Toys to Nome: Design Challenge

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Discipline / Subject: Science, STEAM/STEM

Topic: Engineering Challenges

Grade Level: 3-5, others with modifications

Resources / References / Materials Teacher Needs:

- Mentor Text Article: http://www.ifallsjournal.com/news/local/mushing-all-the-way/article_81ca9bf1-6982-52c6-b867-f911cf323c9c.html
- Ander Tier Racing: http://ryansdogs.com/
- Other Related Text Articles:
  Beads of Courage on the Trail: https://itcteacheronthetrail.com/tag/beads-of-courage/
  Serum on The Trail: https://itcteacheronthetrail.com/2014/02/24/tales-from-the-trail-special-delivery/
  Rule Change That Prohibits Carrying Dogs Behind the Sled: https://www.adn.com/outdoors-adventure/iditarod/2016/11/24/iditarod-bans-mushers-from-carrying-sled-dogs-in-trailers-and-some-arent-happy/?utm_source=fark&utm_medium=website&utm_content=link&ICID=ref_fark Int
- Design Challenge - included

Lesson Summary:
Students will read an article about a special project being undertaken by Iditarod musher Ryan Anderson, who plans to deliver wooden toys to Nome during his rookie Iditarod run. Using the information conveyed in the article, students will create and solve a design challenge focused on offering suggestions on how Ryan could take the toys to Nome on his sled.

Standards Addressed: (Local, State, or National)
CCSS.ELA-Literacy.RL.3.1
Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
CCSS.ELA-Literacy.RL.4.1
Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.
CCSS.ELA-Literacy.RL.5.1
Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text.
NGSS Physical Science and Engineering Design:
3-5-ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
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.
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:	**Assessment:**
o TLW outline a design challenge based on a mentor text article o TLW identify the criteria and conditions for the challenge o TLW design, create, test, and revise a prototype o TLW report their findings	o Students will be assessed on the final report made to advise Ryan on their solution to his design challenge.

Procedural Activities:

1. Introduce to the students the idea that mushers sometimes carry things down the trail that are not a part of their required items. Mushers frequently carry beads as a part of the Beads for Courage project as way to support kids with childhood diseases. In 2014 mushers carried vaccines as a way to raise awareness about the importance of vaccinating kids. Monica Zappa carries information to pass out to schools and communities about the importance of protecting the environment. Sometimes they even carry special mementoes or keepsakes for themselves or special friends.
2. Introduce the idea that rookie musher Ryan Anderson from Minnesota is carrying something very special this year.
3. Share with the students the article entitled "Mushing All the Way," from the *International Falls Journal*.
4. Have the students brainstorm a plus and minus chart about this project.
5. Distribute the Design Challenge and review with the students.
6. Something to keep in mind:
    - The Iditarod has modified the rules this year to reflect that dogs cannot be carried behind the sled, but does that mean nothing can be carried back there?
7. Have the students complete the challenge by identifying the challenge, criteria and considerations of the challenge in a class discussion. Essentially, they need to get the toys from Anchorage to Nome on Ryan's sled.
8. Individually, or in groups, students should identify materials and tools that they would need to design a solution for Ryan.
9. Using classroom materials or perhaps with a visit to the Maker Space, students should build a prototype, test it, and revise it. For the purposes of brevity, prototype testing can consist of pulling or pushing the prototype a short distance and see if it holds up
10. To wrap up the project, students should write a paragraph to explain their findings and offer their advice to Ryan.
11. The teacher may want to share the following information with the students after the challenge is complete: Ryan reports after much thought, it's going to be just too heavy to carry all of the toys on his sled. He will carry one to two "ceremonially" and have the rest shipped to Nome in a different method.

Materials Students Need:

- Copies of the article outlying Ryan's plan
- Design Challenge worksheet
- Materials provided by teacher for creating and testing solutions

Technology Utilized to Enhance Learning:

- If available, using Mindstorm Lego Robots to pull or push the prototypes is a fun way to feel like there is a true test

Other Information:

Modifications for Special Learners/ Enrichment Opportunities:

- Teachers of younger students may what to pair with big buddies in older grades to complete the challenge
- Older students, or classes with more time, may want to involve some type of weight bearing test into the prototype stage

Additional Information