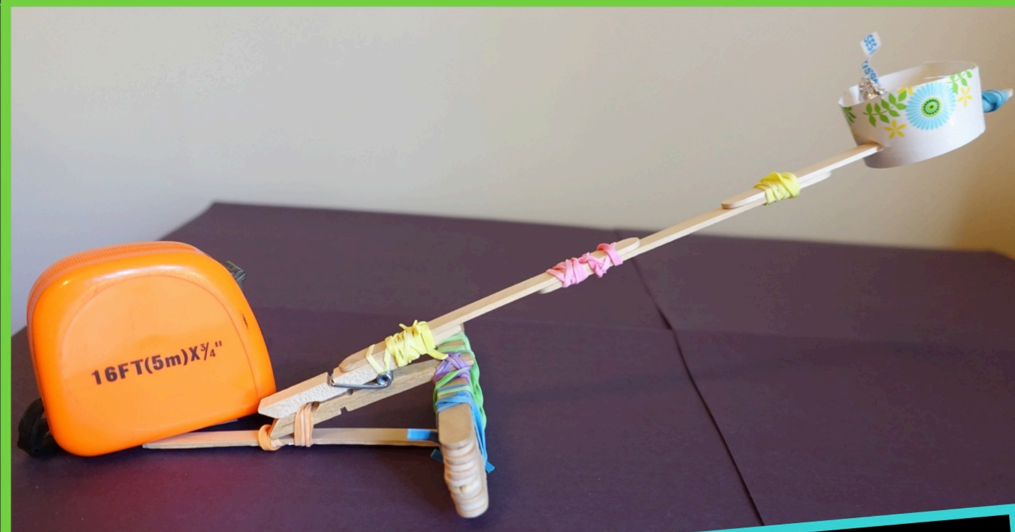
HALLOWEEN STEM CHALLENGE

2nd – 8th
NGSS Aligned

Treat Toss



DIGITAL/PAPERLESS VERSION

FOR USE WITH GOOGLE SLIDES

Terms of Use

Thank you for your purchase! My terms of use are simple: please respect the time and effort that goes into creating resources! What does that mean?

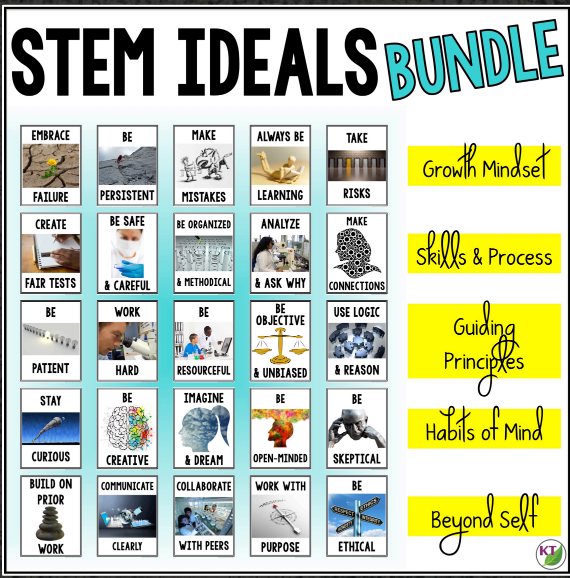
A single purchase entitles one teacher to use the product in his/her classroom. If you intend to share with other educators, please purchase additional licenses at a discount (available under "My Purchases" at Teachers Pay Teachers). Posting my resources online is prohibited; it can be easily accessed by others using Google search. If you have any questions regarding what you can or can't do, please just ask! I'm friendly! ☺

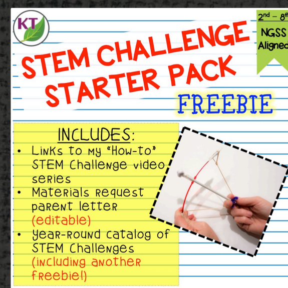
I look forward to your feedback. If you have questions or suggestions, please do not hesitate to contact me through any or all of the links below:

