

Wagons Ho!

2nd Grade

Unit 2 – The Wild West

Text Connection: *Cowboys and Cowgirls, Yippee-Yay* by Gail Gibbons

and/or *Cowboys* by Lucille Recht Penner

Design Challenge Summary

Challenge: What will the students be required to do?

You are preparing to go on a cattle drive. Cookie's chuck wagon must be packed with all the necessary supplies for feeding the cowboys. Your task is to design a chuck wagon that will travel the furthest distance possible, without breaking down, while carrying Cookie's necessary supplies.

(See additional information section for more details on the travel of the wagon)

Standards: What standards are addressed?

Science:

NS.1.2.1 Communicate observations orally, in writing and in graphic organizers

NS.1.2.2 Develop questions that guide scientific inquiry

NS.1.2.3 Conduct scientific investigations as individually and in teams

NS.1.2.4 Estimate and measure length...

NS.1.2.5 Collect measurable empirical evidence in teams and as individuals

NS.1.2.6 Make predictions in teams and as individuals based upon empirical evidence

NS.1.2.7 Use age-appropriate equipment and tools in scientific investigations

NS.1.2.8 Apply lab safety rules as they relate to specific science lab activities

PS.6.2.1 Investigate the relationship between force and motion

Math:

Mathematical Practice Standards

2.MD.1 Measure the length of an object by selecting and using appropriate tools...

2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit

2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole units, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units

Other:

W.2.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points and provide a concluding statement or section

W.2.3 Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts and feelings, use temporal words to signal event order, and provide a sense of closure

W.2.7 Participate in shared research and writing projects

SL.2.1 Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups

SL.2.3 Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information or deepen understanding of a topic or issue

SL.2.4 Tell a story or recount an experience with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences

SL.2.6 Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification

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Result: What will students know, value, and be able to do as a result of the lesson? What's the big idea?

Know and apply the engineering design loop process.

Demonstrate ability to modify designs based on observations and predictions.

Work collaboratively on solving a problem.

How mass and force affect motion of an object.

Demonstrate ability to measure distance traveled using non-standard units of standard length.

Assessment: What evidence will be used to determine student learning?

Did they design a wagon that could successfully travel with all the necessary supplies?

(because only 1 group can technically "travel the furthest" – this was not included as assessment evidence)

Did they follow the design loop process?

Did they work collaboratively?

Prior Knowledge/Experiences: What prior content knowledge and skills will the students need?

Experience with the Engineering Design Loop process

Connections to the Mathematical Practices

Investigations/inquiry in Science

Experiences with mass and weight (PS.6.1.2)

Experiences with the force of gravity on objects (PS.6.K.3)

Experiences in measurement with non-standard units

Summary/Connections: How will this design challenge connect with new/future learning, other content areas, real world experiences, etc.?

This lesson will help students develop problem solving skills and collaboration skills that are essential in succeeding in the 21st century. It will allow student the opportunity to transfer and apply skills from various content areas within one task.

Suggested Questions:

- Why did X group's wagon travel the furthest?
- What could you change about your design to help it travel further next time?
- If your wagon couldn't carry the load, what could you change about your design to strengthen it?
- How did the weight of your load affect the ability of your wagon to travel?

Mathematics:

- Measure the distance each wagon travels from the end of the ramp. Measurements can be taken using lengths of string, cube trains, etc.
- It may be helpful to record measurements from repeated/multiple runs per group. (student recording page has a table for keeping this data)
- Create a line plot with the class data from the distances traveled. Ask and answer questions related to the data in the line plot. (student recording page has an area for students to produce the class line plot)

As a summary activity, you could engage students in:

W.2.2 Write informative/explanatory texts in which they introduce a topic, use facts and definitions to develop points and provide a concluding statement or section

W.2.3 Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts and feelings, use temporal words to signal event order, and provide a sense of closure

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Extensions:

- Complete the travel tests on different surfaces (i.e.; carpet, grass, gravel, playground area, mud, etc.)
How does the surface affect the travel of the wagon?
- Change the height of the ramp. How does that affect the travel of the wagon?
- Write a narrative about the cattle drive from Cookie's point of view

Materials/Equipment/Preparation: What materials and equipment will students need to successfully complete this design challenge?

Lifesavers hard candies (like the wint-o-greens) – 4-6 per group

Straws or coffee stirrers (straw diameter needs to be smaller than the lifesaver opening) 4-6 per group

Popsicle sticks – 20 per group

Large index cards, cardstock or cardboard scraps (amount will vary depending on which material is chosen)

Tape

Scissors

Ramp (see additional information below)

Measurement Tools (snap cubes, color tiles, string, etc.)

Items to be used as weights – suggestions: marbles, golf balls, teddy bear counters, other manipulatives, pennies, etc.

ADDITIONAL INFORMATION

Suggestions for the ramp:

Stack 2-3 books and place a sheet of cardboard, plywood, etc., on the edge to create the ramp.

Cookie typically traveled with several different supplies. Many of those can be seen in the pages of the two books referenced for the challenge. (Among those supplies were food, utensils/cooking equipment, and bedding.)

