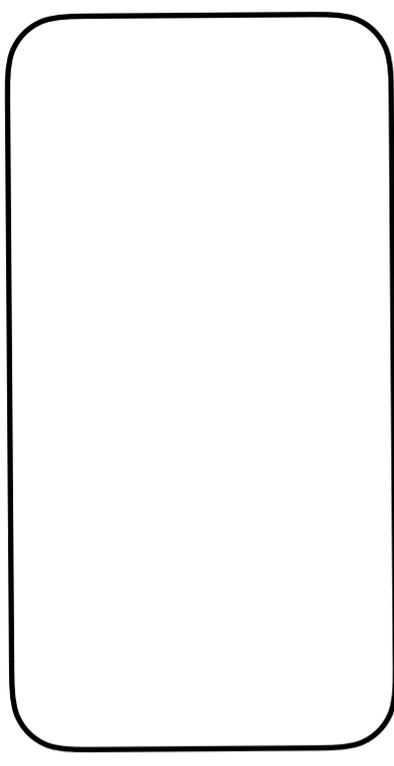
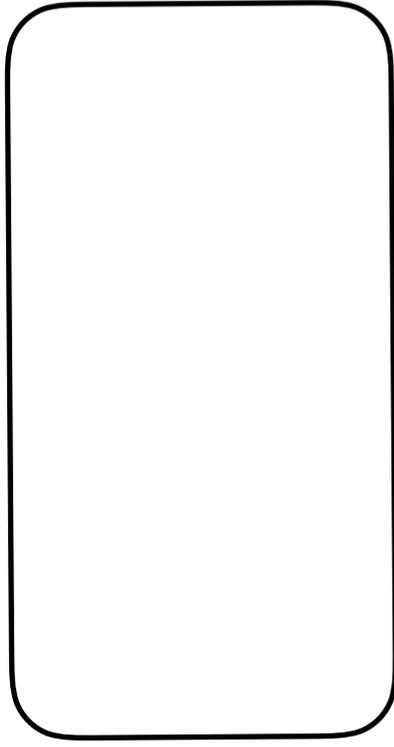
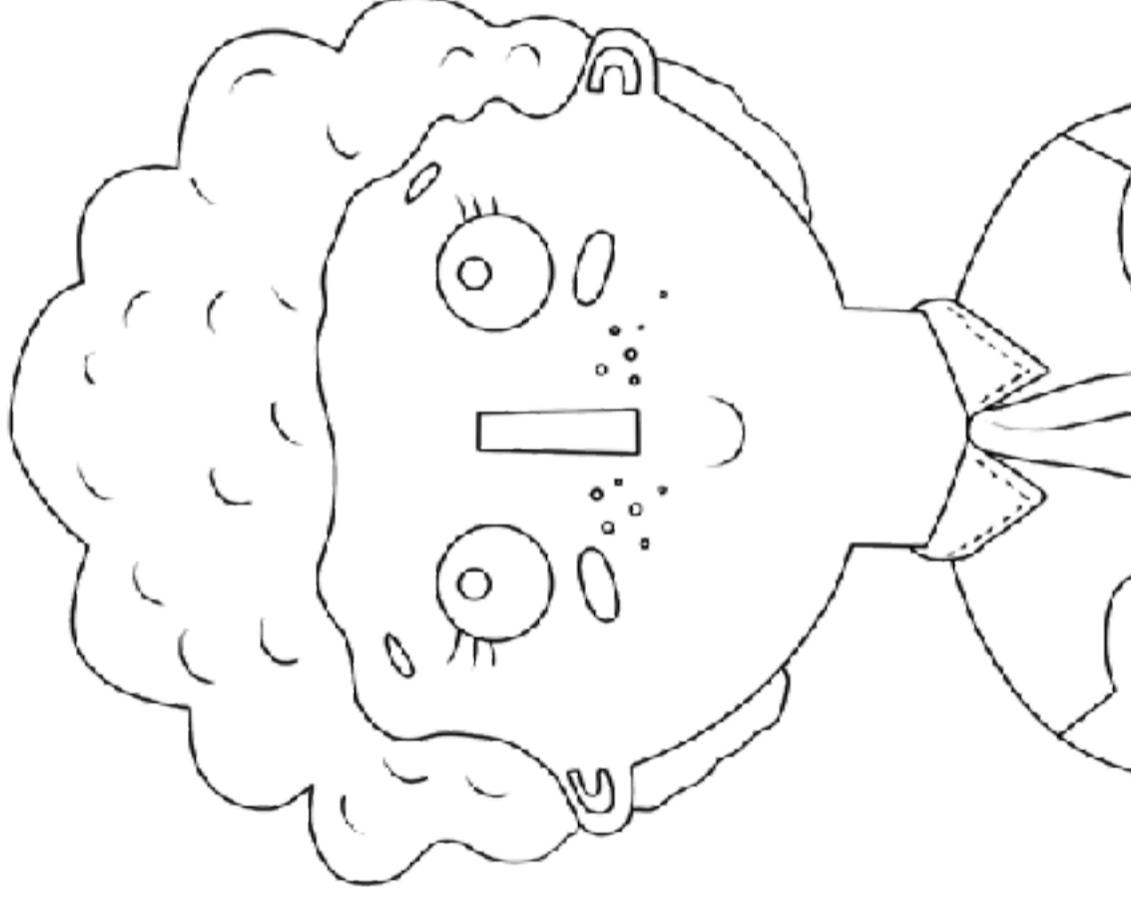
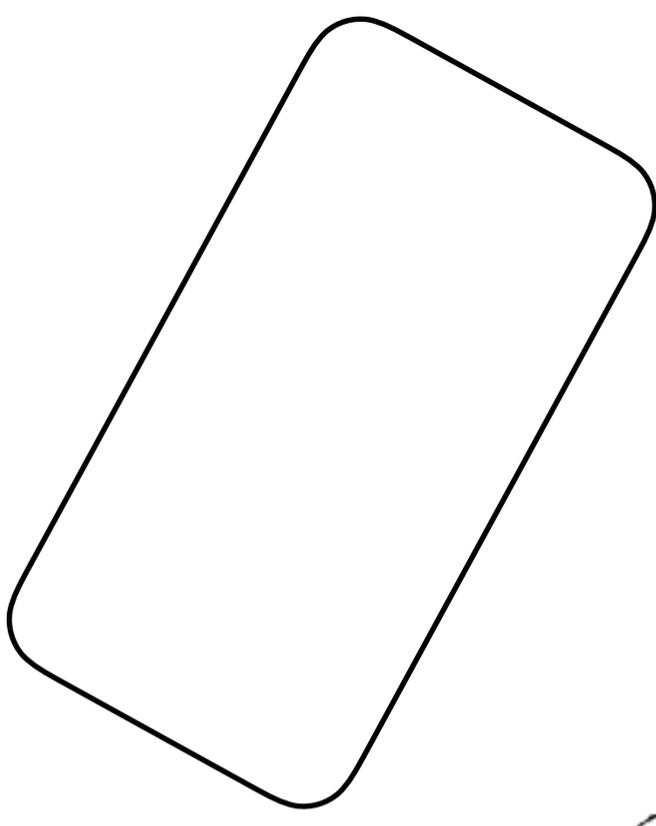
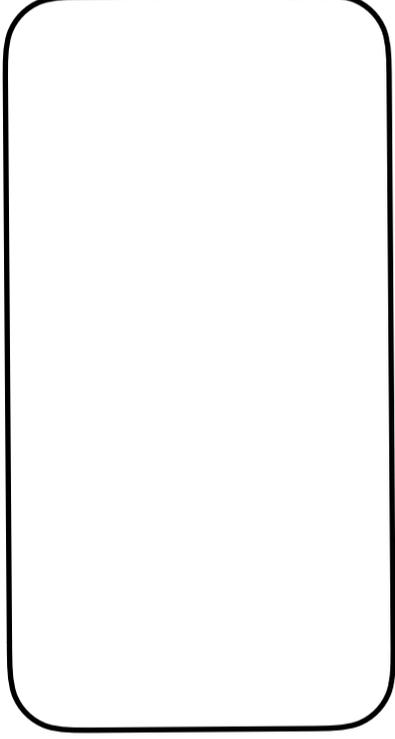
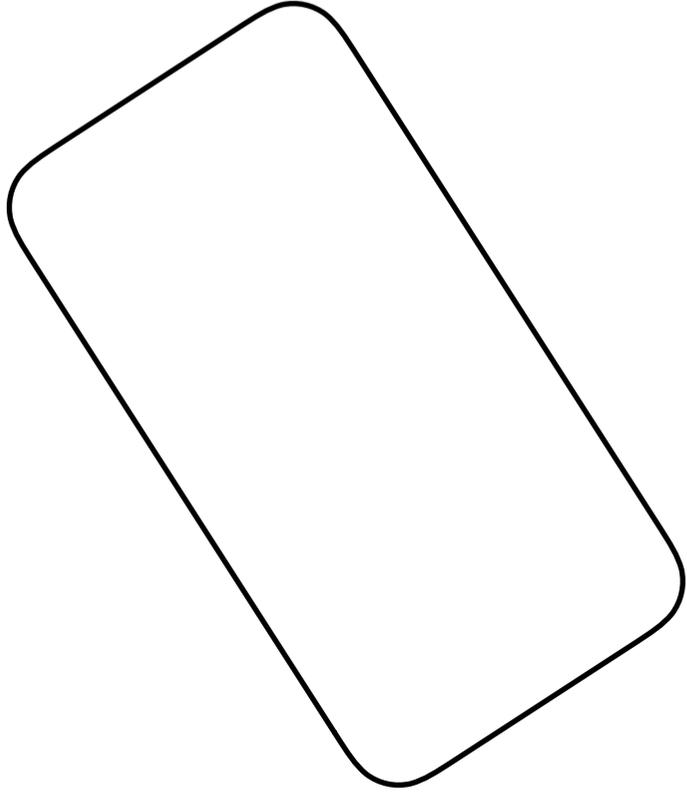
- 2.RI.5.1 Ask and answer literal and inferential questions to demonstrate understanding of a text; use specific details to make inferences and draw conclusions in texts heard or read.
- 2.RI.5.2 Make predictions before and during reading; confirm or modify thinking
- 2.RI. 8.1 Identify how the author uses words, phrases, illustrations, and photographs to inform, explain, or describe.
- 2.RI.10.1 Identify and analyze the author's purpose.
- 3.RI.5.1 Ask and answer literal and inferential questions to determine meaning; refer explicitly to the text to support inferences and conclusions.
- 3.RI.8.1 Explain how the author uses words and phrases to inform, explain, or describe.
- 3.RI.8.2 Use knowledge of appendices, timelines, maps, and charts to locate information and gain meaning; explain how these features contribute to a text.
- 3.RI.10.1 State the author's purpose; distinguish one's own perspective from that of the author.
- 4.RI.5.1 Ask and answer inferential questions to analyze meaning beyond the text; refer to details and examples within a text to support inferences and conclusions
- 4.RI.8.1 Determine how the author uses words and phrases to shape and clarify meaning.
- 4.RI.8.2 Apply knowledge of text features to gain meaning; describe the relationship between these features and the text.
- 5.RI.8.1 Analyze how the author uses words and phrases to shape and clarify meaning.
- 6.RI.5.1 Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
- 6.RI.7.1 Integrate information presented in different media or formats to develop a coherent understanding of a topic or issue.

