

**Grade Levels:** Fourth Grade

**Time:** 20 minutes

**Brief Description of Lesson:** In this activity, students will become engineers and learn about filtration as they investigate the BEST way to make a water filtration system. The students will work with the instructors to create a water filtration from limited supplies.

FIU-EOW offers ways to **differentiate** to provide opportunities for all students to access the curriculum or standards. These are being provided as **suggestions**.

SCIENCE	TECHNOLOGY	ENGINEERING	MATHEMATICS
<p><b>Standard:</b> <b>SC.4.P.10.2:</b> Investigate and describe that energy has the ability to cause motion or create change.</p>	<p><b>Standard:</b> <b>ISTE: 1.4: Innovative Designer:</b> Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions.</p>	<p><b>Standard:</b> <b>3-5-ETS1-3 Engineering Design</b> 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.</p>	<p><b>Standard:</b> <b>MA.4.M.1.1:</b> Select and use appropriate tools to measure attributes of objects.</p>
<p><b>Activity:</b> The teacher will introduce water filtration and environmental sciences by watching the video below.</p> <p><a href="#">Water Purification Facts</a></p> <p>As students follow the engineering design process, they will need to observe how the layers of the materials will impact the water's ability to filter through the system and come out clean.</p> <p><b>VOCABULARY</b> <b>Contamination:</b> The presence of a substance where it should not be or at concentrations above the background. <b>Filtration:</b> the process in which solid particles in a liquid or gaseous fluid are removed using a filter medium that permits the fluid to pass through but retains the solid particles.</p>	<p><b>Activity:</b> Throughout the development of the engineering design process, students will have to test their water filtration systems to understand the purpose of each media layer and how long it takes for the water to filter through.</p> <p>The students will use a smart device to time the water filtration process. In addition, a camera will be used to take a time lapse of the filtration system at work.</p>	<p><b>Activity:</b> <b>Hook:</b> Have you ever thought about how there is always fresh water pouring out of your faucet? We have clean drinking water available at the tip of our hands because of water treatment plants. Today we will learn how to model a water filtration system used in real life. Are you ready?</p> <p><b>Problem:</b> How can we create a model filtration system that effectively cleans muddy water and does so in a timely manner?</p> <p><b>Measurable Goal:</b> Students will determine if they were successful in their project by evaluating if the filtration system meets the criteria:</p> <ul style="list-style-type: none"> <li>Water drains out of the system</li> <li>The water looks clear after being filtrated</li> </ul>	<p><b>Activity:</b> Students will have to use measuring cups to measure activated carbon, sand, and gravel/rocks.</p> <p><a href="#">Worksheet 1</a></p> <p>After recording the different measurements of media added and the time it took for the water to filter through the system, summarize the experiment's outcome in about two sentences.</p> <ol style="list-style-type: none"> <li>Cut off the bottom of the plastic bottle with scissors (keep the cap on).</li> <li>Stuff cotton balls into the neck of the bottle.</li> <li>Crush the activated charcoal (optional, but it will work best this way).</li> <li>Pour 1 Cup of the activated charcoal into the bottle.</li> </ol>

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<p><b><u>Filtration Tank:</u></b> filters the solid particles in a liquid or gaseous fluid and contains it, removing it from the water supply and preventing the potential for pollution or contamination.</p> <p><b><u>Pollution:</u></b> the introduction of harmful materials into the environment.</p> <p><b><u>Purification:</u></b> the physical or chemical process of removing contaminants from a compound. For example: water.</p> <p><b><u>Water treatment:</u></b> is any process that improves the quality of water to make it appropriate for a specific end-use, like water.</p> <p><b><u>Components:</u></b></p> <ul style="list-style-type: none"><li>• Plastic water bottles/soda bottles</li><li>• Cotton balls/coffee filters</li><li>• Sand</li><li>• Rock/Gravel</li><li>• Activated Charcoal</li><li>• Pair of scissors</li><li>• Plastic cup</li><li>• Mallet and a plastic bag</li></ul>		<ul style="list-style-type: none"><li>• No sediments are observed in the water outflow from the system</li><li>• Media layers remain in their original layering</li></ul>	<ol style="list-style-type: none"><li>5. Next add 1 Cup of sand to the bottle.</li><li>6. Then add 1 Cup gravel.</li><li>7. Loosen the cap and set your water filtration system on top of the plastic cup</li><li>8. Gently add muddy water into the top.</li><li>9. Observe what happens as the muddy water is filtered.</li></ol>
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<b>Differentiation:</b> Students will be given the opportunity to view the video before and after it is presented to the class. Watching the video before or after individually or within a small group will allow the students to pause the video and ask clarifying questions in a small group setting.	<b>Differentiation:</b> Students should be allowed to record their projects and look them over later. This accommodation will elevate any challenges around having to write down and describe the outcomes of their projects during the activity.	<b>Differentiation:</b> When putting together the filtration system, students should be allowed to reference the worksheet to use as a visual reference and a step-by-step demonstration of how to conduct the experiment.  Differentiated Planning Pages: <a href="#">Worksheet 1</a>	<b>Differentiation:</b> Differentiated recording worksheets:  <a href="#">Worksheet 1</a>