



Filtering Water A STEM Lab

What I Will Be Learning In This Mastery Badge:

This is a STEM Mastery Badge. In this mastery badge we will work to solve problems surrounding water pollution.

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:

- Solving the water pollution problem.
- How Mesh Size Affects Water Filtration
- Creating your own water pollution solution.
- What is the engineering process?

Name: _____

Date: _____



Discovering Lab

Learning Through Hands On Activities



Activity: Discovering Pollution

Directions: You will follow the Engineering Design Process to create your own water filtration system.



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: Create the best water filtration system in the entire universe.

Problem: A flood has polluted the local water supply. Other residents of the community have called on you to build a device to clean the water so that everyone can safely drink. You must build your filter using only supplies available to you around your home. Create the best possible water filtration system that you can.

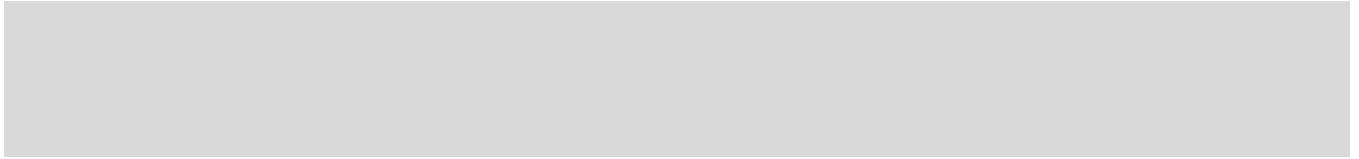
Possible Supplies:

You are allowed to use anything that is already found around your home. Do not go buy something new for this lab. Possible supplies include the following items. But this is just a list to spark your imagination. You are allowed to use anything else that you might have laying around.

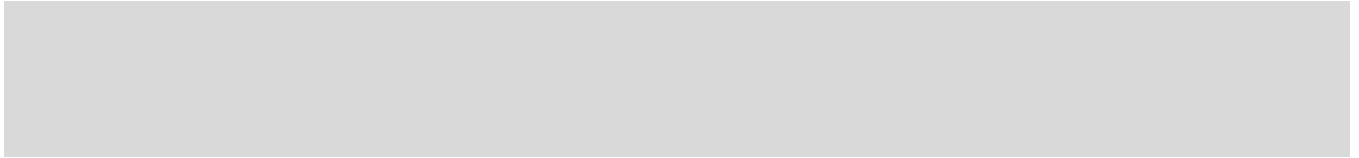
| | |
|------------------------|--------------------------------|
| Water Bottle | Screen Window Material |
| Cotton Ball | Material From An Old Sheet |
| Muslin Square | Hay or Straw |
| Cotton Material Square | Charcol From A Fishtank Filter |
| Sand | Coffee Filter |
| Pea Gravel | Old Sock |

Step 1: Ask

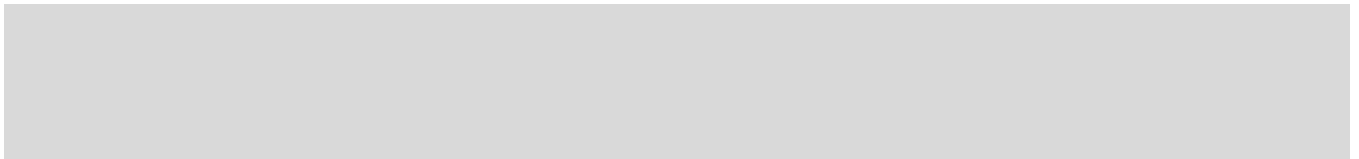
What types of materials might filter out both large and small particles found in water?



