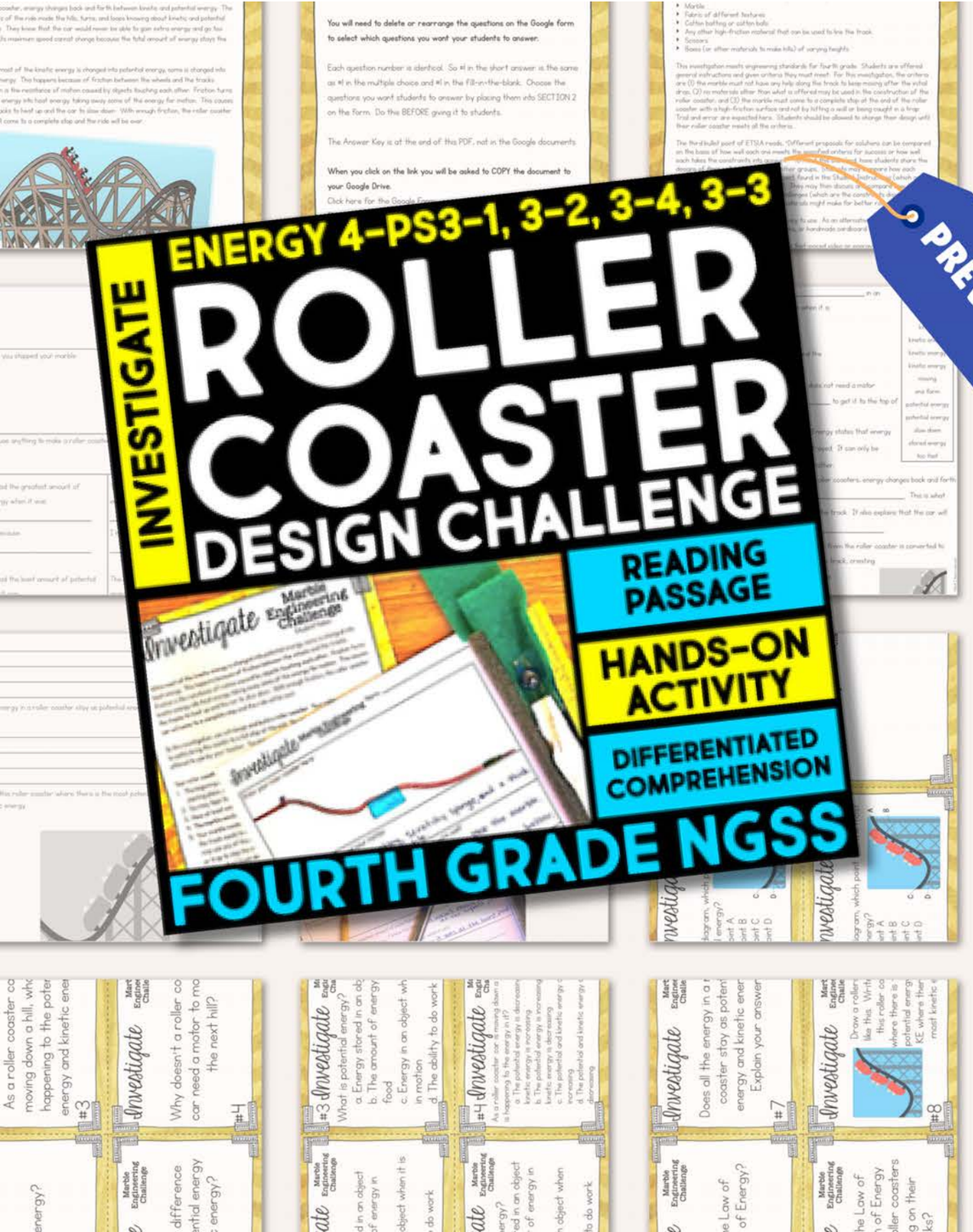


Rollercoasters Unleashed!

4TH GRADE

INVESTIGATE POTENTIAL & KINETIC ENERGY ROLLER COASTER FRICTION DESIGN CHALLENGE

Energy 4-PS3A-D & ETS1.A

KEEP SCROLLING TO SEE WHAT'S INSIDE!