Science:

- 2.S.1: The student will use the science and engineering practices, including the processes and skills of scientific inquiry, to develop understandings of science content.
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DESCRIBE Temple

After reading "The Girl Who Thought in Pictures," describe Temple Grandin.



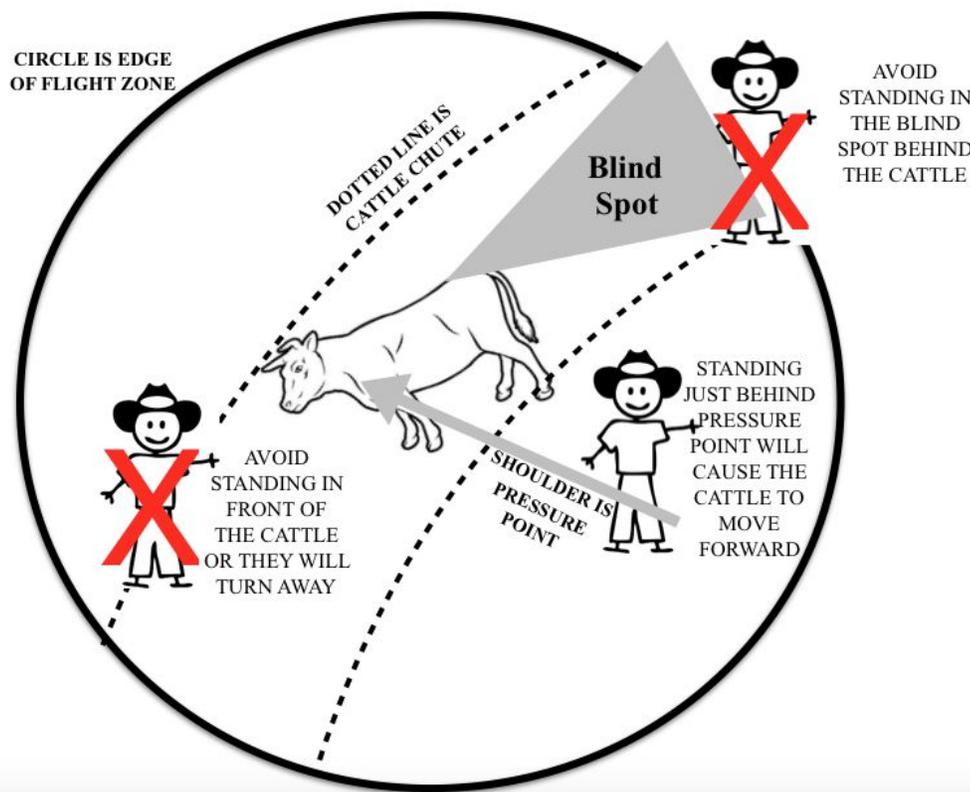
Cattle Flight Zones Reading Page

CATTLE FLIGHT ZONES

To move cattle forward, you need to know where the flight zone and point of balance are. 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. 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 its rear. You should also avoid standing in the animal's 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 chute or 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

Cattle Flight Zones Comprehension Sheet

Name: _____ Date: _____

Class/Hour/Teacher: _____

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.

