



Newton's Third Law of Motion - A STEM Lab

What I Will Be Learning In This Mastery Badge:

In this mastery badge we will learn about Newton's Third Law of Motion.

What This Packet Includes:

It is important that you complete all aspects of this packet so that you gain the knowledge and skills that we are working on.

I. **Discovering Lab**

A discovering lab is a fun, introductory lab, where we discover the knowledge on our own.

II. **Video Instruction**

You will watch a video presented by Mr. Bertoch, and answer questions about it.

III. **Literacy Practice**

Reading and writing are critical life skills, and also very important to science. You will read the assigned article and complete a writing prompt.

IV. **Applying Lab**

An applying lab is how you pass off the Mastery Badge. It serves as the quiz. It is a hands on demonstration that you have mastered the skills and content of this badge.

Key Things We Will Learn In This Mastery Badge

Some of the most important things we will learn in this mastery badge:

- Issac Newton
- The Laws of Motion
- The Third Law of Motion
- What happens when you push against another object?
- How does this reaction occur on Earth?
- How does this reaction occur in space?

Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Newton's Third Law of Motion

Directions: Follow the directions below to learn about Newton's Third Law of Motion



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To learn as much as you can about Newton's Third Law

Humpty Dumpty drove in his car. Humpty Dumpty didn't get far... because he crashed into a wall! But I mean, who gave an egg a driver's license anyway! That seems like an oversight on the part of the DMV.

Your job is to build Humpty Dumpty protective gear that can keep him from breaking the next time he crashes. (Because he is a really bad driver!)

Supplies For This Lab

For this lab, you will need an egg, a small car, and anything else you want to use to protect your egg from breaking. Note that an inexpensive option for a car is a pinewood derby kit. Which you can get at most local BSA stores. Home Depot also often sells really good wooden car kits for little money.

Build A Basic Car

For this lab, you will need a vehicle for Humpty Dumpty to ride on. Have fun making the car, but don't spend too much time on it. Your car does not need to be overly complicated. Just a place for your egg to rest, and four wheels.

Decorate Humpty Dumpty

Once again, have fun with this, but don't spend too much time on it. Also, don't get attached... because he may die.

Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. When solving a new problem they always start by first planning. They often use computer programs for this, such as Autocad. Before computers, though they did this planning using paper and pencil, which is what we will be doing.

Later in this lab, you will be crashing your car and its passenger into a wall. How can you protect the egg from breaking? You are allowed to use anything you want. From seatbelts to padding.

Diagram and protective measures in the space provided.



Put Your Design Into Action

Now that your design is completed, it's time to build it. Place your egg inside a sandwich baggie (to protect your home from the mess) and then set your egg onto your car. Use the protective measures you invented to help protect your egg.

Test Your Design

Build a ramp with the end of the ramp being no more than a few feet away from a wall. You want your ramp to be at least five feet high. A good way to build a ramp is to use a staircase and cardboard. You can also use a folding table, or just hold a board in the air.

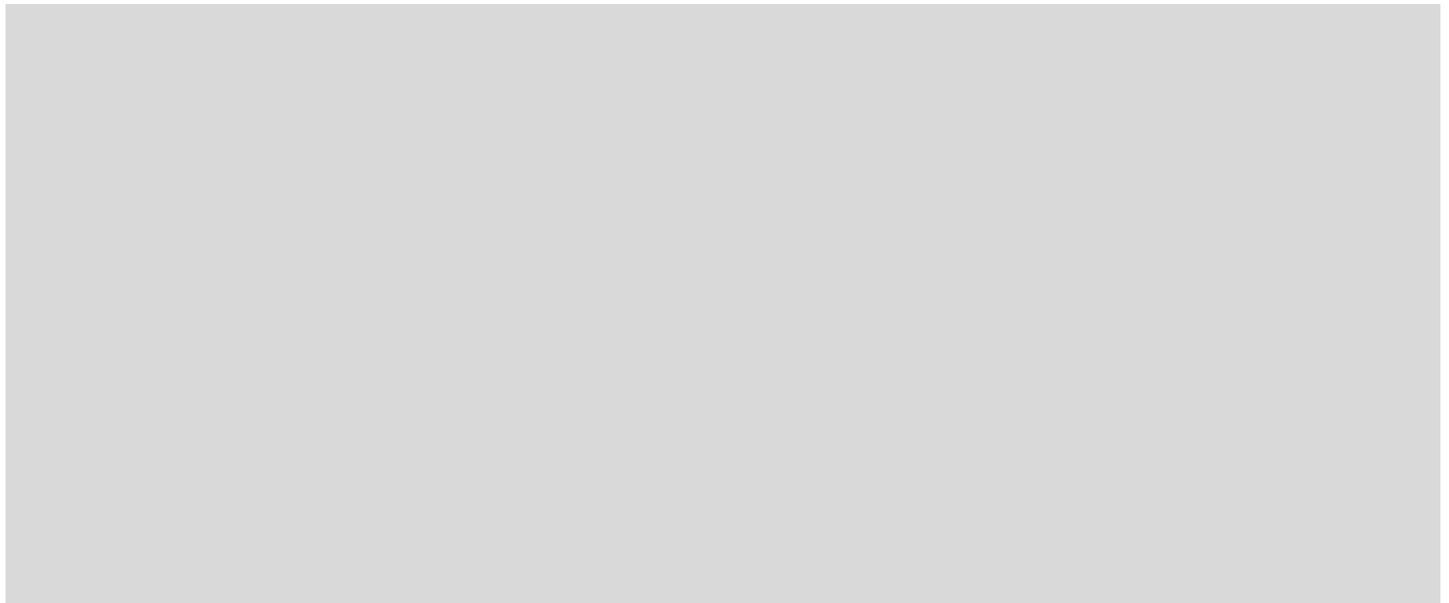
Once your ramp and car are ready put your car at the top of the ramp, and let it go down until it crashes into the wall.

