Shelf for the Elf

STEM

LOW PREP
CHRISTMAS
STEM CHALLENGE

K-5TH GRADE

CREATED BY BROOKE BROWN

- ✓ SIMPLE SUPPLIES
- ✓ INTERACTIVE ANCHOR CHARTS
- ✓ VISUAL VOCABULARY
- ✓ QR CODE RESEARCH
- ✓ REFLECTION QUESTIONS

Shelf for the Elf

The elf needs a safe and high place to sit that cannot be reached by children.

Construct the tallest shelf possible that will hold the elf.

MATERIALS:

- Playdough (1-2 cans per group)
- Popsicle sticks (20 per group)
- Paper elves
- Rulers

Shelf for the Elf

REAL WORLD EXAMPLES	Where Shelves Are Found
 What is similar? What is different?	
Types of Shelves	How

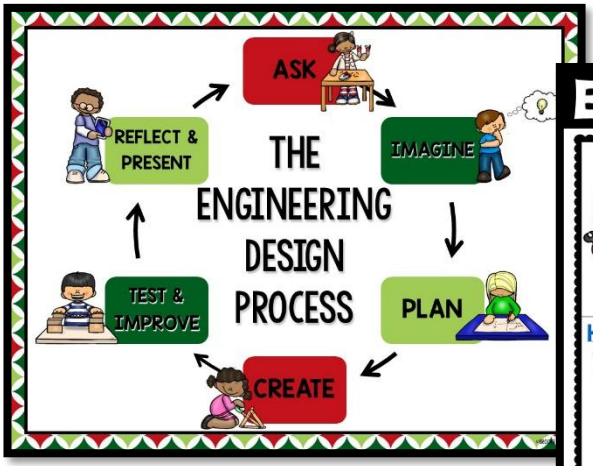
WORDS TO KNOW

horizontal — side to side direction, parallel to the ground

vertical — up and down direction, perpendicular to the ground

joint — a point at which parts of a structure are joined

support — to bear weight or hold up



EXPLORE SHELVES

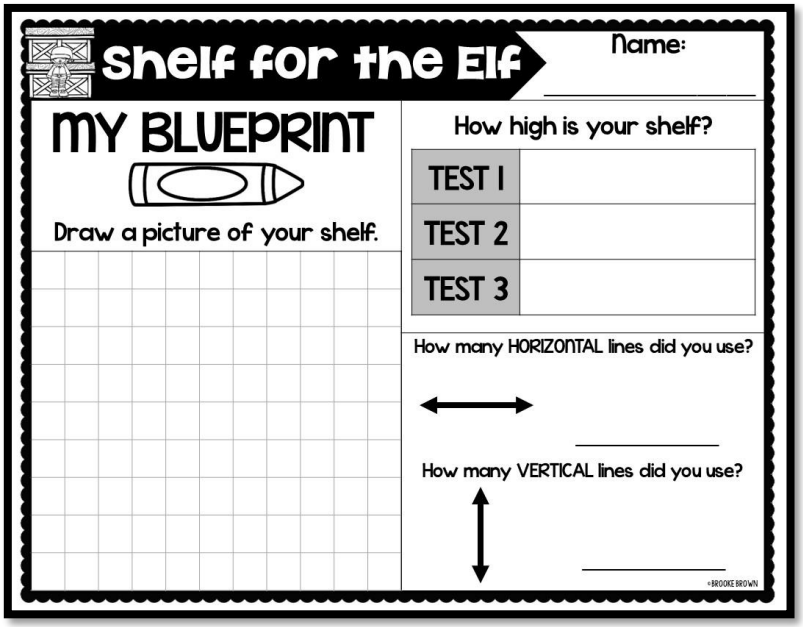
ENGINEERING	THINK LIKE AN ENGINEER
HOW SHELVES ARE MADE	FURNITURE MAKERS

LET'S REFLECT!

