# Worksheets Ready to Print!K - 2nd GradeSTERMACTIVITYGrade





Teacher Instructions
Student Worksheets
Teacher Demo Video
Grading Rubrics



EERING.

## STEM ACTIVITY CHALLENGES #1

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complete

STEM LABS

# Introduction

**THESE ACTIVITIES** will challenge students to work together in groups to complete the given task. They are fun, engaging and facilitate group work and problem solving. Each activity includes teacher instructions, student instructions, grading rubrics, a demonstration video showing the teacher how to set up the activity with an explanation of the science involved and 2 pdfs of related Next Generation Science Standards. Each activity challenge will end with a real-world research question. This question is an extension of what the students just discovered and learned. Your students will be engaged, excited, and looking forward to future challenge activities in your classroom.

#### MATERIALS NEEDED LIST

This will help you to quickly identify exactly what materials you need to successfully run this lab in your classroom.

#### TEACHER DEMO VIDEO

Each activity includes a video. This video gives an overview of the project, talks through the materials needed, how to run the activity with your class and the science behind each activity.

#### TEACHER INSTRUCTIONS

This includes an explanation of the science concepts involved and offers a suggestion on how to introduce the activity. You are also reminded of the materials needed.

#### STUDENT WORKSHEET

Each group working together on this activity will have a set of student worksheets/ instructions. These help guide each group through the problem solving and discovery process. There is a "Beyond the Challenge" section at the end of each activity. This encourages the students to research additional (often "real world") information related to the project.

#### GRADING RUBRIC

I've included a grading rubric with each activity. The text is completely customizable (in Adobe Acrobat Reader) to accommodate for your specific grading style.

#### NG99

This includes two different standards lists: Engineering Standards & Forces Standards. I have included these standards for your convenience and reference. They can also be found for free at: http://www.nextgenscience.org/

# Thank You!!!

#### I'M SO EXCITED YOU'VE PURCHASED THIS PRODUCT!!

I'm confident that you'll find this resource to be very valuable as you integrate STEM into your classroom, home-school curriculum, summer camps or anywhere STEM can be used for learning and fun! I take great pride in the products that I sell here and I would greatly appreciate you taking the time to review this product. My goal is to earn your "A" rating and positive feedback! If for ANY reason you are not 100% satisfied, please give me the opportunity to make it right before leaving feedback. You can contact me either through my store, or by emailing me at sciencedemoguy@gmail.com

I hope you have a fantastic day and lots of fun with STEM! - Josh (AKA, Science Demo Guy)



#### YOU CAN EDIT THIS PRODUCT RIGHT HERE IN THE PDF FILE!!!!!

- 1. The Teacher's Instructions, Materials List, Grading Rubric and Student Worksheet are directly editable in Adobe Acrobat Reader.
- <u>MAKE SURE</u> you are using the most current version of Adobe Acrobat Reader. Download it for free: https://get.adobe.com/reader/
- 3. Before you edit anything, make sure to save the pdf file as a copy.
- 4. To edit the text, click on it and start typing! When you save your file, your text changes will also be saved!
- 5. If the text appears highlighted, don't worry, the highlights will not print.

If you have any questions, please email me:

sciencedemoguy@gmail.com

# K-2nd Grade NGSS Alignment (16pk #1)

Marble Roller Coaster K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Marshmallow Catapult K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2 2-PS1-1

Hoop Glider K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 2-PS1-1 2-PS1-2

Oobleck K-2 K-2-ETS1-1 K-2-ETS1-3 2-PS1-1 2-PS1-2

Jumping Bugs K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Popcorn Huff and Puff K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Pop Can Races K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Musical Straws K-2 K-2-ETS1-1 K-2-ETS1-3 1-PS4-1 Self Inflating Balloons K-2 K-2-ETS1-1 K-2-ETS1-3 2-PS1-2

Drops on a Penny K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 2-PS1-1

Spaghetti Tower K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 2-PS1-3

Swinging Pendulum K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Aluminum Foil Boats K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 2-PS1-3

Levitating Ping Pong Ball K-2 K-2-ETS1-1 K-2-ETS1-3 K-PS2-1 K-PS2-2

Dancing Raisins K-2 K-2-ETS1-1 K-2-ETS1-3 2-PS1-1

Exploding Sandwich Bag K-2 K-2-ETS1-1 K-2-ETS1-3 2-PS1-1

# Related NGSS K - 2nd Grade

#### MOTION AND STABILITY: FORCES AND INTERACTIONS

Students who demonstrate understanding can:

**K-P32-1.** Plan and conduct an investigation to compare the effects of different strengths or different directions of pushes and pulls on the motion of an object. [Clarification Statement: Examples of pushes or pulls could include a string attached to an object being pulled, a person pushing an object, a person stopping a rolling ball, and two objects colliding and pushing on each other.] [Assessment Boundary: Assessment is limited to different relative strengths or different directions, but not both at the same time. Assessment does not include non-contact pushes or pulls such as those produced by magnets.]

**K-P32-2.** Analyze data to determine if a design solution works as intended to change the speed or direction of an object with a push or a pull.\* [Clarification Statement: Examples of problems requiring a solution could include having a marble or other object move a certain distance, follow a particular path, and knock down other objects. Examples of solutions could include tools such as a ramp to increase the speed of the object and a structure that would cause an object such as a marble or ball to turn.] [Assessment Boundary: Assessment does not include friction as a mechanism for change in speed.]

**ENGINEERING DESIGN** Students who demonstrate understanding can:

**K-2-ETSI-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-ETSI-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.

## **Marble Roller Coaster**



**In this activity** students will work in groups to create a rollercoaster from foam pool noodles. They will include twists, turns, hills and loops. The goal is to create an exciting "ride" (for the marble) while getting it safely to the ground.









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# **Marshmallow Catapult**



**In this activity** students will work in groups to create a catapult from popsicle sticks. They will modify their catapult in order to produce the best launch possible. Kids will have a great time launching mini marshmallows across the room while learning about potential and kinetic energy.









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# **Hoop Glider**



**In this activity** Students are challenged to build a glider that will glide as far as possible. Working in groups, students will cut and tape various hoops to their straw. They will experiment with hoops of different sizes, positioning, and throwing styles.









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## **Oobleck**



**In this activity** students will work in groups to explore the properties of Oobleck. They will be testing random objects such as paper clips, toothpicks, marbles, string etc. to determine whether they float or sink. Oobleck has properties unlike most substances we usually encounter.







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## **Jumping Bugs**



In this activity students will put effervescent tablets inside a film cannister with a little bit of water. As gas is produced, pressure will build in the film canister causing the cap to pop off. Students will color and tape a bug of their choice to the bottom of the film cannister and see how high it can go!!! The students can experiment with the amount of tablet and water to see what works best. Bug illustrations are also included!

























































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## **Popcorn Huff & Puff**



**In this activity** students will attempt to blow a piece of popcorn into an "empty" 2 liter bottle. To their surprise, they will find that it doesn't work. Students will discuss this phenomenon with their team and attempt to explain it. Students will discover that the bottle is actually full...full of air! They will then brainstorm modifications that may allow the popcorn to be blown into the bottle.







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### **Pop Can Races**



**In this activity** students will work in groups to explore electrostatic forces between a balloon that they charge and a pop can on the floor. After experimenting with different balloons and different methods, teams will race their pop can a distance of ten meters. Students will not be able to touch, push or blow on their pop can. It must be pulled with the static electricity they create.







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### **Musical Straws**



**In this activity** students will explore sound. They will cut a normal straw and turn it into a musical instrument. They will cut the straw to different lengths and analyze how the length changes the pitch.







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## **Self-Inflating Balloons**



In this activity students will work in groups to load three different balloons with different amounts of baking soda and fill three bottles with vinegar. When the balloons are inverted and the baking soda drops into the vinegar, students will make observations as the balloons self-inflate.







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### **Drops on a Penny**



**In this activity** students will work in groups (or individually) to get as many drops as possible to sit on the head of a penny. They will be amazed at how much water will stay on the top of a penny. Not only will students be competing against others, they will be observing surface tension as well.







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### **Spaghetti Tower**



In this activity students will work in groups to build the tallest structure possible from mini-marshmallows and uncooked spaghetti noodles. Not only will the students learn the importance of working together as a team, but they will discover what shapes they need to make their tower strong.









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# **Swinging Pendulum**



**In this activity** students will work in groups to determine which factors (angle, length, or mass) affect the period of a pendulum. Through several different experiments, they will discover that only changes in length affect the period. Near the end of this project, the challenge will be for each group to create a pendulum of period 1 second by using the knowledge they've gained through prior experiments.






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# **Aluminum Foil Boats**



In this activity students will work in groups to design and build a small boat from aluminum foil. They will then see how many pennies it can hold before it sinks. The goal is for each student to work with their group to build and modify their boat to hold as many pennies as possible.









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# **Levitating Ping Pong Ball**



**In this activity** students will work in groups to discover the phenomenon that occurs when a ping pong ball is placed above a straw and air is blown through the straw. Most people would expect the ping-pong ball to fly up and off to the side—but it doesn't. Due to Bernoulli's Principle, the ball will hover in the air above the straw. This project can end with a demonstration using a shop-vac or hair dryer with a ping-pong ball that will produce the same interesting results.







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# **Dancing Raisins**



**In this activity** students will work in groups while dropping raisins into a clear carbonated drink (7-up or Sprite) and make observations about their dancing raisins. Students will brainstorm why they appear to be dancing, rising, and sinking.









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# **Exploding Sandwich Bags**



**In this activity** students will work in groups to prepare their ziploc bag for a mini-explosion (pop) :) To get the vinegar and baking soda sealed in the bag without allowing them to mix first will test their groups ability to work together. Once these chemicals (baking soda and vinegar) are mixed, students will observe the chemical reaction and celebrate the volume of their bag's pop.







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# BONUS STEM ACTIVITY



Professor Stemplestien's STEMSTATION



Professor Stemplestien's





**Professor Stemplestien's** 





# Will STEM Man be able to help a troll build a toll bridge?

#### TROLL BRIDGE - MATERIALS LIST

#### Materials listed are per station

#### Box Materials (per station):

Popsicle Sticks (25) Straws (25) Pipe Cleaners (25) Pencils (10) Masking Tape (1 roll) Dental Floss (1 container) Pennies (50-100) Small Cup (to put pennies in on the bridge) Small Troll Doll (optional, just for fun) Planning Sheet & Student Worksheet

#### Will also need:

Tablet/iPad – Alternately the video can be viewed using this link: https://goo.gl/Afp4XQ Scissors Pencil Two objects to span the bridge across. (Some ideas: 2 STEM Boxes, desks, tables, chairs)

#### TROLL BRIDGE - NGSS

#### Kindergarten, Frist Grade & Second Grade Engineering and Design

**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.

#### Third, Fourth and Fifth Grade Engineering and Design Standards

- **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.

#### Fifth Grade Specific Standards – Motion and Stability: Forces and Interactions 5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.

#### TROLL BRIDGE - STUDENT WORKSHEET

#### NAME(S):



**Scan the QR code** to watch the video. Design & build a toll bridge for a troll who wants to earn a little extra cash. The troll is planning to charge one penny to each person who crosses his bridge. There needs to be a collection cup in the middle and it should hold as many pennies as possible.

You will need: STEM Materials Box iPad / Tablet Pencil Scissors Two objects to hold either side of the bridge. (desks, tables, boxes, etc.)

#### STEP #1: PLAN

Your bridge will need to go between two objects (desks, tables, boxes, etc.) across the span of 1 ft / 33 cm. Look at the materials you have, which will you use? What will your bridge look like? What will you do to make the bridge as strong as possible? How many pennies do you think your bridge will be able to hold? \_\_\_\_\_Choose one person in your group to write down your ideas and draw the plan for your bridge. Be sure to listen to the ideas of everyone in your group and plan your design together.

#### STEP #2: BUILD

Use your plan as a guide and build your bridge! Everyone in your group needs a chance to participate. Don't leave anyone out!

#### STEP #3: TEST

Start adding pennies to your bridge. How many can it hold before breaking?

#### STEP #4: ANALYZE

Was your bridge able to hold as many pennies as you thought it would?\_\_\_\_\_ What were the strengths of your bridge? What were its' weaknesses? Why?

#### STEP #5: IMPROVE

What could you change in your design to improve your outcome? If there is enough time, try making adjustments!

Student Video: https://goo.gl/Afp4XQ

TROLL BRIDGE - STUDENT WORKSHEET

#### NAME(S):



**Scan the QR code** to watch the video. Design & build a toll bridge for a troll who wants to earn a little extra cash. The troll is planning to charge one penny to each person who crosses his bridge. There needs to be a collection cup in the middle and it should hold as many pennies as possible.

You will need: STEM Materials Box iPad / Tablet Pencil Scissors Two objects to hold either side of the bridge. (desks, tables, boxes, etc.)

#### STEP #1: PLAN

Your bridge will need to go between two objects (desks, tables, boxes, etc.) across 1 ft / 33 cm. How will your bridge support lots of pennies? Draw your plan. How many pennies do you think it will hold?

STEP #2: BUILD Look at your plan and build your bridge!

STEP #3: TEST Start adding pennies to your bridge. How many did it hold before breaking?

#### STEP #4: ANALYZE

Was your bridge able to hold as many pennies as you thought it would?\_\_\_\_\_ What was great about your bridge? What could have been better? Why?

#### STEP #5: IMPROVE

What could you change in your design to make your bridge stronger? If there is enough time, try making adjustments!

Student Video: https://goo.gl/Afp4XQ

#### PLANNING SHEET

NAME(S):

Use this page to draw out your idea(s). Make a plan to build your design.

This page is for printing on Avery 15264 Labels - MAKE SURE TO PRINT FULL SIZE, don't scale in the print menu!



STUDENT

PRINTABLES

#### TROLL BRIDGE

#### MATERIALS LIST

**Box Materials (per station):** Popsicle Sticks (25) Straws (25) Pipe Cleaners (25) Pencils (10) Masking Tape (1 roll) Dental Floss (1 container) Pennies (50-100) Small Cup (to put pennies in on the bridge) Small Troll Doll (optional) Will also need: iPad / Tablet Pencil Scissors (Two objects to span the bridge across. Ex: Desks, boxes Tables or Chairs)



## **IF YOU LIKE THIS ACTIVITY...**

# Please consider my other STEM STATION Projects:

WaterSlide

Treasure Island Rescue

Toy Store Delivery

Roller Coaster Birthday Party

Mail Capsule Delivery

Lost Marble Lift

Lava Lamp Promotion

High in the Sky

Dog Treat Catapult

Air Show Competition





### CLIPART, BORDERS \$ DESIGN BT:



# Her Science & engineering clipart is located <u>here</u>, in my science demo guy store


## IF YOU LIKE MY STEM ACTIVITIES...

Please consider checking out all of my STEM Bundles!!

Also, please visit <u>my store</u> for other fun science and math resources!!

CLICK

HERE!!