Lesson Plan Title: Mush Madness STEM Project

Developed by: Jim Deprez & Sherri Bauserman

Discipline / Subject: Science/STEM

Topic: Dog sled construction and experimentation

Grade Level: 2-5

Resources / References / Materials Teacher Needs:

- Race track and sled bases – mine are made of wood which works very well, but other materials could be used instead
- Materials for students to build their sleds
- "March Madness" style bracket for recording team advancement
- Student self-assessment paper
- Group project packet

Lesson Summary:

- Students will be given a STEM challenge based on what they have learned about the Iditarod race
- They are placed into groups and given the overall objective of the lesson: to use what they have learned about the scientific method, friction and weight distribution to design, build (redesign & rebuild) then race a sled that will carry required items the greatest distance in a bracket style tournament
- The list of options for required items (same as the Iditarod race itself) is reviewed as well as expectations for group work, participation, and goal
- Use this video of Dallas Seavey discussing his gear and what the items look like: https://www.youtube.com/watch?v=t9BOZI-ihmo
    - Use Iditarod website for list of required gear
    - Their sleds are required to carry a returned dog, and 3 required items
- Students are then given time to research a design model they would like to build
- They are required to draw a blueprint of their sled, labeling the supplies they intend to use and developing an inventory of what they need
- Students are provided examples of real blueprints with labels to us as an example
- After they determine a team name and sign the agreement form (to work well together), their drawings are reviewed for accuracy by the teacher
- Then they are able to construct their sled based on their blueprints
- Once construction is complete, they are able to take a practice run to test the success of their design

- If they need to fix something, they are provided time to make the fixes and retest
- If they like their product, they are still prompted to make improvements

- Once the time is up for practice, the sleds are kept until race day where they compete in a bracket-style tournament to see which sled can go the farthest
- Upon completion of the race, students complete a self-assessment of their group

Standard's Addressed: (Local, State, or National)

1) Ohio State Science Standards
   a) Physical Science (PS) - Changes in Motion - This topic focuses on observing the relationship between forces and motion.
      i) 2.PS.1: Forces change the motion of an object. Motion can increase, change direction or stop depending on the force applied. The change in motion of an object is related to the size of the force. Some forces act without touching, such as using a magnet to move an object or objects falling to the ground.
   b) Physical Science (PS) - Light, Sound and Motion - This topic focuses on the forces that affect motion. This includes the relationship between the change in speed of an object, the amount of force applied and the mass of the object. Light and sound are explored as forms of energy that move in predictable ways, depending on the matter through which they move.
      i) 5.PS.1: The amount of change in movement of an object is based on the mass of the object and the amount of force exerted. Movement can be measured by speed. The speed of an object is calculated by determining the distance (d) traveled in a period of time (t). Any change in speed or direction of an object requires a force and is affected by the mass of the object and the amount of force applied.

*2) Common Core science standard - **3-PS2-1 Motion and Stability: Forces and Interactions***

Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.

Learning objectives:

- Students will use what they have learned about the scientific method, friction and weight distribution (mass) to design, build (redesign & rebuild) then race a sled that will carry numerous required items, the greatest distance, in a bracket style tournament

Assessment:

- Observation - how well the groups adapt/improve their sleds after each run
- Activity "exit slip" self-assessment sheet
- Tournament placing - How far does each team make it in the bracket

Procedural Activities

- Student groups were made ahead of time by teachers
  - An option here is to make teams with 1 student from each homeroom
- Supplies need to be purchased ahead of time and distributed equally to all teachers
- Students must know that in order to receive any supply from the supply area, it has to be included in their blueprint of their sled drawing

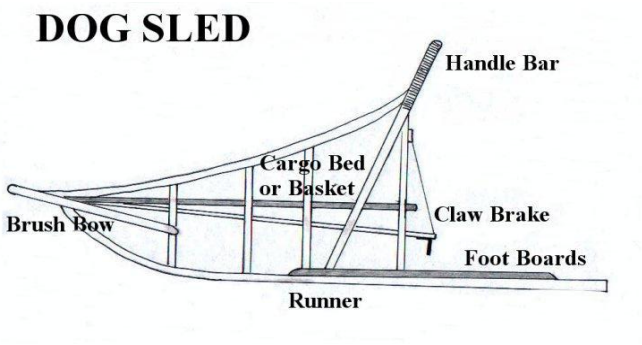
Materials Students Need: ● Access to internet on a device or computer ● “Mush Madness” information packet (1/group) ● Plastic dogs ● Sled bases ● Any materials needed/selected to construct/design their sleds (ex. Glue, popsicle sticks, cardboard, pipe cleaners, sand paper, markers, sharpies, staplers, tape, paperclips, etc.)
Technology Utilized to Enhance Learning: - Students may use the internet to research tips on reducing friction, increasing distance and speed - They may also look up designs of any of the required items for their sled
Other Information ● Teachers create teams ahead of time into mixed ability groups - if doing this activity with another teacher, or grade level team, mix students from all classes ● Parent volunteers might be needed as an option to help students retrieve supplies from the supply area ● Medals for the winning teams may want to be purchased ahead of time as a fun option
Modifications for special learners/ Enrichment Opportunities ● Differentiation for learners is based on number of items needed in each sled o For higher level learners, more items might be required o For lower level students, fewer items might be needed ● These groups could then also be placed in the same section of the bracket to promote a more level playing field