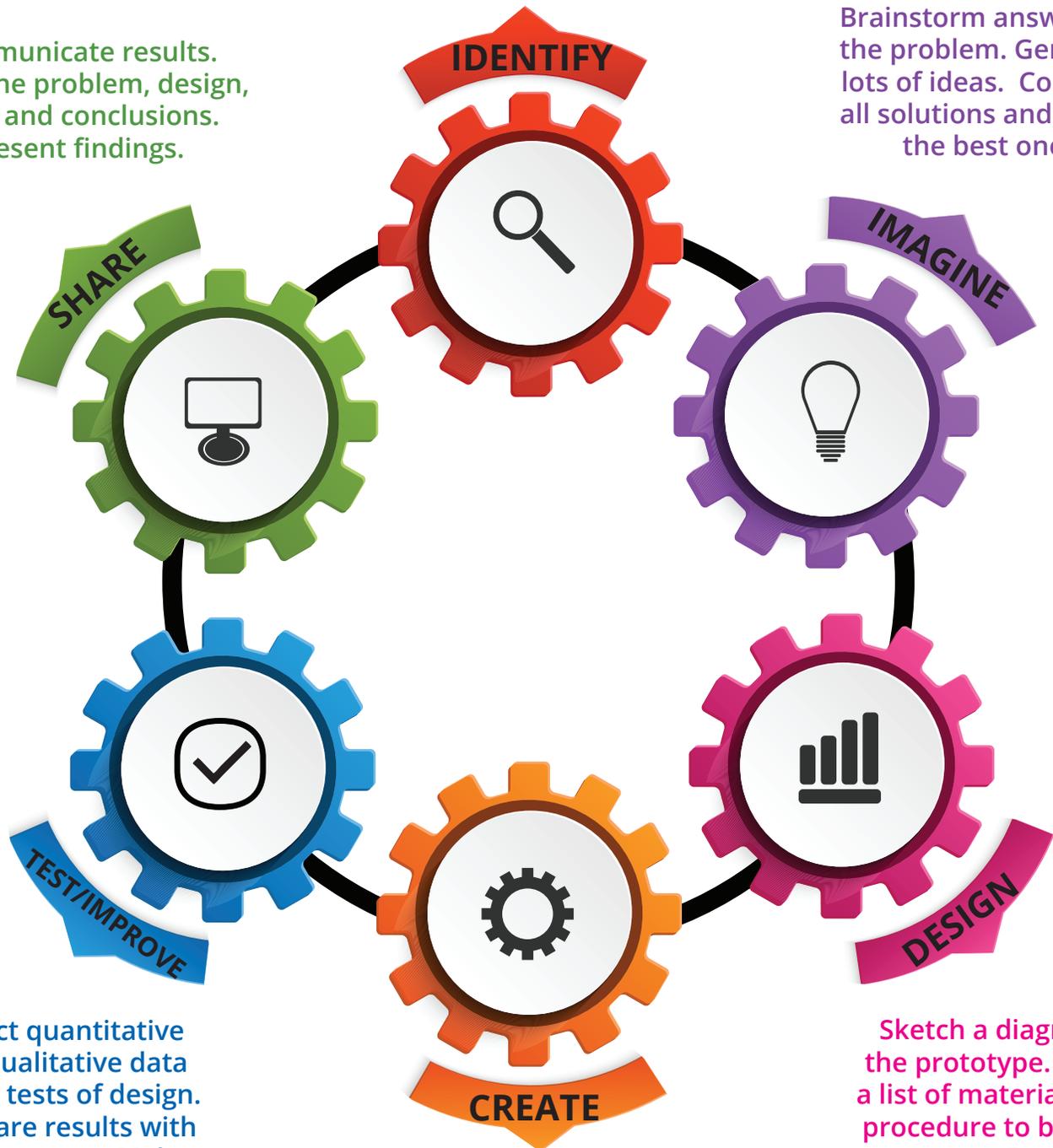
5) Why would it be more difficult to move cattle in a pasture?

Engineering Process

Identify the problem and how it affects people. Think locally, nationally, and globally.

Brainstorm answers to the problem. Generate lots of ideas. Consider all solutions and select the best one.

Communicate results. Share the problem, design, data, and conclusions. Present findings.



Sketch a diagram of the prototype. Create a list of materials and a procedure to build the prototype. Discuss the desired results.

Build the prototype according to design plan and procedures.

Collect quantitative and qualitative data during tests of design. Compare results with expectations. Make needed changes for improvement.





Identify the problem.



Brainstorm solutions.



Diagram the prototype.

List Materials _____

Write out the steps. _____

Describe the outcome _____



Test 1	Test 2	Test 3

What worked and what needs to change for success? _____