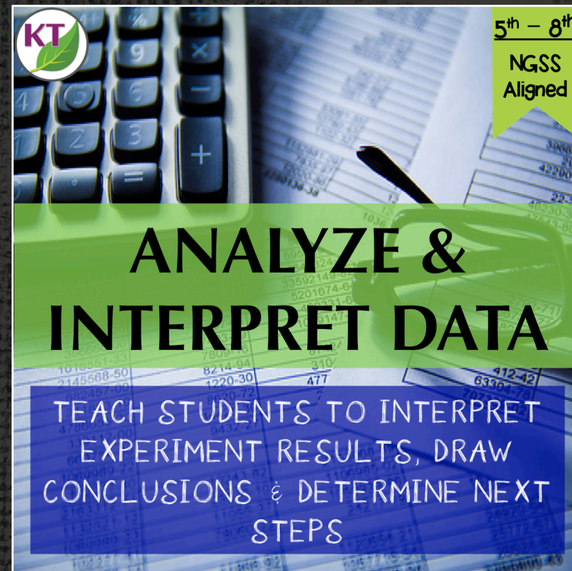
Thanks & happy teaching!

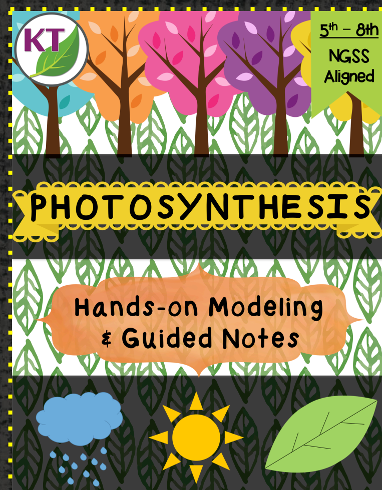
~ Kerry

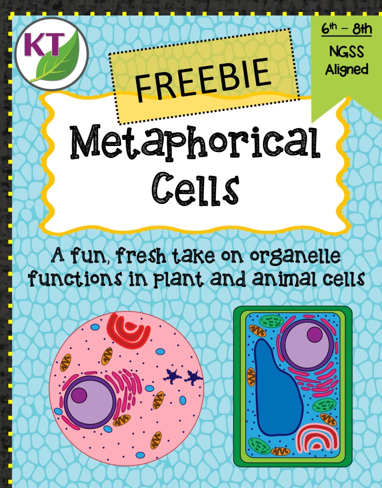
You Might Also Like:

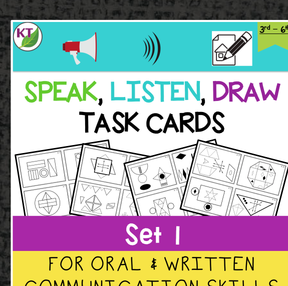












Halloween STEM Challenge:

Treat Toss

TABLE OF CONTENTS

Click on any entry below to navigate through the document.

CLICK HERE TO GO STRAIGHT TO THE HALLOWEEN MASTER FILE IN GOOGLE SLIDES.

CLICK HERE TO GO STRAIGHT TO THE ANYTIME MASTER FILE IN GOOGLE SLIDES.

GETTING STARTED

1. Your students will need their own Google accounts to access the file in Google slides. If you need help setting up Google Classroom, search for how-to videos on YouTube. I found this one helpful, but there are plenty to choose from!

2. Review the Teacher Tips for this challenge in the following pages.

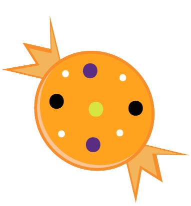
3. Create a copy of the Halloween master Google Slides file and/or a copy of the anytime master Google Slides file. Rename this file "Teacher" or "Master" copy. There is a video on slide 1 that provides a quick explanation of the file contents/ layout.

4. Create a second copy of the file for your students. This way, you always have a master copy with all the slides available. In the student file, delete any pages you don't wish to have students complete, or consider breaking the large file into smaller chunks (Day 1, Day 2, etc.) prior to sharing the file with your class.

Treat Toss Materials

Select from the list. Most materials can be purchased at you local dollar store or Target/ Wal-Mart, etc. Make sure students have an equal amount of each material provided.

- **For each student or group:**
  - Wrapped candy
    - Small candies like Hershey's Kisses are easier to launch and easy to locate post-launch. You may want to provide more than one option.
  - Candy target/container (A printable target is included if you select the target-accuracy goal, but a Halloween-themed candy bowl like the purple one pictured is also fun!)
  - Clothespins (1-2)
  - Rubber bands (5-20 per student/group)
  - Popsicle sticks/tongue depressors/craft sticks/pencils/wooden rulers/small scrap wood pieces (10 – 20)
  - Something (or multiple things) to act as a fulcrum (markers, batteries, spice bottles, etc.)
  - Tape (constrain to 24 in. or less)
  - Tape measure
  - Design Analysis slides (included)
  - Optional:
    - Small cups
    - Cardboard
    - Foil
    - Pipe cleaners
    - String



Video Walk-Through

The image below is linked to a video walk-through of the challenge. For more Halloween STEM challenges, check out the Halloween video playlist.

