

Shelf for the Elf

STEM



SHELF FOR THE ELF

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



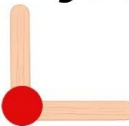
vertical

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



LET'S REFLECT!

What was most difficult about this challenge?
How was your shelf similar to and different from the ones in our classroom?
How was your shelf designed to make it as sturdy and tall as possible?
How many horizontal and vertical lines did you use in your design?
Are there some different styles of shelves and how are they useful?
What materials would you use to build real shelves?
If you completed this challenge again, what would you do differently next time?

EXPLORE

SHELVES

ENGINEERING



HOW SHELVES ARE MADE



THINK LIKE AN ENGINEER



FURNITURE MAKERS



THE ENGINEERING DESIGN PROCESS

ASK

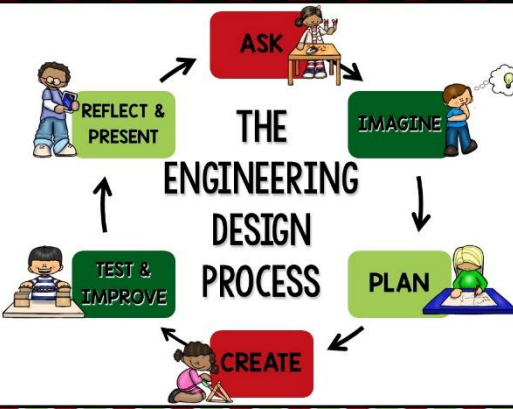
IMAGINE

PLAN

CREATE

TEST & IMPROVE


REFLECT & PRESENT



DIFFERENTIATED RECORDING SHEETS FOR K-5TH GRADE

LOWER GRADES


UPPER GRADES



Shelf for the Elf

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?

↑↓ _____

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Shelf for the Elf

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?

How high is your shelf?

TEST 1	
TEST 2	
TEST 3	


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DIGITAL GOOGLE SLIDES NOTEBOOK

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

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STEM Challenge Assessment Rubric

Challenge: _____

Date: _____

Student Name: _____

3	2	1
Student followed all instructions for challenge.	Student followed some instructions for challenge.	Student did not follow instructions for challenge.
Student used best effort and perseverance on challenge.	Student used some effort and perseverance on challenge.	Student did not show effort or perseverance on challenge.
Student completed assigned blueprint and reflection sheet.	Student partially completed assigned blueprint and reflection sheet.	Student did not complete assigned blueprint and recording sheet.
Student showed accuracy in testing, calculating, and measuring.	Student showed some accuracy in testing, calculating, and measuring.	Student did not show accuracy in testing, calculating, or measuring.
Student fully cooperated with group members and contributed fairly.	Student partially cooperated with group members and contributed fairly.	Student struggled to cooperate with group members and/or failed to contribute.
Student fully participated in class discussions.	Student somewhat participated in class discussions.	Student did not participate in class discussions.

TOTAL POINTS: _____ /18

Comments: _____

We Need STEM Supplies!

Dear Families,

We are learning all about Science, Technology, Engineering, and Math through STEM lessons, and we need your help! If you are able to donate any of the following supplies for our STEM Challenge, please detach and return the form below and send back to school with your child. We greatly appreciate your support and generosity!

We are in need of the following items by _____:

Thank you so much for helping to make our STEM lessons possible! Please contact me at _____ with any questions.

Sincerely, _____

All you are able to donate, please detach and return the form below:

Parent Name(s): _____

Child's Name: _____

I am able to donate: _____

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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-H , 3-5-ETS1-2 , 3-5-ETS1-3 3-5-ETS1 Engineering Design 3-5-ETS1-H , 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 MP2 : Reason abstractly and quantitatively MP3 : Model with mathematics MP5 : Use appropriate tools strategically MP6 : Attend to precision MP7 : 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

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.

KEY SKILLS

SUGGESTED READ ALOUDS

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.

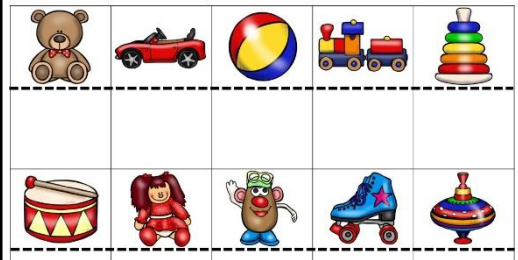


MATERIALS:

- 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



What is similar? What is different?

Where Shelves Are Found

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 vertical lines did you use in your shelf design?
- What are some differences between your shelf and the shelves in our classroom?
- What materials would you use if we completed this challenge differently next time?

WORDS TO KNOW

horizontal

side to side direction,
parallel to the ground



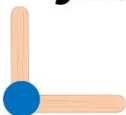
vertical

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: _____

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?

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?