Cookie's Necessary Supply List

3 containers of food

1 water barrel

5 utensils/cooking equipment

Cookie must be in the wagon, too!

These supplies will be represented by specific items (weights) in the challenge.
Here is a suggestion of items that could be used as weights to represent the supplies:

Marble – Food

Teddy Bear Counter – Cookie

Golf Ball – Water Barrel

Pennies – Utensils/cooking equipment

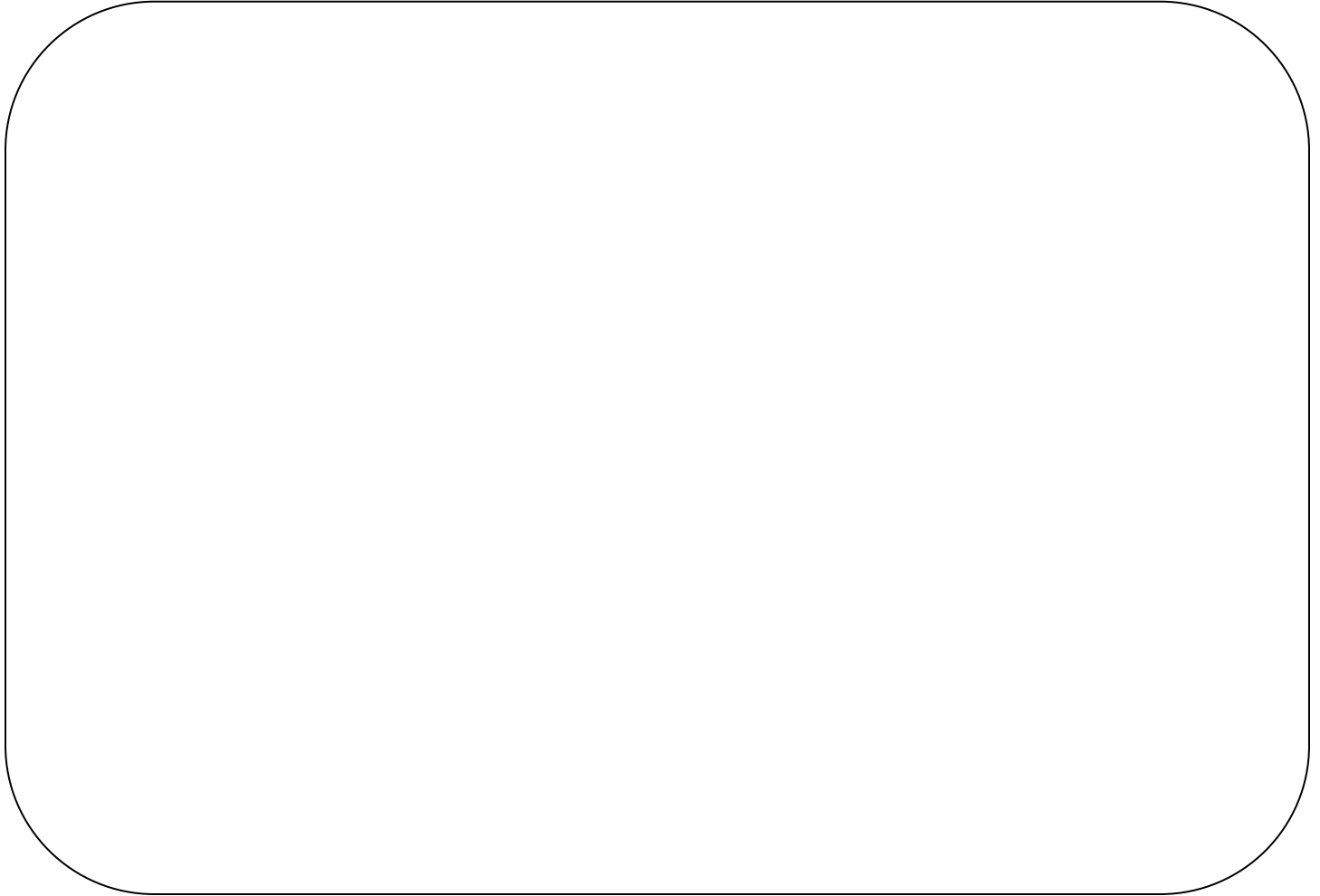
Other manipulatives could be used in place of these listed above, if not available.

You will need to post your supply list and what material will represent the weight for item.

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Generate Ideas:



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Build the Item - create and test your wagon:

Record observations from the building process, testing, evaluation, and redesign of your wagon

Test your design. Be sure to measure and record the distance the wagon travels.

Test #	Distance wagon travels from bottom of ramp
1	
2	
3	

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Evaluate:

1. How did the weight of your load affect the ability of your wagon to travel?

2. If your wagon couldn't carry the load, what could you change about your design to strengthen it?
If your wagon did carry the load, what could you change about your design to help it travel further next time?

Create a line plot together using the class data of wagon travels.



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Group Supplies:

Lifesavers candies (4-6), straws (4-6), 20 popsicle sticks, tape scissors
Index cards, cardstock or cardboard,

Other supplies: ramp, measurement tools, weights

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