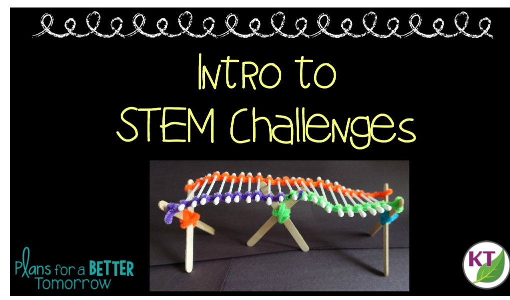
Note to Teachers

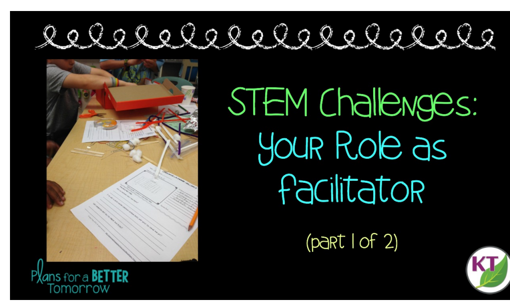
The beauty of STEM Challenges is that they are open-ended and require critical thinking and problem-solving. This is why we don't give students directions to build a specific design. In keeping with the engineering design process, a criteria & constraints list is provided to give students a framework of the design problem and goal. How they choose to address the problem and goal is entirely up to them.

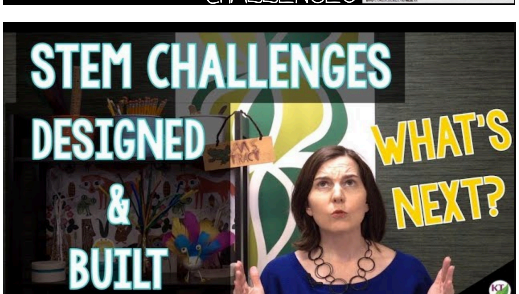
You can tailor the challenge to your students' needs using the editable list provided, but don't make it too easy! Be bold and embrace the *challenge* – it's in the title after all! Understand that the potential to fail is an inherent risk, and in fact, when you're prepared for that possibility, a "failure" can turn into a far richer lesson than a success. Check out the first video linked below for more on what you can do to prepare for – and even look forward to – a potential "fail"!

Videos & PD

Video is such an effective way to share tips and examples for running fantastic STEM Challenges! I've linked a few below to help get you started and cover some troubleshooting topics as well.







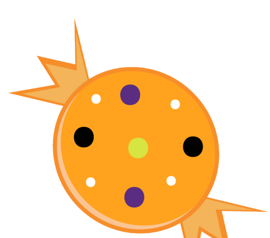
You can also find my full video library & newest PD on:

If you have any questions, please feel free to reach out via email or social media!

Treat Toss Teacher Tips

- **Premise**
  - Students will build a low-energy machine to toss treats. The teacher chooses from one of two challenge goals: launch candy the maximum distance and/or target-accuracy. Because there are two options for the challenge goal, there are two slightly different sets of slides provided.
  - Plan to give students 30-40 min. to design, 10-15 min. to measure and share results, and 10-15 to complete data analysis slides. Additional time will be needed if you are assigning extension activities.

- **Set up**
  - If you are new to STEM Challenges, you might find it helpful to review one or more of the videos from the previous page.
  - Note: A non-Halloween version of the student slides is available.
  - Decide whether you will have students test for maximum launch distance or maximum launch distance & accuracy. Two sets of handouts are available (separated by orange page dividers) based on the challenge goal you select.
  - Students may take inspiration from slingshots, catapults/trebuchets, or other forms of launchers. You may or may not want to review these or other simple machines prior to the challenge. I usually prefer to wait until after one iteration to have students do any form of research. I find this results in greater creativity and innovation rather than replication, but there are benefits to either approach.
  - Younger students might need more guidance/support. When I did this with first graders, I introduced the simple lever design (similar to the cover photo with the sharpie and sticks, but without the candy basket). After showing them the simple concept, they made their own and modified the size and placement of the fulcrum. They also added/removed/changed anything else they pleased. Rest assured, this approach still results in varied designs that perform quite differently from one another.
  - You will want to review safety expectations and set up designated testing areas prior to the beginning of this challenge.
  - Review the Criteria & Constraints List provided, and decide if you will make any modifications ahead of time.