Record your results below. Explain what happened in detail.



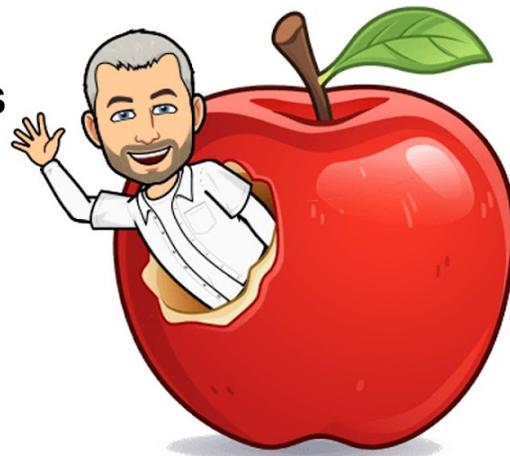
The Engineering Process

Engineers are always improving their designs. No matter how good an idea or technology is, there is always room for improvement. What could you do to improve the design of your protective devices?



Video Instruction

Reviewing The Teacher's Instruction At My Own Pace



Handsome Science Teacher One Take Videos

Now that you have completed the Discovering Lab let's watch the video that goes with it. In this video Mr. Bertoch will help connect the discoveries that you made during the lab to the broader concepts covered under this badge, and will also introduce the vocabulary that goes with these concept.

Take Your Time, Pause And Rewind As needed

You are not in a hurry! It is more important that you understand the concepts in this video than that you finish it quickly. Take your time. If you don't understand something, pause the video and use the Internet or other resources to look up the concept that has you confused.

When you finish this video, you should have a good understanding of the concepts that have been taught. If you find yourself confused, rewind, and rewatch.

The Video For This Mastery Badge Can Be Opened Using This QR Code

This Mastery Badge includes one video:



Watch The Assigned Science Video

Scan This QR Code To Open And Watch The Assigned Video For This Mastery Badge

Check Point

Let's make sure that you really did take your time and watch the video carefully! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I watched the video carefully, and paused to look up anything I didn't understand.

Recording Your Learning

On the next page, you will record your learning and connect it to things you already know.

Ten Things I Learned From This Video

A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed in this video.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

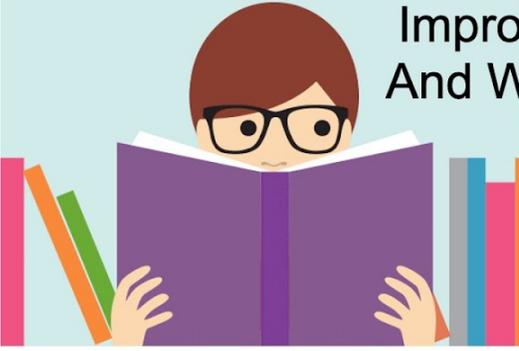
Now, Let's Connect These New Concepts To Things You Already Knew

Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

Write a paragraph explaining how the concepts taught in this video relate to things you already knew. There are no wrong answers. What are some things that you already knew that this video reminded you of?

Literacy Practice

Improving Our Reading
And Writing In Search of
Knowledge



Activity: Reading And Writing About Lunar Phases

Directions: Reading and writing are very important life skills. Good scientists must be able to learn through reading and communicate their own discoveries through writing.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

1. Practice Reading For Understanding

Read the article below **for understanding** . Reading for understanding means that you take your time and monitor your own learning. If you get to the end of a sentence and you do not remember or understand what you read, **re-read it**.

2. Practice Writing To Communicate

Complete the writing prompt below. Do your very best to write clearly so that others will understand what you are saying. This means using correct spelling, grammar, and writing, taking your time to think about the best ways to clearly communicate to others the main ideas that you are trying to get across to them.

Article:



Read The Assigned Article Carefully For Understanding.

<https://handsomescienceteacher.com/Online-science-classes-kids/newtons-third-law-of-motion/>

Scan This QR Code To Open And Read The Article That Goes With This Mastery Badge

Check Point

Let's make sure that you really did read for understanding! Remember that it is important to hold yourself accountable to a high standard and to take pride in your own success as a learner.

I Read For Understanding. I did not skim the article. I understood the material that the article discussed.

Quiz Time

Complete the quiz at the end of the article and post your score in the box below. Your goal is to get at least 75% on the quiz. Did you accomplish this goal?

%

Now Let's Write To Communicate

Remember that when you write to communicate you are taking your time, and explaining the topic in a detailed and concise way. Don't rush! You are not in a hurry. Think about what you are going to say, and plan how you will say it. So that someone else who reads your paragraphs will understand them easily.

Writing Prompt: Write two paragraphs in your own words explaining Issac Newton's Third Law of Motion.

Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Directions: Follow the steps outlined below to create an improved sailboat design.



Video Instructions Available For This Assignment. Watch this video to learn how to do this assignment, and why it is important.

Scan This QR Code To Watch Mr. Bertoch Give You Directions For This Assignment

Goal: To use the engineering process in order to create an improved sailboat.

That incorrigible Humpty Dumpty has just been released from the hospital and is eager to go on his next drive down the ramp you built for him! If he didn't break in your first trial, great work! But, we can still do better.

Supplies For This Lab

For this lab, you will need an egg, a small car, and anything else you want to use to protect your egg from breaking. Note that an inexpensive option for a car is a pinewood derby kit. Which you can get at most local BSA stores. Home Depot also often sells really good wooden car kits for little money.

What Can You Do To Improve Your Design?

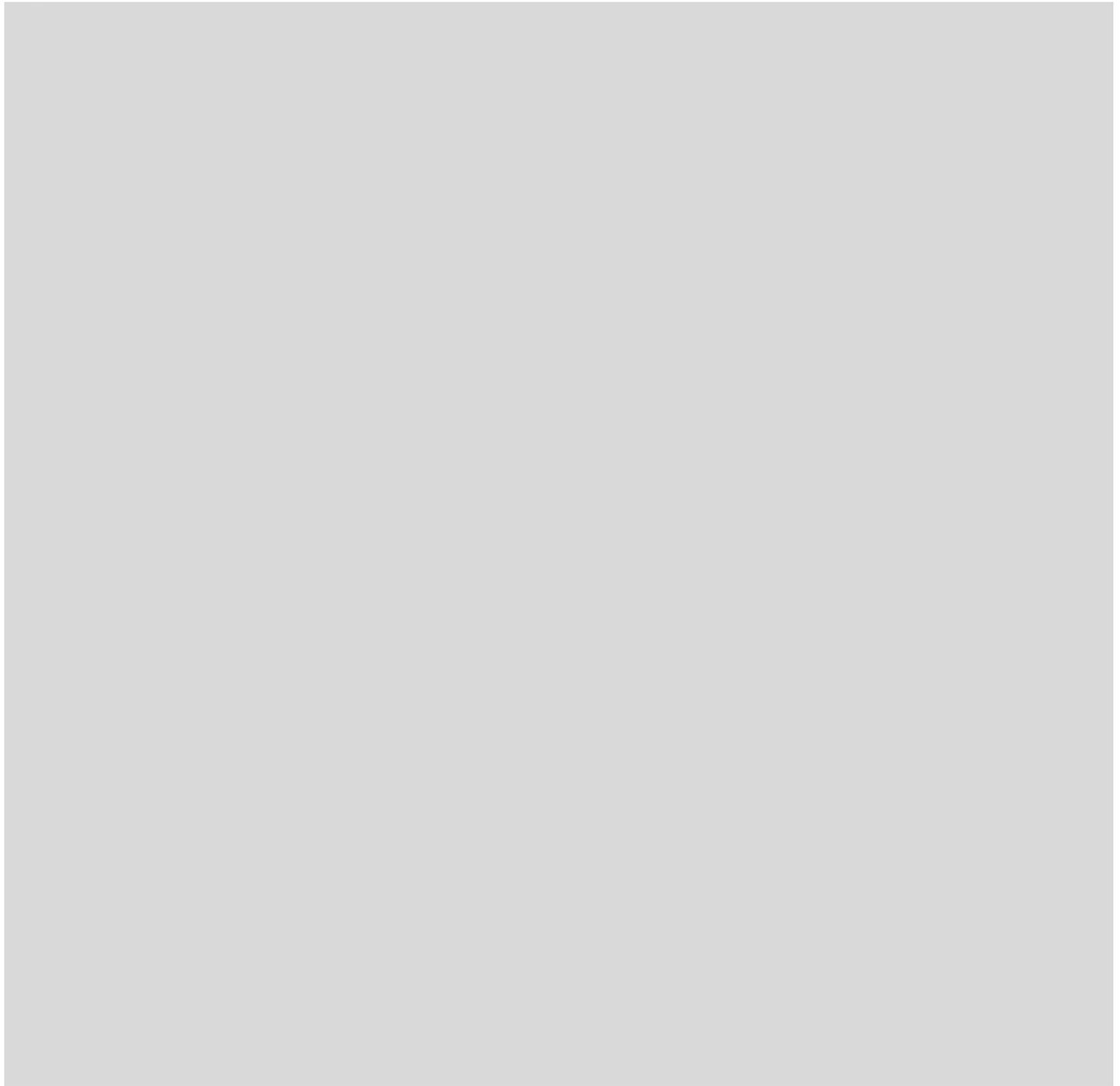
If your egg broke on the first trial, then your goal is to improve your design so that your egg does not break this time. If your egg survived on the first trial then your goal is to increase the force of the crash so that it is more violent. (Do not damage your wall!)

