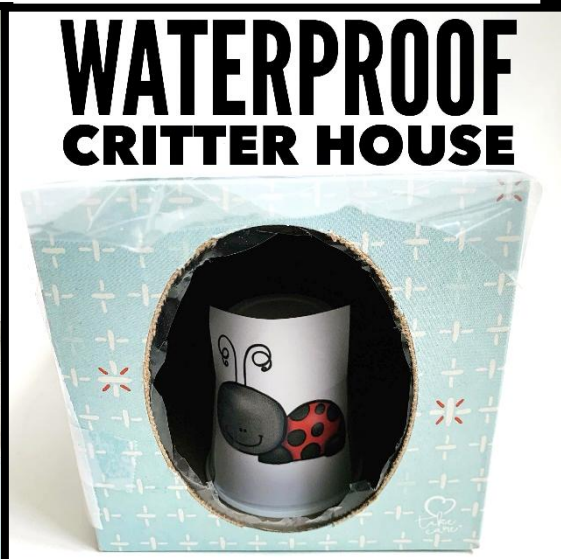
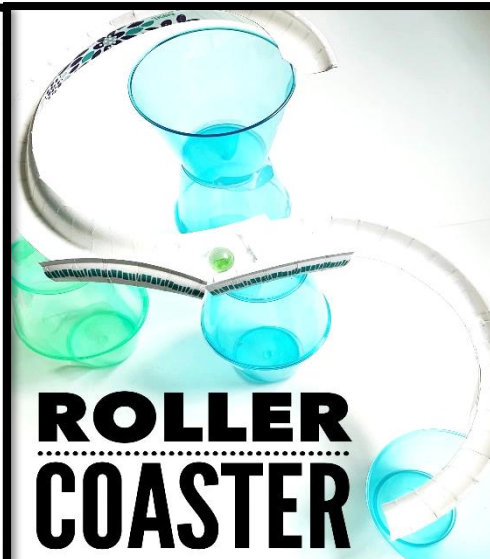
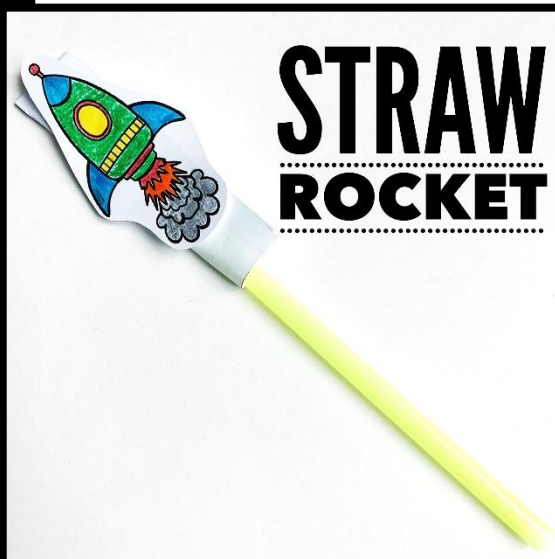