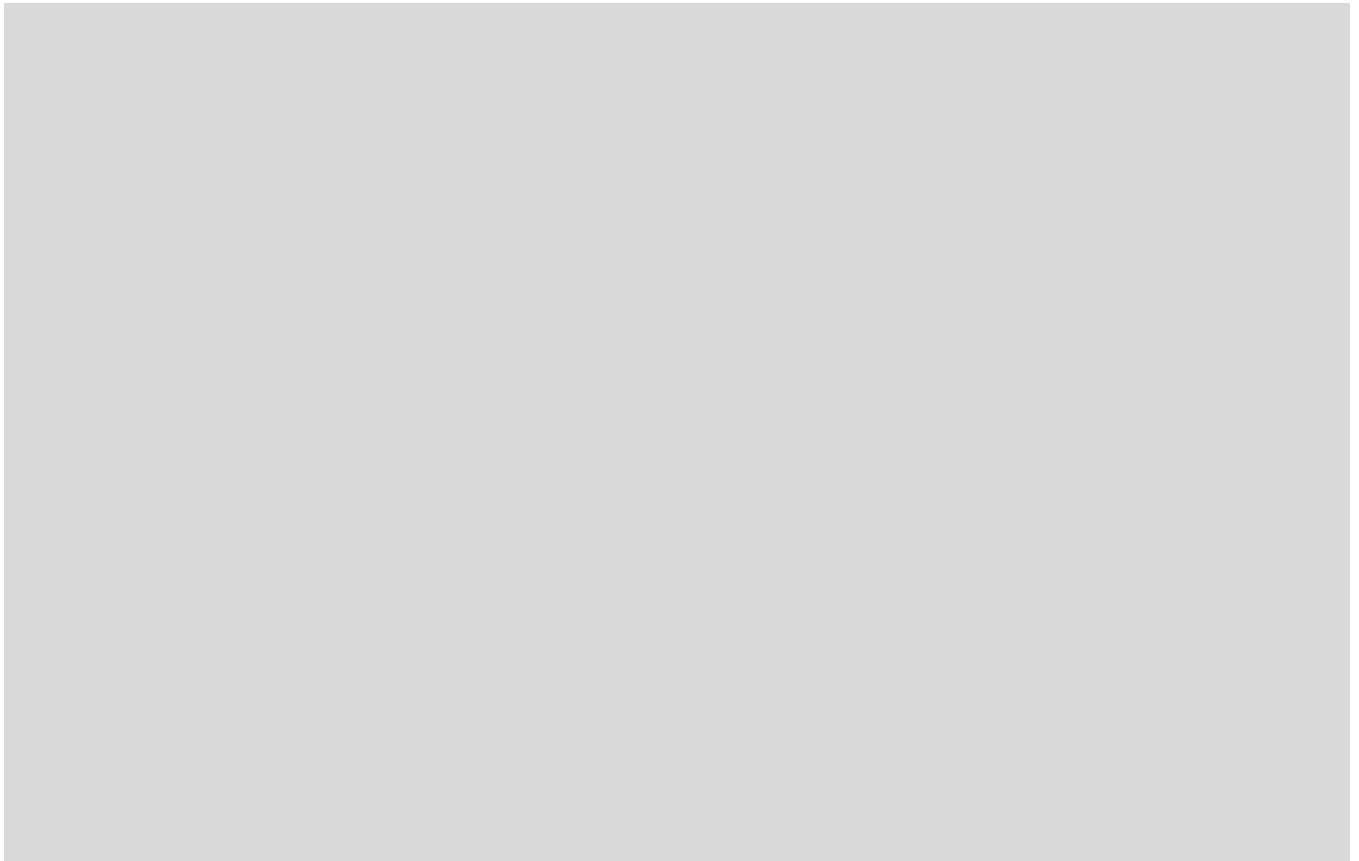
Do you think it matters what order you put these supplies in? Why or why not?

**Step 2: Imagine**

What are some ideas you can try as you design your water filter?

**Step 3: Plan**

Draw a picture of your design.



Step 4: Let's Create Polluted Water

We need some dirty (but safe) water for this experiment. You will be drinking this water later, so don't put anything in it that might be toxic. It is important to include things that are both large and also fine. Examples of large safe particles might include pepper, spices, rice, and so forth. Examples of fine particles might include cocoa powder, cool aide mix, and so forth. Make your water nice and polluted. Take time to stir it up super well, and give everything time to fully mix into the water.

Step 5: Build Your Filter

Now build an actual prototype based on the design you created earlier. To do this, take the supplies you planned to use, and assemble them into a water filter.

Step 6: Test Your Design

Test your design by pouring the polluted water you made earlier through your filter.

How long did it take for your water to pass through the filter?

Does your filtered water have any large particles in it?

How clear was your water?

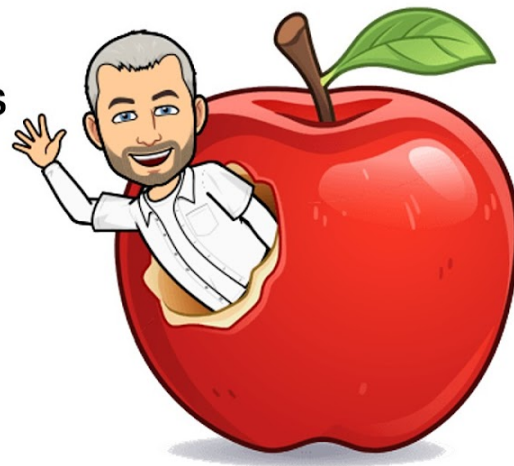
Step 5: Improve By Using The Engineering Process

Engineers are always working to improve their designs. They are never satisfied with the way things are. Instead, they are constantly looking for little ways they can make their designs even better. Now that you have built and tested your water filter, what could you do to make it even better?