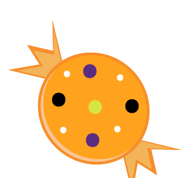


Treat Toss Teacher Tips (pg. 2 of 4)

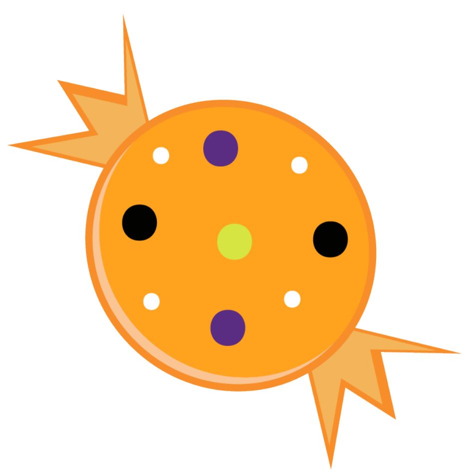
- **Criteria/Constraints**
  - The Criteria & Constraints List slides provided are editable.
  - Increase or decrease the time as needed.
  - Ideas to increase the difficulty of the challenge:
    - Add criterion for the treat toss device to work with various types/sizes of candy
    - Add criterion for the treat toss to hit multiple targets at varying distances and/or angles
    - Add criterion to make the device as light-weight as possible (requires scale for measurement)
    - Add constraint for maximum height, length, or width dimensions

- **Measuring Results**
  - Students verify they have met all listed criteria and constraints.
  - You can have students test for launch distance or launch distance & accuracy.
  - There are two versions and two sets of design analysis slides:
    - Set A is for if you are measuring launch distance only
    - Set B is for if you are measuring both launch distance & accuracy.

- **Measuring Results for Launch Distance**
  - You will need a large, open space to test designs. Mark a spot on the ground to serve as the common launch line.
  - Have students test and record results (either as they finish or whole-class) using the "Gather Data: Launch Distance" handout. You might want to have students duplicate the data gathering slides and use one in analysis as they work through their initial designs and one for the official treat toss test results. It depends on how much time you have and how much your students would benefit from practicing measuring.
  - Direct students how to find their official results (e.g. take the best launch of seven, average of the best three launches, or average of all seven launches). Students record the launch distance on the first design analysis slide.



- **Measuring Results for Accuracy**
  - You will need a large, open space to test designs. Mark a spot on the ground to serve as the common launch line. Students may set up any distance behind that line. There are several options from there:
  - Set up one or multiple targets. You can print and use the targets provided, or use any object you like.
  - Have students test and record results (either as they finish or whole-class) using the "Gather Data: Accuracy" slide. You might want to have students duplicate the data gathering slides and use one in analysis as they work through their initial designs and one for the official treat toss test results.
  - For the official results, have students record their treat toss device accuracy out of a certain number of launches, e.g. 3/7 landed on target.
    - Note: If accuracy was 0/7, you can choose to have them report their smallest distance off-target in addition to, or instead of, the #/# results.
  - (Optional) Provide multiple candy types. Choose whether to have students test several candy types, or allow students to select the candy type they think will work best with their device.
    - Note: You may want to duplicate data gathreing slides if working with multiple candy types.
  - If you are treating the challenge as a competition, consider judging on smallest total distance off target out of a certain number of launches rather than just the total number of target hits.



TREAT TOSS TEACHER TIPS (PG. 4 OF 4)