Plan Your Design

Engineers are a special kind of scientist that create ideas and inventions to solve problems. When solving a new problem they always start by first planning. They often use computer programs for this, such as Autocad. Before computers, though they did this planning using paper and pencil, which is what we will be doing.

Later in this lab, you will be crashing your car and its passenger into a wall. How can you protect the egg from breaking? You are allowed to use anything you want. From seatbelts to padding.

Diagram and protective measures in the space provided.



Put Your Design Into Action

Now that your design is completed, it's time to build it. Place your egg inside a sandwich baggie (to protect your home from the mess) and then set your egg onto your car. Use the protective measures you invented to help protect your egg.

Test Your Design

Once your ramp and car are ready put your car at the top of the ramp, and let it go down until it crashes into the wall.

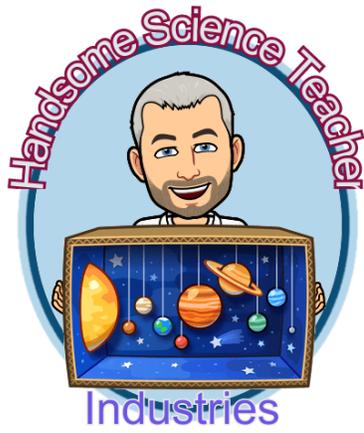
Record your results below. Explain what happened in detail. Was your design more effective this time?



The Engineering Process

Engineers are always improving their designs. No matter how good an idea or technology is, there is always room for improvement. What could you do to improve the design of your protective devices?





Congratulations! You Have Completed The Entire Mastery Badge

You have worked really hard to earn this mastery badge. More importantly, you have worked hard to earn your knowledge!

Time To Evaluate Your Work

Check each of the following to evaluate your work:

1. Did you do every assignment?
2. Did you read the assigned article?
3. Did you watch the assigned video?
4. Did you answer all the questions using complete sentences?
5. Are your answers accurate?

My Self-Evaluation:

Based on the criteria listed above, I believe I have passed off this Mastery Badge because...
(Be detailed and specific)

Mastery Badge Counselor Evaluation:

I have reviewed this student's work. Based on the criteria listed above I hereby certify that they have passed off the Mastery Badge because... (Be detailed and specific) Note: Any adult may serve as a Mastery Badge Counselor, so long as they are committed to ensuring the highest standards of excellence.

Student's Signature

Date

Signature of Mastery
Badge Counselor

Date

Certificate For Your Homeschool Records

The following certificate which has been awarded through self-evaluation by the student, and also certified by a mastery badge counselor proves that the student listed thereon has completed all the work and has mastered all the concepts for the specified topic.

Keep this on file as evidence of your successful completion of this topic.

If audited by the State, these certificates stand as evidence that you have worked on and successfully completed a rigorous science curriculum.



The certificate features a decorative border with a repeating floral pattern. On the left side, there is a circular logo with a cartoon man's face and the text "Handsome Science Teacher Industries". The main title "Mastery Badge Certificate" is centered in a large, bold, black font. Below the title, the topic "Topic: Newton's Third Law of Motion" is written in a purple font. A line for the student's name is provided. The central text certifies the student's completion of the requirements. At the bottom, there are two lines for signatures and dates, with a small version of the logo on the right.

Mastery Badge Certificate

Topic: Newton's Third Law of Motion

Student Name: _____

This certificate certifies that the person named above has completed all of the requirements to earn this Mastery Badge.

MASTERY BADGE COUNSELOR SIGNATURE

DATE AWARDED