May

STEM

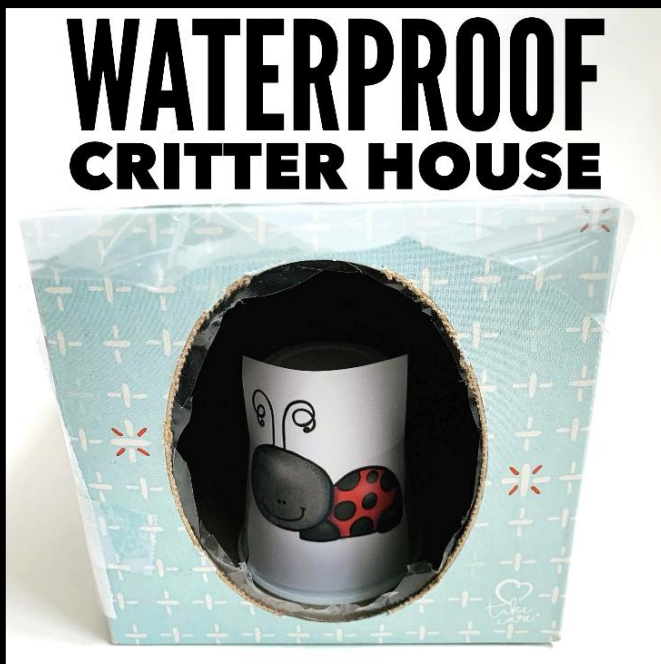
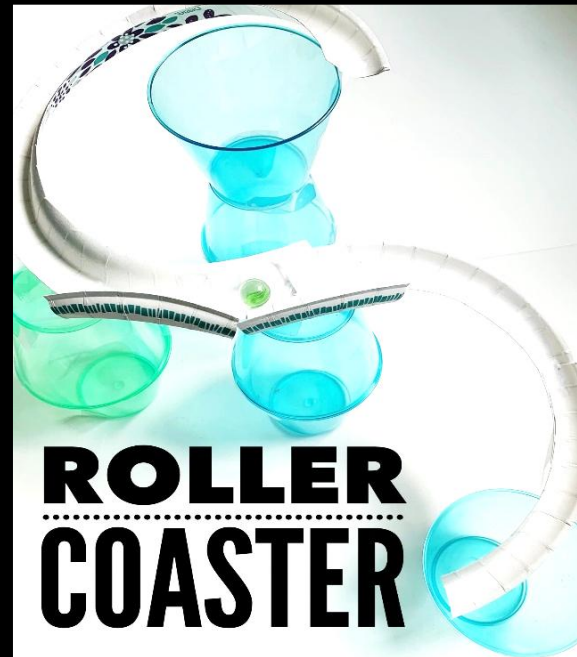
LOW PREP

End of the Year challenges

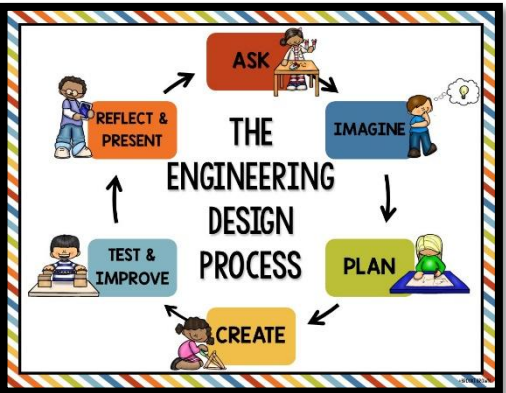


CREATED BY BROOKE BROWN

3 LOW PREP STEM CHALLENGES + BONUS BRAINBUILDER ACTIVITY



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



Roller coaster

You have been asked to design a new roller coaster for an amusement park!

Construct a roller coaster that will carry a marble from the top to the bottom without falling off.

MATERIALS:

- Coated paper plates with "lips" around the edges.
- Film or medium-sized cups
- Tape
- Scissors
- Marbles (one per group)

Straw Rocket

Your friends have challenged you to a contest!

Construct a straw rocket that will travel the farthest distance.

MATERIALS:

- Straws (One per student)
- Paper strips (One per student)
- Paper rockets (One per student)
- Scotch tape
- Yardsticks

Waterproof critter house

You've caught some insects in your backyard and they need to be kept dry during a rainstorm.

Construct a waterproof shelter for your insects that contains materials for survival.

MATERIALS:

- Empty tissue boxes
- Paper plates
- OPTIONS FOR WATERPROOF MATERIALS:** large Ziplock bags, trash bags, plastic wrap, plastic table cloths
- Outdoor materials such as rocks, leaves, dirt, and sticks
- Paper critters (2-3 per group)
- Spray bottle with water

BRAINBUILDER

pool noodle party

Can you use only pool noodle pieces and toothpicks to build a variety of structures?

TRY CREATING:

- tower
- house
- bridge
- vehicle
- boat
- airplane

WORDS TO KNOW

gravity force of attraction of objects to the center of the Earth	friction surface resistance to motion
acceleration an object's	momentum the amount of motion moving object

WORDS TO KNOW

thrust the force of flight that pushes an object forward or upward	drag force on an object in the air that reduces forward motion
propel	gravity force of attraction of objects to the center of the Earth

WORDS TO KNOW

shelter a dwelling or home designed for protection	terrarium a clear container that houses plants, insects, reptiles, or amphibians
waterproof	habitat

Roller coaster

REAL WORLD EXAMPLES

What is similar? What is different?

Forces at Work in Roller Coasters

Important Features of Roller Coasters

Our Design Ideas

Straw Rocket

REAL WORLD EXAMPLES

What is similar? What is different?

How Rockets Work

Basic Parts of a Rocket

Forces of Flight

Waterproof critter house

REAL WORLD EXAMPLES

What is similar? What is different?

Where Insects Live

Types of Insects

What Insect Homes Doed

EXPLORE ROLLER COASTERS

ROLLER COASTERS	ROLLER COASTER PHYSICS
ROLLER COASTER FORCES	WORLD'S TALLEST ROLLER COASTERS

EXPLORE ROCKETS

ESCAPE TO THE MOON	HOW ROCKETS WORK
BUILDING ROCKETS	FORCES OF FLIGHT

EXPLORE INSECTS

INSPECT AN INSECT	UNDER A ROCK
BUG HUNTING GAME	10 INTERESTING INSECTS

DIFFERENTIATED RECORDING SHEETS FOR K-5TH GRADE

Roller coaster

Name: _____

Blueprint

Name of Our Roller Coaster: _____

PROBLEMS	IMPROVEMENTS

Was your final design successful? YES ☐ NO ☐
Why or why not? _____


How did you feel? _____

Straw Rocket

Name: _____

Blueprint

Label the PAYLOAD, FINS, AND OTHER TANKS, FINS, AND NOZZLE.



Which forces of flight were at work when you launched your rocket? _____

Pool Noodle party

Name: _____

Draw and describe your creations.


If it works? YES ☐ NO ☐
How could you improve your shelter to make it an ideal habitat for insects? _____

Roller coaster

Name: _____

MY BLUEPRINT

Name of Our Roller Coaster: _____



Draw a picture of your roller coaster: _____


The Force that carries the marble to the bottom is called: _____

Straw Rocket

Name: _____

MY BLUEPRINT

Label the PAYLOAD, FINS, AND NOZZLE.



How far did your rocket travel? _____

TEST 1 _____

TEST 2 _____

TEST 3 _____

Waterproof critter house

Name: _____

MY BLUEPRINT

Draw a picture of your critter house: _____

Draw the objects that you found outside for your habitat: _____

Draw the insects that you put inside your critter house: _____

Waterproof critter house

Name: _____

Draw the objects that you found outside for your habitat: _____

Draw the insects that you put inside your critter house: _____

Waterproof critter house

Name: _____

Draw the objects that you found outside for your habitat: _____

Draw the insects that you put inside your critter house: _____

Waterproof critter house

Name: _____

Draw the objects that you found outside for your habitat: _____

Draw the insects that you put inside your critter house: _____

LET'S REFLECT!

- What was most difficult about this challenge?
- What features in your design were necessary for the marble to roll all the way to the end?
- What improvements were necessary as you constructed your roller coaster?
- What force pulled your marble to the end of the track?
- How are potential and kinetic energy used in a roller coaster?
- How did friction affect your marble?
- How is your roller coaster design similar to and different from a real roller coaster?
- If we completed this challenge again, what would you do differently next time?

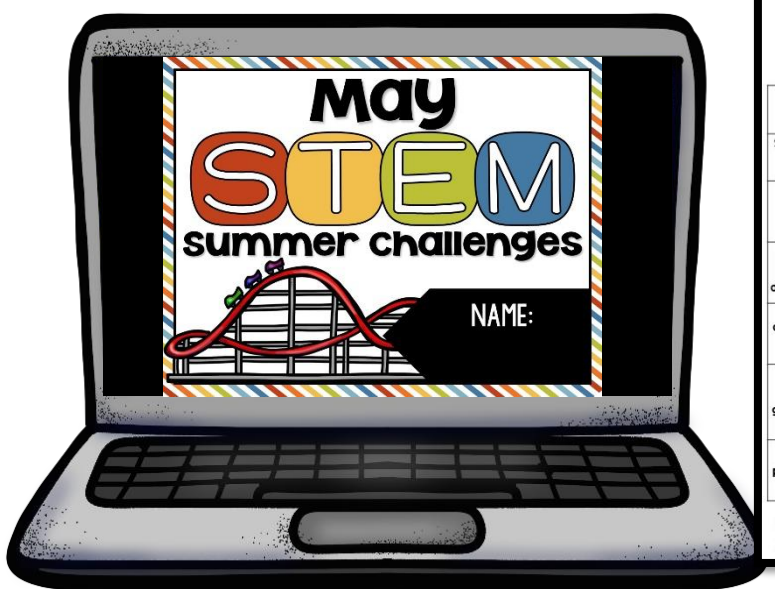
LET'S REFLECT!

- What was most difficult about this challenge?
- How did you design your critter house to be a good habitat for your insects?
- What types of items did you include in your critter house to help your insects survive?
- Which waterproof material was most effective and why do you think so?
- What types of waterproof materials do you find on real shelters?
- What are some waterproof materials that are found in nature or animal coverings?
- If we completed this challenge again, what would you do differently next time?

LET'S REFLECT!

- What was most difficult about this challenge?
- What types of pushes and pulls were used in this challenge?
- Which forces of flight were at work when you launched your straw rocket?
- How did you improve the distance of each test?
- How is wind power involved with the same principles you used today?
- How is your rocket design similar to and different from a real rocket?
- If we completed this challenge again, what would you do differently next time?

DIGITAL GOOGLE SLIDES NOTEBOOK



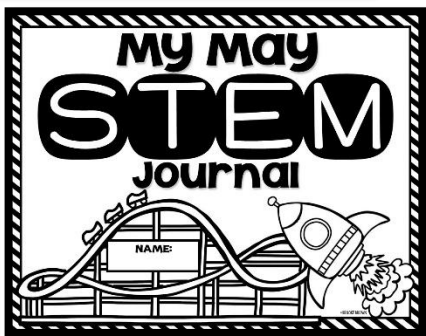
STEM Challenge Assessment Rubric

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 reflection 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 Challenges, 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, _____

If you are able to donate, please attach and return the form below.

Parent Name(s): _____

Child's Name: _____

I am able to donate: _____

SAY *Hello* TO STRESS-FREE STEM!

SUPPLIES CHECKLIST

STEM CHALLENGE	ITEM	NUMBER PER GROUP	I HAVE IT
Roller Coaster	cups (mini or medium-sized work best)	12	
	coated paper plates with "lips" around the edges	6	
	tape	1 roll	
	scissors	2	
	marble	1	
Straw Rocket	9" x 12" sheet of construction paper	1-2	
	straws	1 per student	
	blank paper rectangle	1 per student	
	paper rocket	1 per student	
	scissors and tape	1 per pair of students	
Waterproof Critter House	yardstick	1	
	empty tissue box	1	
	OPTIONS for waterproof materials: gallon ziplock bags, trash bags, plastic tablecloths, plastic wrap	variety	
	paper plates	1	
	scissors	1	
BONUS BRAINBUILDER: Pool Noodle Party	tape	3 feet	
	mini cups with paper critters taped to the front	1 set	
	spray bottle with water	1	
	pool noodles sliced into a variety of shapes and sizes	1 large lub per class	
	toothpicks	30 per group	

STANDARDS ALIGNMENT

MAY STANDARDS ALIGNMENT			
CHALLENGE	ENGINEERING	SCIENCE	MATH
Roller Coaster	K-2-ETS1 Engineering Design: K-2-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3 3-5-ETS1 Engineering Design: 3-5-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3	K-PS2 Motion and Stability: Forces and Interactions 3-PS2 Motion and Stability: Forces and Interactions 4-PS3 Energy 5-PS2 Motion and Stability: Forces and Interactions	1-MS. Make sense of problems, and persevere in solving them. 2-MS. Reason abstractly and quantitatively. 3-MS. Model with mathematics. 4-MS. Use appropriate tools strategically.
Straw Rocket	K-2-ETS1 Engineering Design: K-2-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3 3-5-ETS1 Engineering Design: 3-5-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3	K-PS2 Motion and Stability: Forces and Interactions 3-PS2 Motion and Stability: Forces and Interactions 4-PS3 Energy 5-PS2 Motion and Stability: Forces and Interactions	1-MS. Make sense of problems, and persevere in solving them. 2-MS. Reason abstractly and quantitatively. 3-MS. Model with mathematics. 4-MS. Use appropriate tools strategically.
Waterproof Critter House	K-2-ETS1 Engineering Design: K-2-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3 3-5-ETS1 Engineering Design: 3-5-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3	K-LS1 From Molecules to Organisms: Structures and Processes K-ESS2 Earth's Systems: (Structure, Function, and Information Processing 3-LS1 Biological Evolution: Unity and Diversity 3-ESS3 Earth and Human Activity	1-MS. Make sense of problems, and persevere in solving them. 2-MS. Reason abstractly and quantitatively. 3-MS. Model with mathematics. 4-MS. Use appropriate tools strategically.
BONUS BRAINBUILDER: Pool Noodle Party	K-2-ETS1 Engineering Design: K-2-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3 3-5-ETS1 Engineering Design: 3-5-ETS1A, 3-5-ETS1-2, 3-5-ETS1-3	2-Structure and Properties of Matter 4-Balance, stability	1-MS. Make sense of problems, and persevere in solving them. 2-MS. Reason abstractly and quantitatively. 3-MS. Model with mathematics. 4-MS. Use appropriate tools strategically.

CHALLENGE OVERVIEW



STEM CHALLENGE: Roller coaster

OVERVIEW: This challenge is perfect for the end of the year. It requires perseverance as well as constant testing and improvements, and is sure to bring cheers of success at the end. For best results, purchase coated paper plates with prominent "lips" around the outer edges that are not too thick for students to cut (not Styrofoam). Students will cut off the outer lips of the plates and crease them along the middle to make "tracks" for the marbles. They may also cut the tracks into different sizes so that they can turn their track different directions. The tracks should be taped to the top of mini or medium-sized plastic (cocktail) cups. The cups can be taped together in towers so that students can gradually reduce the height of the tracks from beginning to end.

HELPFUL TIPS:

- 1) Test each piece of the track before extending it to add another piece.
- 2) Tape the cup towers down to the construction paper to stabilize the roller coaster.
- 3) If any drops in the roller coaster are too steep, the marble may fall out. Tape small pieces of paper plate to the tracks to act as "bumpers" to block the marble from falling out.

After students achieve a successful roller coaster design, encourage them to give it an exciting name and decorate their poster with signs and details.

KEY SKILLS: Engineering roller coasters, Potential and Kinetic Energy, Acceleration and Momentum, Gravity

SUGGESTED READ ALOUDS: [Roller Coaster](#) by Maria Fracze, [Roller Coasters \(How it Works\)](#) by Precious McKenzie, [Building a Roller Coaster](#) by Karen Latchana Kenney

MATERIALS PER GROUP: marble, 12 mini or medium-sized cups, 6 coated paper plates with "lips" around the edges, 1-2 sheets of 9" x 12" construction paper, scissors, 1 roll of tape

LESSON PLAN

1. Activate students' prior knowledge by asking them to share what they already know about roller coasters and the forces at work during a roller coaster ride.
2. Share and discuss the videos on "Explore Roller Coasters."
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 60-90 minutes to construct their roller coasters and test them with marbles.
8. Hold a whole class closing discussion and reflection, allowing students to share, compare, and contrast their roller coaster designs. Use the "Let's Reflect" poster to guide the discussion.

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KEY SKILLS

SUGGESTED READ ALOUDS

MATERIALS

STEP BY STEP INSTRUCTIONS