- **Post-Design Options**
  - Design analysis (slides included)
  - Discussion questions (slides included)
  - Re-design and re-test (consider incorporating new, student-suggested materials)
  - Extension activities
    - Read/research about simple machines and catapults and apply learning to future iteration. A few good websites & videos to start with are linked below.
      - Catapults websites:
        - » Catapult Physics
        - » Physics of Catapults: History
        - » All Things Medieval: Catapults
      - Levers/simple machines websites:
        - » Interactive Simple Machines
        - » Simple Machines: Facts
      - Videos:
        - » (2^{nd} – 4^{th}) Super Simple Machines: Lever (~3 min.)
        - » (5^{th} – 8^{th}) Simple Machines: The Lever (~ 6min.)
        - » (4^{th} – 8^{th}) Punkin Chunkin (~3 min.)
        - » (4^{th} – 8^{th}) The Physics of "Punkin Chunkin" (~4 min.)
        - » (4^{th} – 8^{th}) Mythbusters: How to Build a Trebuchet (~3 min.)
    - Write a short story about Mr. Jones and his treat toss device.
    - Create and solve math problems related to designs (handout included).
      - Examples:
        - » Our Twix launch went 4 in. The Hershey's Kiss launched 6 in. b eyond the Twix. How far did the Hershey's Kiss launch?
        - » The average of our Hershey Kiss launches was 18 in. The Tw ix bars launched 65% less than the Kisses. What was the average launch of the Twix candies?
    - Create process flow map to make designs. Have students trade and try to bu ild the other's design based on the process flow map (slide included).

Note: One slide per video/website is included in the student slides with its link, so you can easily assign to students.

Universal STEM Challenge Notes & How to Use the Design Analysis Slides

STEM Challenge Cycle (overview video of the STEM Challenge steps)