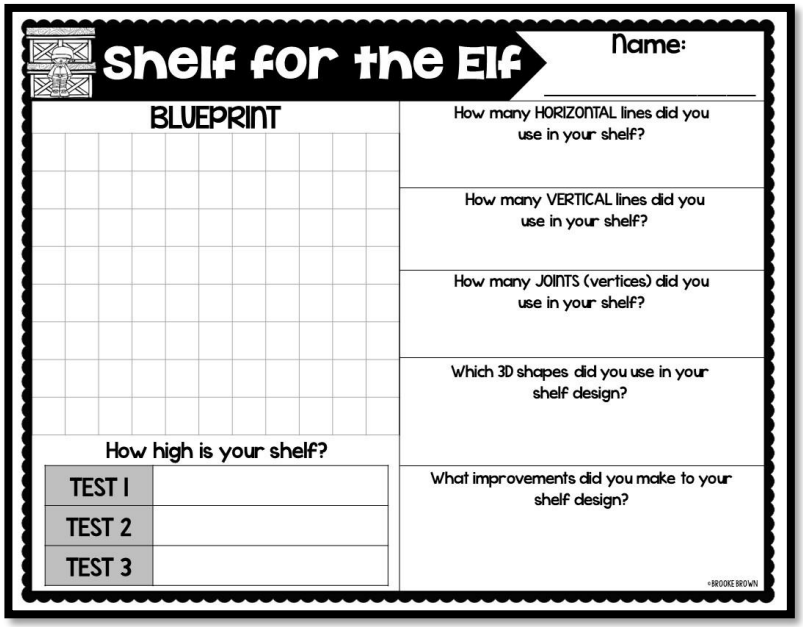
- was most difficult about this challenge?
- your shelf similar to and different from the s in our classroom?
- your shelf designed to make it as sturdy and ed as possible?
- horizontal and vertical lines did you use in your design?
- are some different styles of shelves and how ey useful?
- materials would you use to build real shelves?
- completed this challenge again, what would you ferently next time?

DIFFERENTIATED RECORDING SHEETS FOR K-5TH GRADE

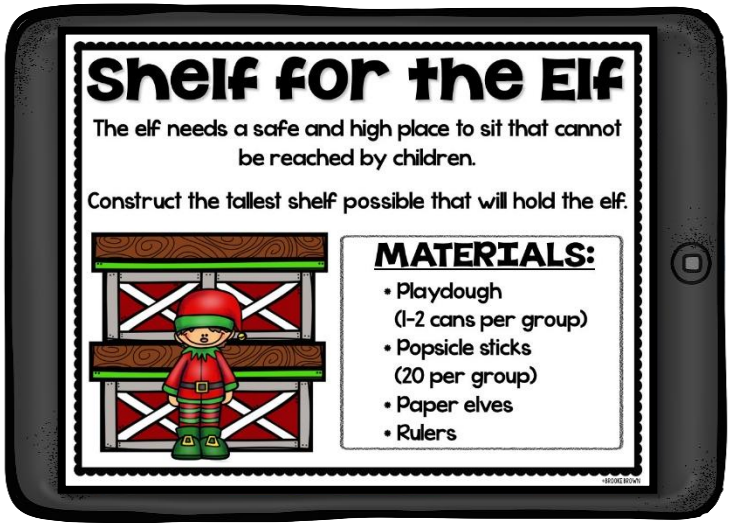
LOWER GRADES

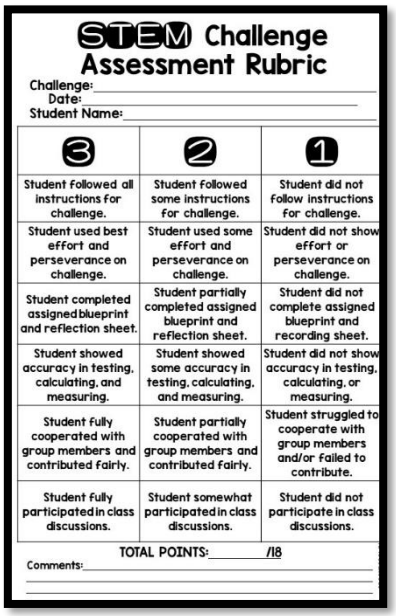


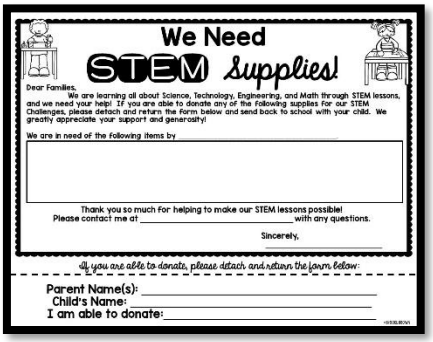
UPPER GRADES



DIGITAL GOOGLE SLIDES NOTEBOOK







SAY *Hello* TO STRESS-FREE STEM!