YOU WILL LOVE THIS BECAUSE



Time-Saving Resource

Comprehensive resource with step-by-step guidance, minimizing planning time that is suitable for whole-class instruction, small groups, or independent work



Aligned with NGSS

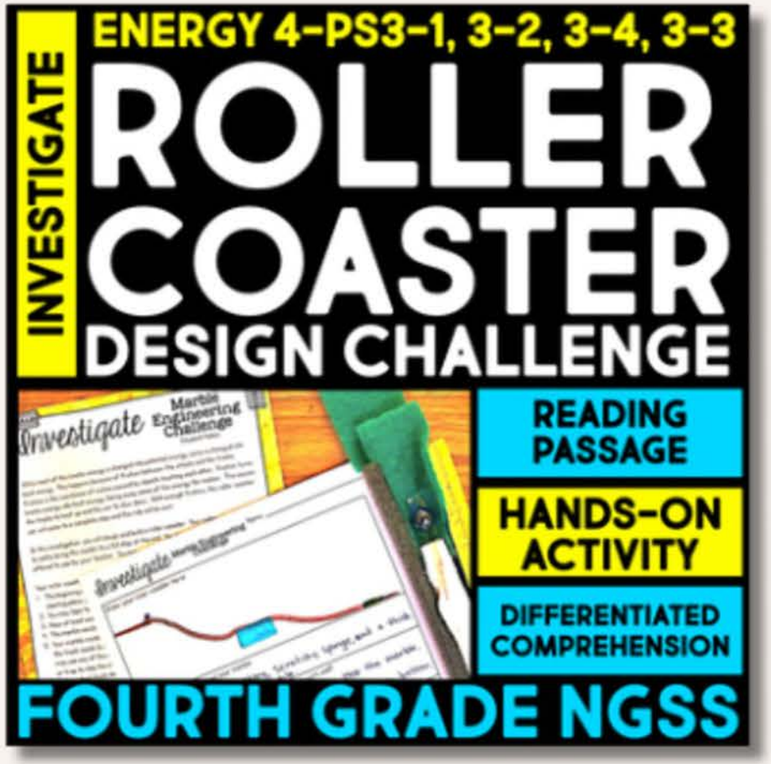
These lesson plans aren't just random; they're laser-focused on Next Generation Science Standards. No more curriculum guesswork!

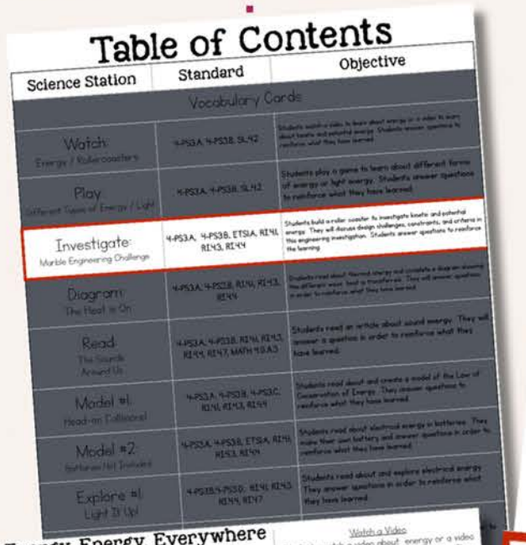


Engineering Design Challenge

Support inquiry-based learning, allowing students to explore and discover concepts on their own.