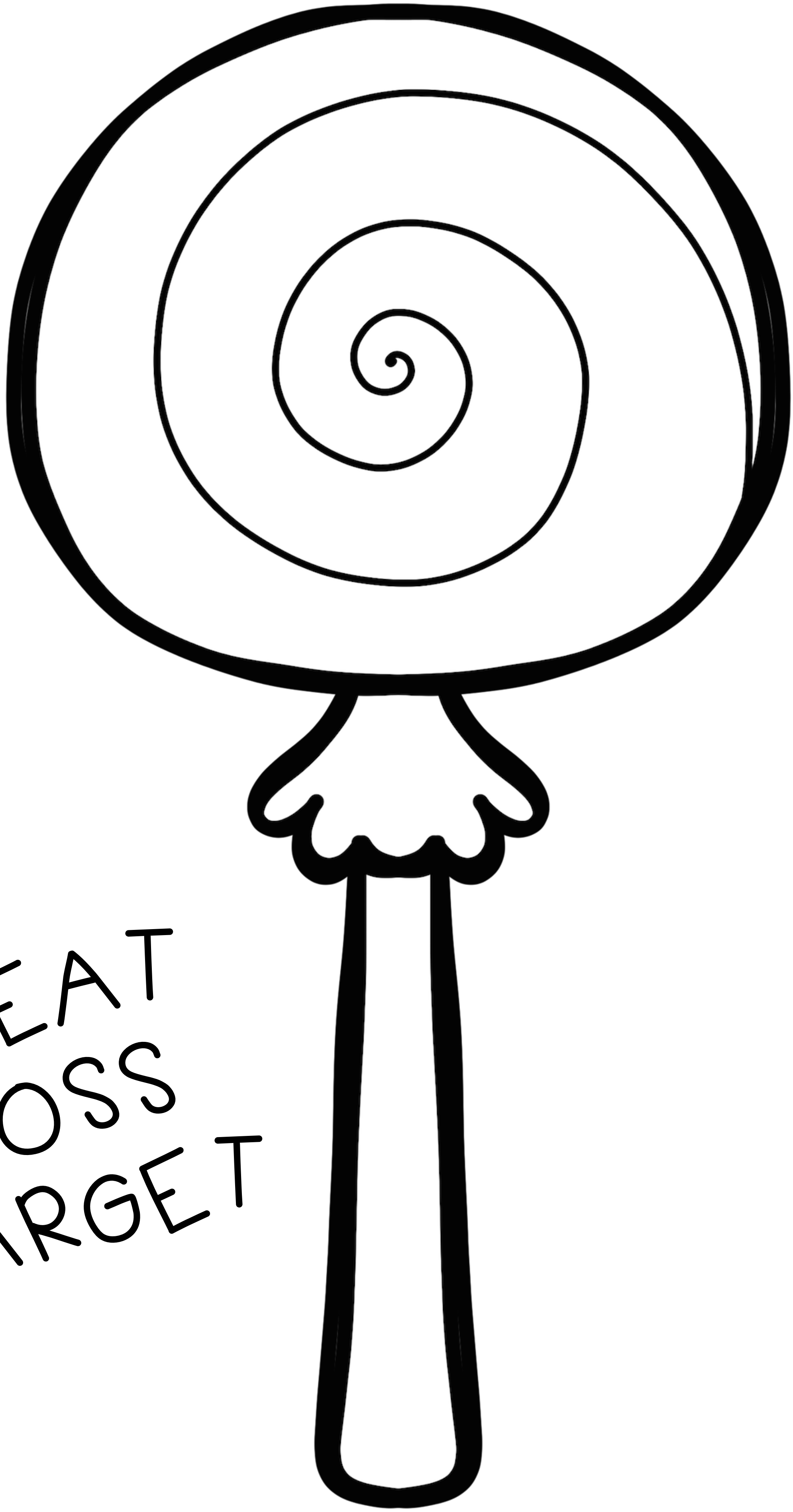
Planning

- Try giving students experience with different planning styles on different challenges, so they can begin to understand their own preferences. Several approaches are listed below:
  - Students begin to manipulate materials immediately
  - Students sketch ideas prior to building
  - Students discuss ideas with teammates prior to building
  - Have students jot notes for their plan prior to building
  - Students have 3 – 5 minutes of silence to think about what they will do prior to building (follow with another approach, or go straight into building)
  - Walk & talk: Introduce the challenge, then have students go on a short walk to discuss ideas with teammates prior to building
  - Free choice or mix/combine approaches

Post-Design – Design Analysis Slides

- Multiple iterations are always recommended to allow students an opportunity to apply learning, try new ideas, and to be in keeping with the engineering process. While you might not be able to do so with every challenge, try to do it whenever you can. Never conducting a second or third iteration is akin to never asking students to tell you how they *could* improve their writing, but never actually having them revise it; the execution of ideas is crucial in developing skills!
  - For each new iteration, make a new copy of the design analysis slides.
  - The following analysis question can be used in different ways: "WHICH WAS YOUR MORE/MOST EFFECTIVE DESIGN? WHAT DO YOU THINK IT WAS ABOUT THE DESIGN THAT MADE IT SUPERIOR TO THE OTHER(S)?":
    - **Option 1:** Have students consider the evolution of their design within the current iteration of the challenge. Frequently, students change aspects of the design right up until time is called. Their final version is not necessarily the best version. If they insist they stuck with one idea throughout and have nothing to compare, select option 2 or 3 below.
    - **Option 2:** Students can select what they think was the most effective design in the class, not necessarily their own.
    - **Option 3:** If you will conduct multiple iterations, students can wait to answer this question until after the final iteration, and answer it only once on the final set of handouts (or use options 1 or 2 to answer the question prior to the last handout set).

TREAT TOSS TARGET



TREAT
TOSS
TARGET

Next Generation Science Standards (NGSS)

A Note RE: NGSS Science & Engineering Practices

This STEM Challenge has the potential to hit upon all NGSS ETS standards depending on the depth and number of iterations you choose to implement in your classroom. Take a moment to review the Performance Expectations as well as the Disciplinary Core Ideas (DCIs) included here prior to inform your decisions and approach.

K-2 NGSS
Science & Engineering Practices: Performance Expectations

K-2 Science & Engineering Practices

Students who demonstrate understanding can:

- **K-2-ETS1-1.Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.**

- **K-2-ETS1-2.Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.**

- **K-2-ETS1-3.Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.**

K-2 NGSS Disciplinary Core Ideas (DCIs)

- **ETS 1.A: Defining and Delimiting Engineering Problems**
  - A situation that people want to change can be approached as a problem to be solved through engineering. (K-2-ETS1-1).
  - Asking questions, making observations, and gathering information are helpful in thinking about problems. (K-2-ETS1-1).
  - Before beginning to design a solution, it is important to clearly understand the problem. (K-2-ETS1-1)
- **ETS 1.B: Developing Possible Solutions**
  - Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2).
- **ETS 1.C: Optimizing the Design Solution**
  - Because there is always more than one possible solution to a problem, it is useful to compare and test designs. (K-2-ETS1-3).

3-5 NGSS
Science & Engineering Practices: Performance Expectations

3-5 Science & Engineering Practices

Students who demonstrate understanding can:

- **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.**

3-5 NGSS Disciplinary Core Ideas (DCIs)

- **ETS 1.A: Defining and Delimiting Engineering Problems**
  - Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Difference proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. (3-5 ETS1-1).
- **ETS 1.B: Developing Possible Solutions**
  - Research on a problem should be carried out before before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. (3-5-ETS1-2).
  - At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5 ETS1-2).
  - Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. (3-5-ETS1-3).
- **ETS 1.C: Optimizing the Design Solution**
  - Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3).