Notes:

- The racing portion of this needs to take place in an open area with a tiled/smooth floor where each group is able to see the race as it happens

Notes: <u>The next 5 pages are the "Group Project Packet" for the activity (copy & use):</u>

Mush Madness Design Challenge



During the Great Serum Race, dog sled teams had to travel great distances quickly to deliver a life saving medicine safely to Nome. Over the next week, you and your design team will create a dog sled that will deliver the serum (life saving medicine) quickly and safely.
Your goal will be to design and build a sled that can cary food, supplies and serum safely, quickly and travel the longest distance without stopping.

- Team members are:

_____
_____
_____
_____
_____

- Our team name is:

_____

We promise to participate, cooperate, and try our hardest to design and build a sled that will hold all supplies and go a great distance.

Each team member must agree and needs to sign on the lines below.

_____
_____
_____
_____

Below is a list of supplies that will be available for you to use to complete your team sled for the design challenge.

- One wooden sled per team
- Glue
- Straws
- Popsicle sticks
- Cardboard
- Markers
- Construction paper
- Sandpaper
- Pipe cleaners
- Yarn/string
- Rubber bands
- Tape
- Bubble wrap
- Staples
- Paper clips

After your team has finished building a sled, you must pick up supplies that your sled will be carrying.

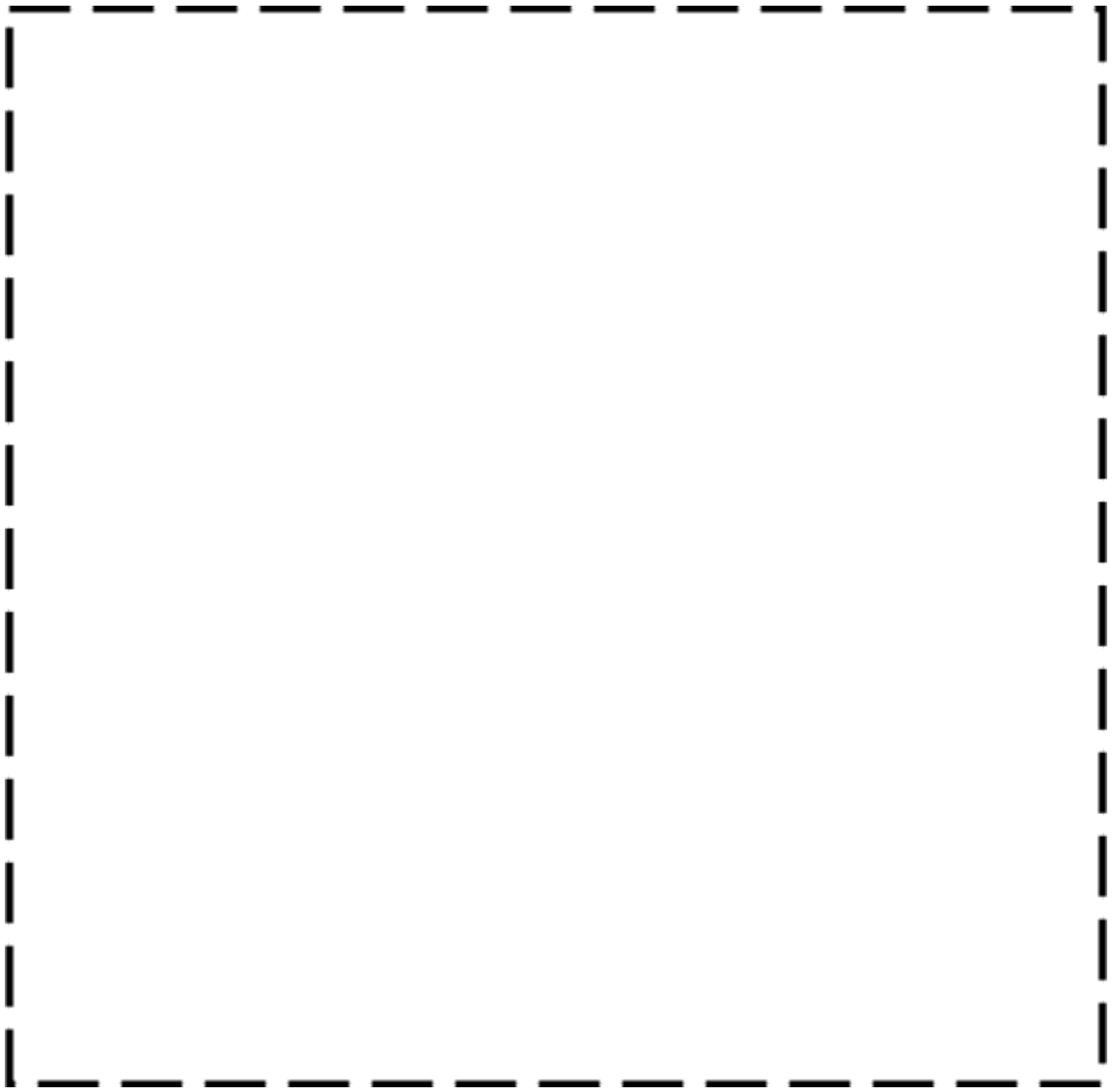
- Mandatory gear (3)
- A returned dog

Please see a teacher for supplies.

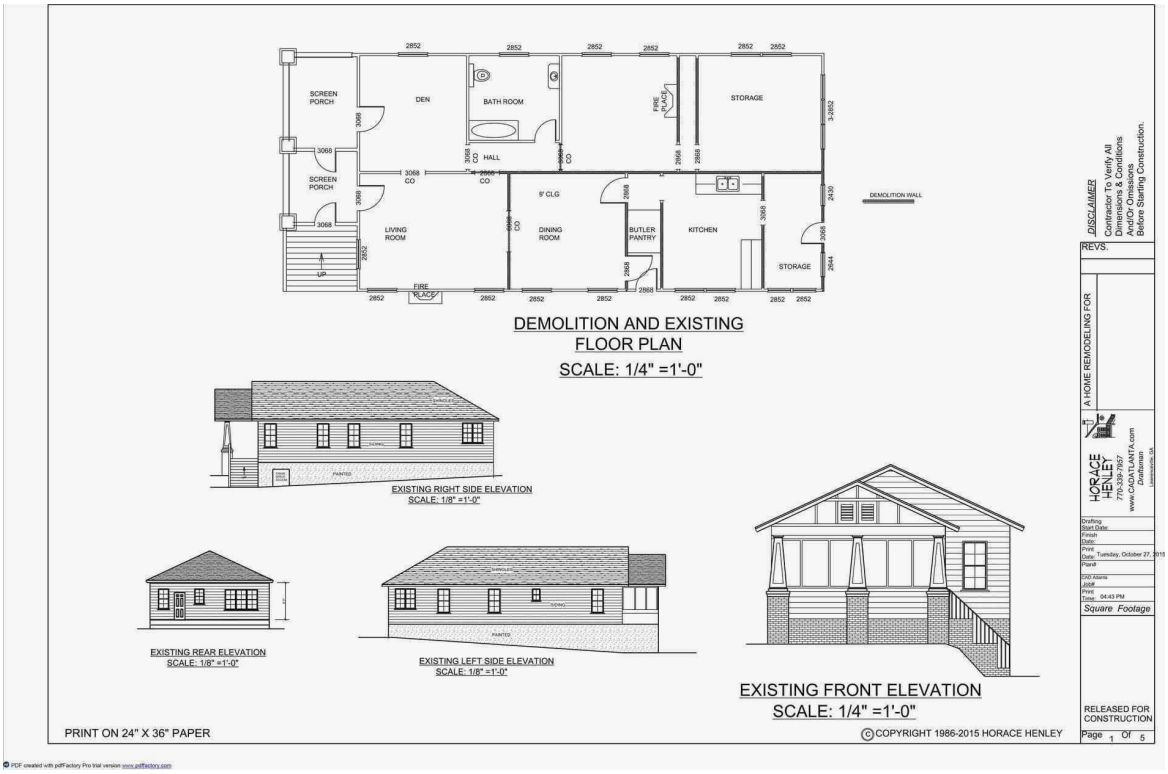
Remember your GOALS

1. **All supplies travel safely**
2. **Travel the greatest distance**

Keeping your goals in mind, draw a sketch of what your sled may look like.
Team name _____



Blueprints (references) to show different views:



Blueprints to stress the importance of labels: