



## The Ideal Sled

**Developed by:**

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Photo Credits: Terrie Hanke

**Discipline / Subject:**

STEM/ Math

**Topic:**

Measurement

**Grade Level:**

Second/Third Grade (can be modified to any grade level)

**Resources / References / Materials Teacher Needs:**

1. Planning sheets
2. Popsicle sticks
3. Straw
4. Rulers
5. Toothpicks
6. Tape/glue
7. Scale (kitchen scales works well)
8. Inclined plane
9. <https://www.youtube.com/watch?v=vNA7FwG0qCU>  
<https://www.youtube.com/watch?v=7wmNxRh8RGs>  
(Cody Strathe, Parts of the Iditarod Sled)

**Lesson Summary:**

Students will plan and create a dog sled based on specific measurements given. Students will use prior knowledge on weight (grams) and measurement (inches) to create and test a prototype of a dog sled.

**Standards Addressed: (Local, State, or National)**

1. 2.MD.A.1- Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
2. 2.MD.A.3- Estimate lengths using units of inches, feet, centimeters, and meters.
3. 3.MD.A.2- Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l).
4. 3-5-ETS1-2- Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
5. 3-5-ETS1-3- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

**Learning Objectives:**

1. Students will measure in inches with a ruler.
2. Students will measure in grams using a scale
3. Students will create a prototype of the "ideal sled" that is lightweight, durable, and strong

**Assessment:**

Reflection  
Sled completed to the correct measurements  
Class discussion questions:  
1. What worked?  
2. What didn't work?  
3. How can you change your design to make it better?

**Procedural Activities**

1. Introduce the topic "Today we are going to be reviewing our measurement skills by building a prototype of a dog sled" Start by brainstorming with the students what they think the "Ideal Sled" would look like for a musher on the Iditarod. Sample ideas: a place for the mushers to stand or sit, a place for the dogs to be connected to the sled, lightweight, a place to store your supplies, size, etc....
2. Show the students the video clip of Cody Strathe explaining parts of the sled. Depending on your grade level there are two videos, one is about 2 and half minutes and one about 9, both cover the parts of a sled and their function; however, the 9-minute video gives more detail. Also, share the picture slide show of sleds along the trail.

(Photo credits: Terrie Hanke) Talk about what the student notice about the sleds as you look through the pictures and video. Add these ideas to the class brainstorm. Discuss essential vocabulary as you finish the brainstorm.

Key vocabulary

Lightweight (grams are the measurement we will be using)

Inches

Durability

Strength

Inclined plane

3. Today the students are going to be working in partnerships to build the “Ideal Sled” based on a set of measurements given on their planning sheet. We will be focusing on inches and grams as units of measurements. Pass out the planning sheet and review the directions and materials available.

As seen on the video of Cody Strathe, the sled must be lightweight, and durable. For our purposes, the sled should be 5 inches long, 2 inches wide, and no more than 3 inches tall. Each sled will have a small Lego man (musher) weighing 3 grams (The 3 grams will be subtracted from the total weight). The sled must be able to slide down a small inclined plane (you can determine the length; I use a 2-foot-long piece of pegboard) without breaking. The materials include:

Straws, popsicle sticks, toothpicks, yarn, tape/glue, and pipe cleaners.

4. During the 30 minutes of building time, the students will plan, build, weigh their sleds, and test them on the inclined plane. Students should adjust as needed through the building process.

After the building, have each partnership share their sleds. The share should include evidence the sled is the correct size, the weight, and it will be run down the inclined plane to prove strength and durability. Students should also share what materials they used to build their sled and why they choose the materials. (Ex: popsicle sticks are the correct length, straws are lightweight, pipe cleaners bend for the handles and brush bow, etc..)

#### **Materials Students Need:**

Students will need:

1. Planning sheet
2. Popsicle sticks, toothpicks, straws, tape/glue, pipe cleaners
3. Kitchen scale
4. Reflection sheet

**Technology Utilized to Enhance Learning:**

1. <https://www.youtube.com/watch?v=vNA7FwG0qCU>
2. <https://www.youtube.com/watch?v=7wmNxRh8RGs>

**Other Information:****Modifications for Special Learners/ Enrichment Opportunities:**

## Modifications:

1. Pre-teach vocabulary
2. Pairing students
3. Scaffolding the building process

## Enrichment:

1. Student can continue their exploration of the "Ideal Sled" by studying forces and interactions. How does the placement of weight affect the speed?
2. Using a variety of inclined planes, how does the degree at which the inclined plane is placed affect the forward movement of the sled?
3. How does the length of the inclined plane affect the sled?
4. Use the inclined plane in the uphill manner. How much weight does it take to move your sled up the inclined plane?