Teacher-Author note: I philosophically disagree with DCI 3-5-ETS1-2. With an iterative design approach, one often produces more innovative designs by *not* researching first. Design first also motivates students to have a reason to research between iterations. It's nice to have the baseline of design results before and after research as well. This challenge reflects my approach.

Middle School NGSS
Science & Engineering Practices: Performance Expectations

MS Science & Engineering Practices

Students who demonstrate understanding can:

- **MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**

- **MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**

- **MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**

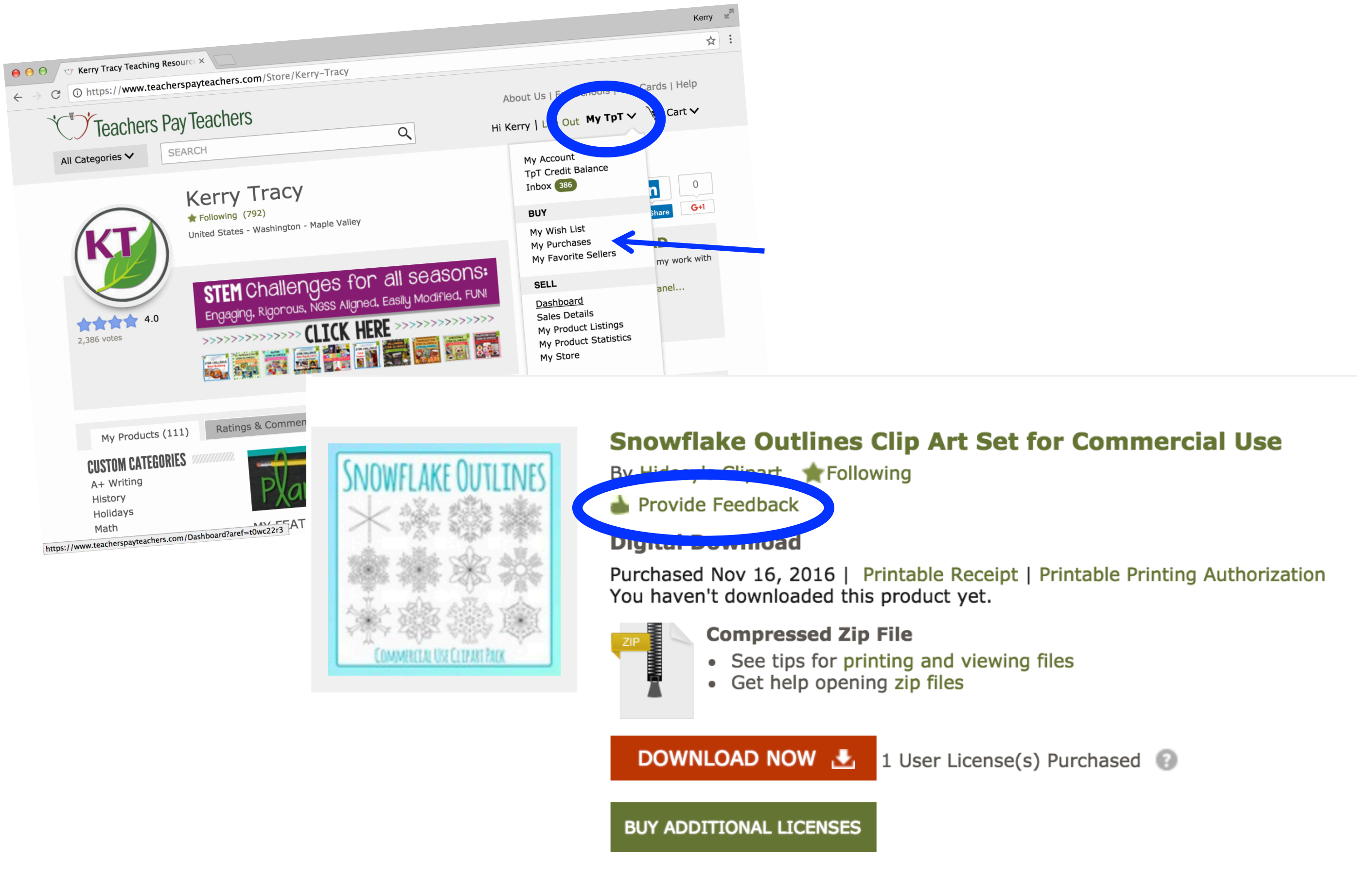
- **MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.**