PAGE OVERVIEW




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Science Station	Standard	Objective
Vocabulary Cards		
Watch: Energy / Rollercoasters	4-PS3A, 4-PS3B, SL.4.2	Students watch a video to learn about energy or a video to learn about kinetic and potential energy. Students answer questions to reinforce what they have learned
Play: Different Types of Energy / Light	4-PS3A, 4-PS3B, SL.4.2	Students play a game to learn about different forms of energy or light energy. Students answer questions to reinforce what they have learned
Investigate: Marble Engineering Challenge	4-PS3A, 4-PS3B, ETS1A, RI.4.1, RI.4.3, RI.4.4	Students build a roller coaster to investigate kinetic and potential energy. They will discuss design challenges, constraints, and criteria in this engineering investigation. Students answer questions to reinforce the learning
Diagram: The Heat is On	4-PS3A, 4-PS3B, RI.4.1, RI.4.3, RI.4.4	Students read about thermal energy and complete a diagram showing the different ways heat is transferred. They will answer questions in order to reinforce what they have learned
Read: The Sounds Around Us	4-PS3A, 4-PS3B, RI.4.1, RI.4.3, RI.4.9, RI.4.7, MATH.4.G.A.3	Students read an article about sound energy. They will answer a question in order to reinforce what they have learned
Model #1: Head-on Collisions!	4-PS3A, 4-PS3B, 4-PS3C, RI.4.1, RI.4.3, RI.4.9	Students read about and create a model of the Law of Conservation of Energy. They answer questions to reinforce what they have learned
Model #2: Batteries Not Included	4-PS3A, 4-PS3B, ETS1A, RI.4.1, RI.4.3, RI.4.4	Students read about electrical energy in batteries. They make their own battery and answer questions in order to reinforce what they have learned
Explore #1: Light It Up!	4-PS3B,4-PS3D, RI.4.1, RI.4.3, RI.4.4, RI.4.7	Students read about and explore electrical energy. They answer questions in order to reinforce what they have learned


Science Stations Overview

Watch a Video
At this station, students will watch a video relevant to the topic and answer questions. You have the option of the included worksheet with the questions or use task cards and have students respond in their science journals.

Play a Video Game
Students play an online video game and answer questions about the experience. You have the option of the included worksheet with the questions or use task cards and have students respond in their science journals.

Investigate
Students use materials to investigate the science topic by following directions and recording results. Students answer questions about the investigation.

Draw a Diagram
Students draw and label a diagram specific to certain requirements. Students then explain how their diagram meets the requirements.

Read a Passage
Students read a short passage about the topic and answer questions about the information in the passage. You have the option of the included worksheet with the questions or use task cards and have students respond in their science journals.

Create a Model
Students use materials to illustrate the science concept and answer questions. You have the option of the included worksheet with the questions or use task cards and have students respond in their science journals.

Explore
Students create a sample and manipulate it using the new science concepts they have learned. Students answer question based on the effects.

Sort
Students sort cards into groups or put them in a specific order. Students record the sort and then describe their reasoning.


Energy, Energy, Everywhere
Science Stations

In Fourth Grade, the Engineering Standards are incorporated within the Disciplinary Core Ideas (DCI) of those science standards. For this reason, we incorporated the engineering standards within the science stations for the Physical, Life, and Earth Science standards. For example, in 4-PS3, 4-ETS1A is listed as one of the DCIs. We created the 4-PS3 station set to include not only the physical science concept of "energy" but also the engineering practice of "defining engineering problems." We will always use the "Investigate" science station in the science station set to meet this engineering DCI, and may use 1 or more other station as well.

In 4-PS3, energy transfer, and conservation of energy are closely related topics that are build upon and interwine with each other. For this reason, we chose to combine the four physical science Disciplinary Core Ideas (DCI) standards into one mega-station set. There would have been much overlap between station sets had we created four separate sets of stations. Here is how the DCIs are intertwined:

- The DCI 4-PS3-A defines energy, relates energy and speed, and discusses how energy is moved through light, sound, and electricity. This DCI integrates all three main topics of 4-PS3.
- The DCI 4-PS3B discusses energy transfer and conservation in moving and/or colliding objects, light energy, and the transfer of energy from electrical to other types of energy. This DCI integrates all three main topics of 4-PS3, as well as incorporating all the information in 4-PS3A.
- The DCI 4-PS3C discusses energy transfers in collisions, which is also part of 4-PS3B. The DCI also integrates the energy and energy transfer topics of 4-PS3, and it is not unreasonable to also introduce and discuss how energy is conserved in collisions.
- The DCI 4-PS3D discusses conservation of energy as energy is transferred from one form to another. This DCI integrates all three topics of 4-PS3, and is a topic that is covered in great detail in 4-PS3A and B.

By working through this mega-set of stations, students will gain a robust understanding of energy, energy transfer, and conservation of energy.

These Science Stations have several different ways students can display their understanding. Most of the variations are similar to each other, but differentiated for various classrooms and learning styles. Included are worksheets for both short-answer and fill-in-the-blank and task cards for both short-answer and multiple choice responses. To provide even more support, give students a word list for the fill-in-the-blank options. Also included are vocabulary cards in two formats which could become a math station if needed.

Students are encouraged to use their Science Journals with the task cards, but worksheets are provided as well. Use the checklist to monitor student progress through the stations. The Science Stations are designed to last about 20 minutes each. Students may do one a day for 8 days or 2 a day for four days. The following checklists will help you organize the stations.

Watch a Video
Students watch a video about energy or a video to learn about kinetic and potential energy. They answer questions to review what they learned

Play a Video Game
Students play a game to learn about different forms of energy or light energy. They answer questions to reinforce what they have learned

Investigate
Students build a roller coaster to investigate kinetic and potential energy. They will discuss design challenges, constraints, and criteria in this engineering investigation. They answer questions to reinforce what they have learned

Draw a Diagram
Students read about thermal energy and complete a diagram showing the different ways heat is transferred. Students answer review questions to reinforce what they learn

Read a Passage
Students read an article about sound energy. They will answer a question in order to reinforce what they have learned

Create a Model
Model #1 Students read about and create a model of the Law of Conservation of Energy. They answer questions to reinforce what they have learned

Model #2 Students read about electrical energy in batteries. They make their own batteries and answer questions in order to reinforce what they have learned

Explore
Explore #1 Students read about and explore electrical energy. They answer questions to reinforce what they have learned
Explore #2: Students read about different types of energy. They explore a laser light and answer questions in order to reinforce what they have learned

Sort
Students read about different types of energy. They then sort pictures into categories based on the type of energy each picture uses.

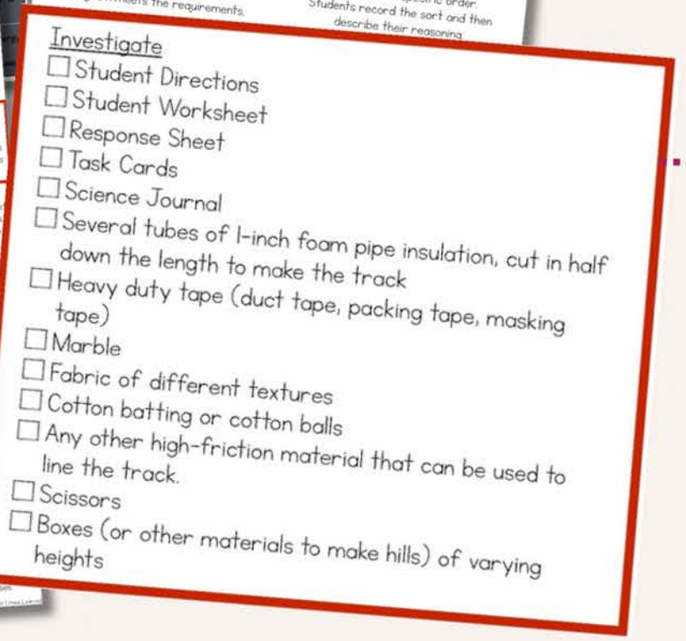

Investigate
- ☐ Student Directions
- ☐ Student Worksheet
- ☐ Response Sheet
- ☐ Task Cards
- ☐ Science Journal
- ☐ Several tubes of 1-inch foam pipe insulation, cut in half down the length to make the track
- ☐ Heavy duty tape (duct tape, packing tape, masking tape)
- ☐ Marble
- ☐ Fabric of different textures
- ☐ Cotton batting or cotton balls
- ☐ Any other high-friction material that can be used to line the track.
- ☐ Scissors
- ☐ Boxes (or other materials to make hills) of varying heights

Table of Contents

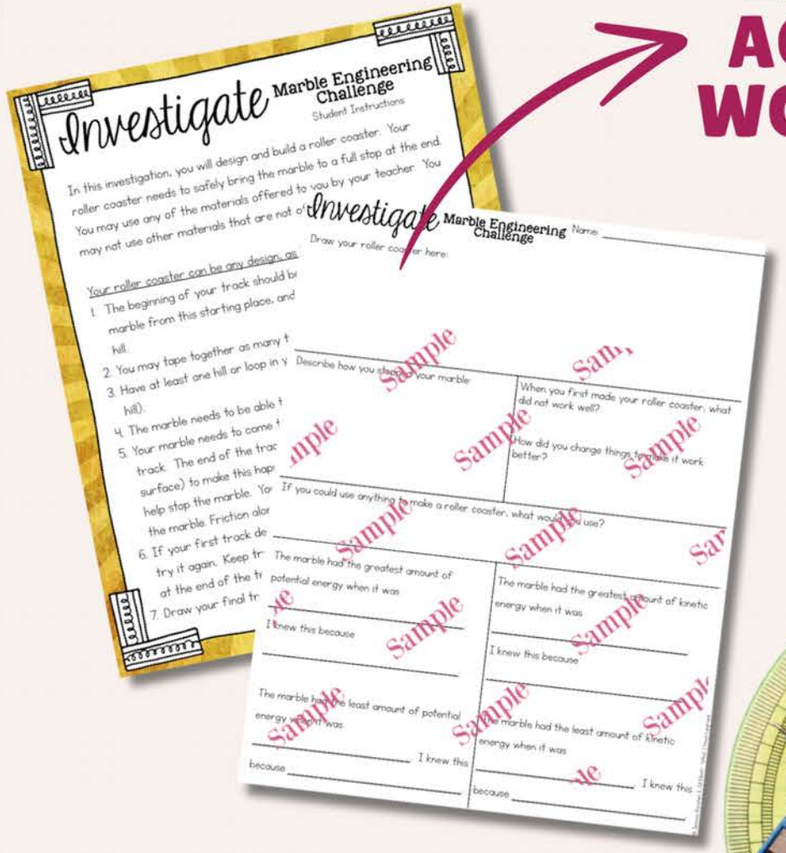
Science Station Overview

Materials Checklist

Background Information

INVESTIGATE: Marble Engineering Challenge







ENGAGING ACTIVITY & WORKSHEETS

READING IN TWO FORMATS

INVESTIGATE: Marble Engineering Challenge

DIFFERENTIATED QUESTIONS



SHORT ANSWER



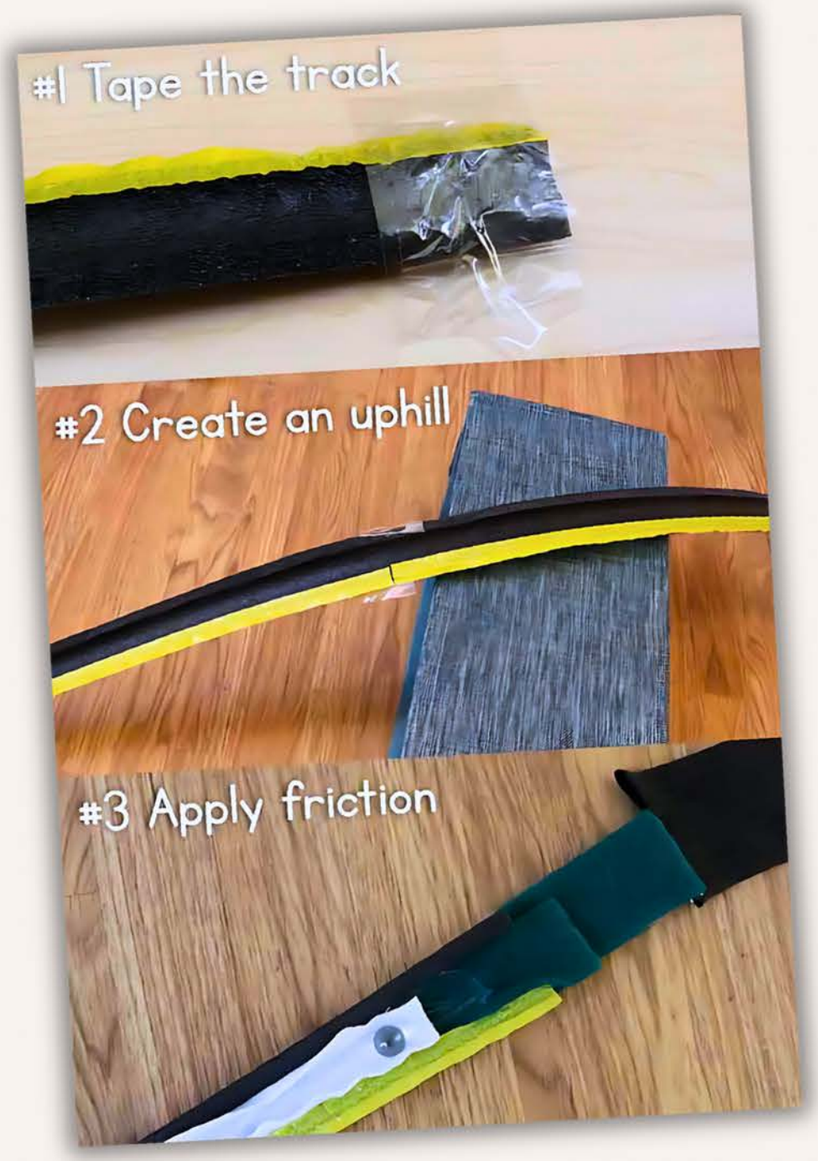
FILL-IN-THE BLANK

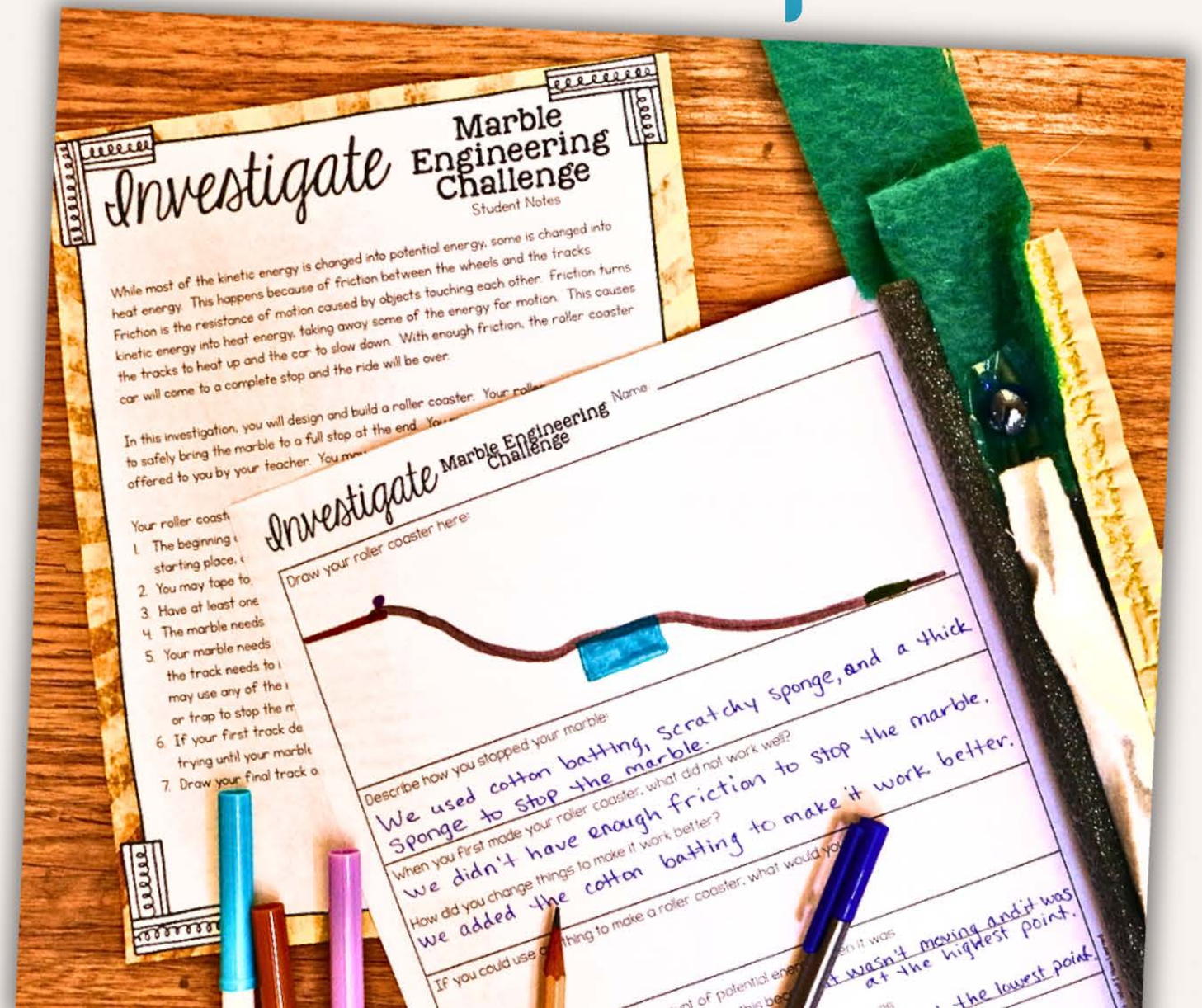


TASK CARDS:

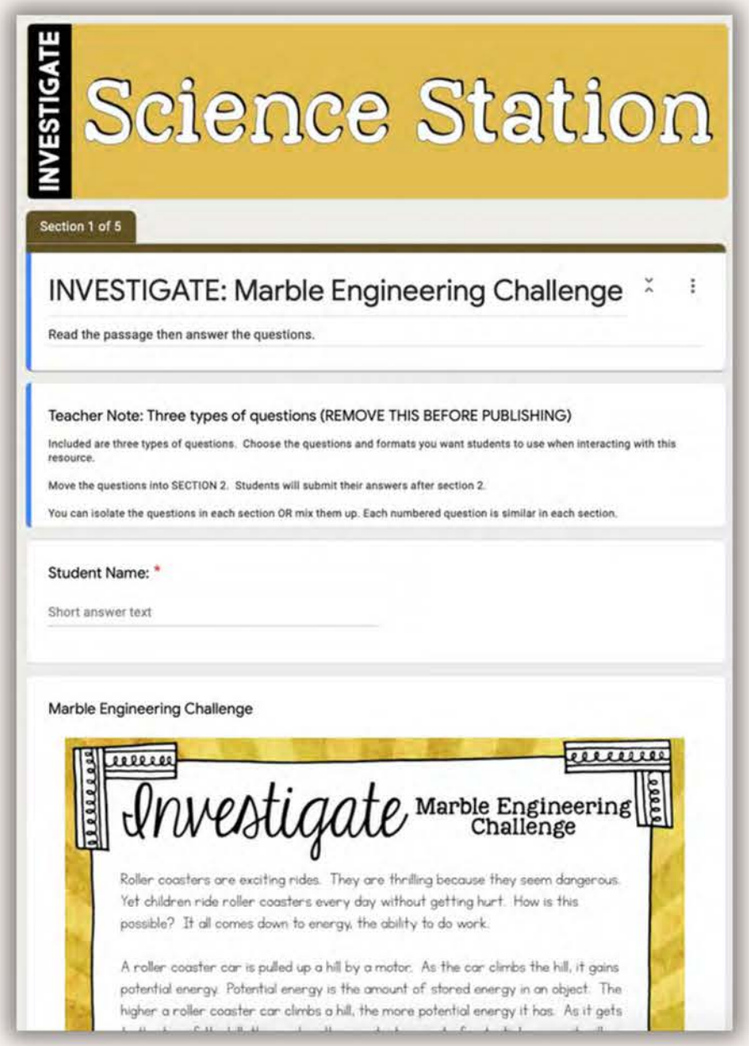
SHORT ANSWER & MULTIPLE CHOICE

INVESTIGATE: Marble Engineering Challenge





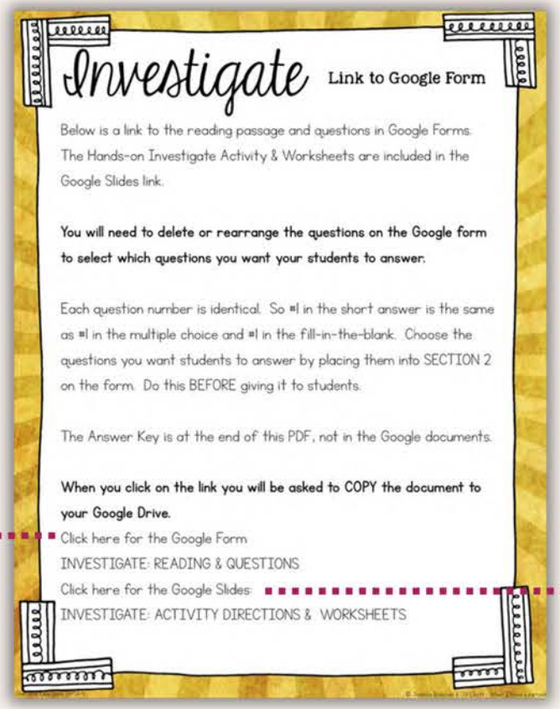
INVESTIGATE: Marble Engineering Challenge

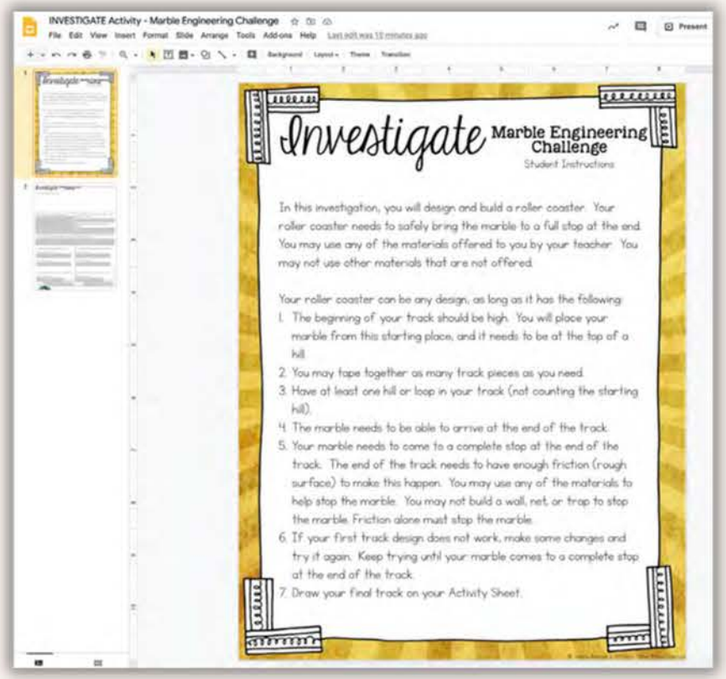


DIGITAL VERSIONS

- ✔ Google Sheet with activity & Directions
- ✔ Google Form with Reading & Questions

Answer keys provided





TEACHERS LOVE IT!

This was a wonderful experience for students to take part in. It tied perfectly to our science unit and allowed the children to be completely engaged, while still being challenged, as they worked through each step of the project. I will be using this for years to come!

Kristen H.



This was a great resource for our science unit. I like the variety of activities in the different lessons that are available. Students were engaged with the activities.

Tiffany L.



My passion is making learning accessible to all students.
I love scaffolding learning, breaking down the concepts and building them up so that students can see the connections.
I love figuring out the small components that build up to the big ideas and helping students see it all.



teach MATH | teach SCIENCE | teach READING | teach WRITING

What I have LEARNED