SUPPLIES CHECKLIST

STEM CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Shelf for the Elf	playdough	one 4 oz. or two 3 oz.	
	popsicle sticks	20	
	elf cutout	1	
	ruler	1	

STANDARDS ALIGNMENT

CHALLENGE	ENGINEERING	SCIENCE	MATH
Shelf for the Elf	K-2-ETS1 Engineering Design: K-2-ETS1-1, 3-5 ETS1-2, 3-5 ETS1-3 3-5-ETS1 Engineering Design: 3-5-ETS1-1, 3-5 ETS1-2, 3-5 ETS1-3	2.Structure and Properties of Matter •Action/Reaction forces, tension and compression forces, weight, balance, stability	MP1: Make sense of problems and persevere in solving them MP.2: Reason abstractly and quantitatively MP.4: Model with mathematics MP.5: Use appropriate tools strategically MP.6: Attend to precision MP.7: Look for and make use of structure

SUPPLIES CHECKLIST & STANDARDS ALIGNMENT

CHALLENGE OVERVIEW

MATERIALS

STEP BY STEP INSTRUCTIONS

STEM CHALLENGE: Shelf for the Elf

OVERVIEW: Students will engineer the highest shelf possible using limited materials. The popsicle sticks will serve as the shelf levels and playdough will serve as joints. The elf will fold in half to "sit" on the highest level. The shelf is best constructed in phases, with students measuring the height at each level. Students will likely build a variety of styles and shapes such as multileveled rectangular prisms, cubes, and even pyramids.

KEY SKILLS: Engineering shelves, Balance/Weight Distribution, Measurement, 3D Shapes

SUGGESTED READ ALOUDS: The Elf on the Shelf by Carol V. Aebersold, The Littlest Elf by Brandi Dougherty, Shmelf the Hanukkah Elf by Greg Wolfe

MATERIALS PER GROUP: Playdough cups (one 4 oz. or two 3 oz.), 20 popsicle sticks, one paper elf, one ruler

KEY SKILLS

SUGGESTED READ ALOUDS

LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about shelf designs. Ask them to brainstorm different styles and important parts of shelves as they observe them around the classroom.
2. Share and discuss the videos on "Explore Shelves."
3. Hold a class discussion, using the teacher chart and real world examples to guide student thinking. (You can project the chart on an interactive whiteboard or document camera.) Record their ideas on the teacher chart.
4. Introduce the STEM challenge and permitted materials.
5. Introduce and discuss key vocabulary cards related to the challenge.
6. Have students sketch blueprints of their designs on their recording sheets.
7. Distribute materials and allow students 30-45 minutes with partners or small groups to construct their shelves and measure the heights at each level.
8. Hold a whole class closing discussion and reflection, allowing students to share their shelf designs. Use the "Let's Reflect" poster to guide the discussion.

ALTERNATIVE WINTER CHALLENGE

Toy Shelf

The toy shop owner needs to build a new shelf.

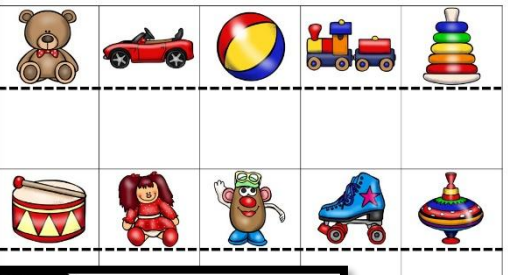
Construct the tallest shelf possible that will hold the toys.

MATERIALS:

- Playdough (1-2 cans per group)
- Popsicle sticks (20 per group)
- Paper toys
- Rulers

Toy Shelf Challenge

Cut on the solid lines and fold on dotted lines so that each toy sits up.



EXPLORE SHELVES

ENGINEERING

THINK LIKE AN ENGINEER

HOW SHELVES ARE MADE

FURNITURE MAKERS

Toy Shelf

REAL WORLD EXAMPLES	Where Shelves Are Found
 What is similar? What is different?	
Types of Shelves	How Shelves are Useful

LET'S REFLECT!

- What was most difficult about this challenge?
- How is your shelf similar to and different from the shelves in our classroom?
- How is your shelf designed to make it as sturdy and balanced as possible?
- What horizontal and ver
shelf design?
What are some differen
are they useful?
What materials would yo
If we completed this chal
do differently next time?

Toy Shelf

Name: _____

BLUEPRINT

How many HORIZONTAL lines did you use in your shelf?

How many VERTICAL lines did you use in your shelf?

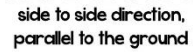
How many JOINTS (vertices) did you use in your shelf?

Which 3D shapes did you use in your shelf design?

What improvements did you make to your shelf design?

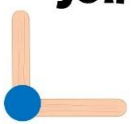
WORDS TO KNOW

horizontal — side to side direction, parallel to the ground



vertical — up and down direction, perpendicular to the ground

joint — a point at which parts of a structure are joined



support — to bear weight or hold up

Toy Shelf

Name: _____

MY BLUEPRINT

Draw a picture of your shelf.

How high is your shelf?

TEST 1	
TEST 2	
TEST 3	

How many HORIZONTAL lines did you use?

How many VERTICAL lines did you use?