Middle School NGSS Disciplinary Core Ideas (DCIs)

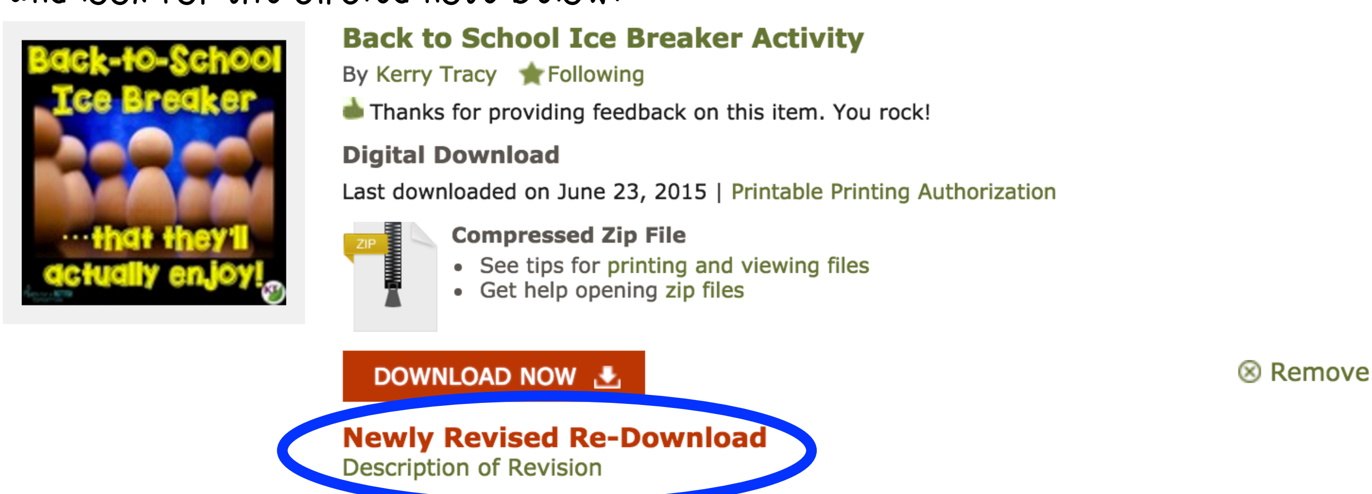
- **ETS 1.A: Defining and Delimiting Engineering Problems**
  - The more precisely a design task's criteria and constraints can be defined, the more likely is is that the designed solution will be successful. Specification of constraints includes consideration of specific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1).
- **ETS 1.B: Developing Possible Solutions**
  - A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4).
  - There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3).
  - Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3).
  - Models of all kinds are important for testing solutions. (MS-ETS1-4).
- **ETS 1.C: Optimizing the Design Solution**
  - Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process – that is, some of those characteristics may be incorporated in the new design (MS-ETS1-3).
  - The iterative process of testing the most promising solutions and modifying what is proposed on the basis of test results leads to greater refinement and ultimately to an optimal solution. (MS-ETS1-4).

Did You Know?

Also, you can earn credits by reviewing your purchases, and use those credits toward even more great TpT resources. So don't forget to leave feedback! You can also leave Questions & Suggestions via TpT's Q&A tab on any store page!



When you purchase a resource, you have access to future updates for free! Be sure to regularly check for updates! Under "My Purchases" scroll through and look for the circled note below!



THANKS!

THANKS AGAIN FOR YOUR PURCHASE!
CUSTOMER SERVICE IS IMPORTANT TO ME.
IF YOU HAVE QUESTIONS, REQUESTS, OR SUGGESTIONS, PLEASE REACH OUT:
KERRY@FEELGOODTEACHING.COM

CREDITS

Clip Art & Fonts Credits

EDUCLIPS

graphics from the pond

KB FONTS
Created by Khrys Bosland
KEEPINITKOOLINKINDERLAND.BLOGSPOT.COM

Credits

aJoy2Share:
http://www.teacherspayteachers.com/Store/Betty-Jones-6757

http://www.teacherspayteachers.com/Store/Math-In-The-Middle