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

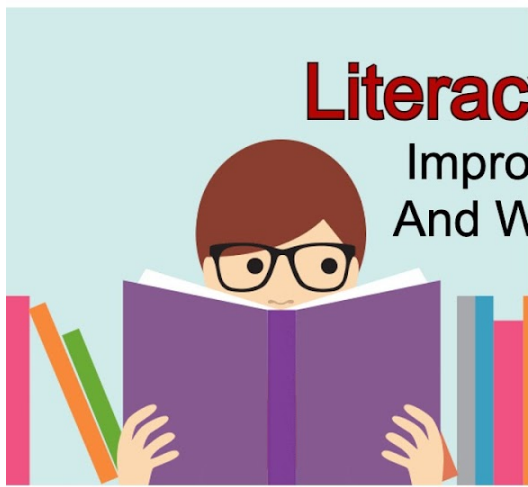
A powerful tool to help you retain what you learn is to take notes. Notes give you something that you can look back at later, to quickly remind your brain reinforcing the memories for the concepts you have learned. Record ten things that you learned or that you perhaps already knew that were discussed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

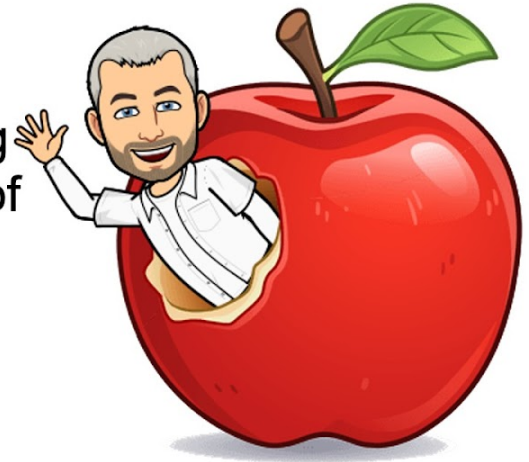
Another great way to help your brain retain new things is to connect these new concepts to other things that you already know. This gives your mind a place to store the new knowledge. Imagine that you are placing the new knowledge on a shelf in your brain next to facts that are already in there.

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

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/water-pollution-and-its-impact/>

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 discussing water pollution and its causes.

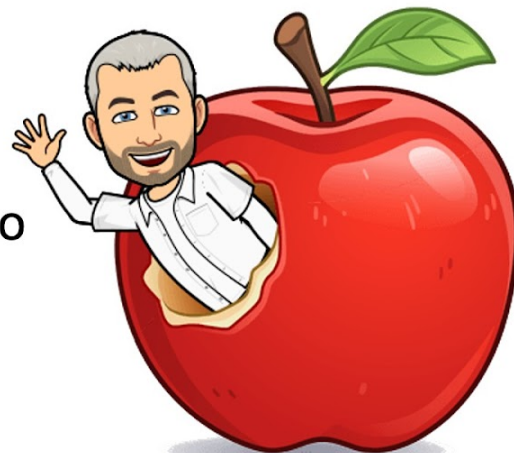
Name: _____

Date: _____



Applying Lab

Proving That We Can Do It Ourselves



Activity: Water Filter Part II

Directions: You will follow the Engineering Design Process to improve your water filter 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: Create the best water filtration system in the entire universe.

Problem: In the last lab you created a water filter. Now we are going to make it even better.

Remember, engineers are constantly working to improve their designs. Which is why technology is constantly advancing. In this lab you will work to improve your last design.

Possible Supplies:

You are allowed to use anything that is already found around your home. Do not go buy something new for this lab. Possible supplies include the following items. But this is just a list to spark your imagination. You are allowed to use anything else that you might have laying around.

| | |
|------------------------|--------------------------------|
| Water Bottle | Screen Window Material |
| Cotton Ball | Material From An Old Sheet |
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| Cotton Material Square | Charcol From A Fishtank Filter |
| Sand | Coffee Filter |
| Pea Gravel | Old Sock |

Step 1: Ask

What did you learn from your last design? What types of materials filter out both large and small particles found in water?

What did you learn in your last trial. How important was the order of the layers of supplies in successfully filtering the water?

Step 2: Imagine

How will you improve your design?

Step 3: Plan

Draw a picture of your design and insert it into the box.

Step 4: Create Polluted Water

We need some dirty (but safe) water for this experiment. You will be drinking this later, so don't put anything in it that might be toxic. It is important to include things that are both large and also fine. Examples of large safe particles include pepper, spices, rice, and so forth. Examples of fine particles include cocoa powder, cool aide mix, and so forth.

Make your water nice and polluted. Take time to stir it up super well, and give everything time to fully mix with the water.

Step 5: Build Your New And Improved Filter

Build the prototype of your design following the improved plan you just created.

Step 6: Test Your Design

Test your design by pouring the polluted water you made earlier through your filter. How long did it take for your water to pass through the filter?

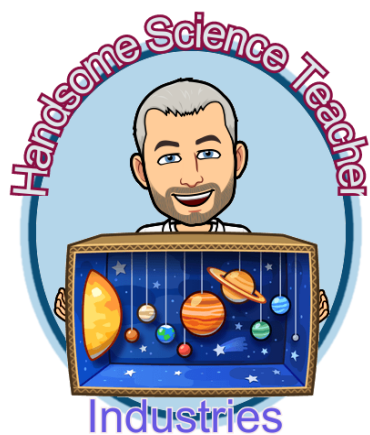
Does your filtered water have any large particles in it?

How clear was your water?

Describe your water sample:

Step 5: How did your second design compare to your first?

Our goal was to improve our design. Were you successful? Did your second design yield cleaner water than your first? Explain your results and how you achieved them.



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.

