STEM Stories: All the Water in the World

Lesson Plan

STEM Career Connections: Mechanical Engineering, Environmental Scientist

STEM Disciplines: Science, Technology, Engineering, & Mathematics

Non-STEM Disciplines: English Language Arts

Design Challenge Problem/Scenario:

In Africa, two out of five people do not have clean water. Because so much of Africa's water is contaminated, many people struggle to stay healthy, go to school/work, grow food, and build houses. The villagers do not have a lot of money or materials available to them, so it is a challenge for them to find a low-cost, simple way to clean their water. Your team knows that a source for clean water would help solve these problems and improve the lives of thousands of people. So you decide to plan a trip to an African village and help.

Engineering Design Challenge:

Before leaving for Africa, your team's challenge is to design, build, and test a filtration system that could be used to remove harmful pollutants/contaminants from water. It is important to conserve clean water. While testing your design, beads will symbolize water and marbles will symbolize contaminated water.

Essential Question Students Investigate:

How can my team design a water filtration system that can provide clean water to a village in Africa?

Enduring Understandings:

- The use of collaboration and the engineering design process are both important when designing a product that can improve the quality of human lives.
- Throughout the hydrologic (water) cycle, contaminated water can move into an environment's water source, and harm organisms that live in that ecosystem.

English Language Arts Standards:

- RL.3.1 Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.
- RL.3.3 Describe characters in a story (e.g., their traits, motivations, or feelings) and explain how their actions contribute to the sequence of events.
- RI.3.4 Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a grade 3 topic or subject area.
- W.3.1 Write opinion pieces on topics or texts, supporting a point of view with reasons

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- SL.3.4 Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
- SL.3.6 Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Science Standards:

Science Inquiry and Applications, Technological and Engineering Design
During the years of PreK to grade 4, all students must develop the ability to:

- Plan and conduct simple investigations
- Employ simple equipment and tools to gather data and extend the senses
- Communicate about observations, investigations and explanations
- Review and ask questions about the observations and explanations of others
- Identify problems and potential technological/engineering solutions
- Understand the design process, role of troubleshooting

Grade 1: EARTH AND SPACE SCIENCE: Sun, Energy and Weather

- The physical properties of water change.

Grade 1: LIFE SCIENCE: Basic Needs of Living Things

- Living things have basic needs, which are met by obtaining materials from the physical environment.
- Living things survive only in environments that meet their needs.

Grade 2: EARTH AND SPACE SCIENCE: The Atmosphere

- The atmosphere is made up of air.
- Water is present in the air.

Grade 3: EARTH AND SPACE SCIENCE: Earth's Resources

- Earth's resources are limited.

Grade 4: LIFE SCIENCE: Earth's Living History

- Changes in an organism's environment are sometimes beneficial to its survival and sometimes harmful.

Mathematics Standards:

- Represent and interpret data. CCSS.MATH.CONTENT.3.MD.B.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units--whole numbers, halves, or quarters.
- Use place value understanding and properties of operations to perform multi-digit arithmetic. CCSS.MATH.CONTENT.3.NBT.A.2 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- Use place value understanding and properties of operations to perform multi-digit arithmetic. CCSS.MATH.CONTENT.3.NBT.A.2 Multiply one-digit whole numbers by multiplies of 10 in the range 10-90 (e.g., 9 x 80, 5 x 60) using strategies based on place value and properties of operations.
- Represent and solve problems involving multiplication and division. CCSS.MATH.CONTENT.3.OA.A.1 Interpret products of whole numbers, e.g., interpret 5 x 7 as the total number of objects in 5 groups of 7 objects each.

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- Represent and solve problems involving multiplication and division. CCSS.MATH.CONTENT.3.OA.A.1 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
- Multiply and divide within 100. CCSS.MATH.CONTENT.3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 x 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.
- 3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b

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Materials List:

Material	Quantity per Team	✓	Quantity per Kit	✓
Marbles	10		2 packs	
Beads	1		2 packs	
Toothpicks	10		2 packs	
Rubber bands	7		1 pack	
Plastic Cups	1		10	
String	1 yard		1 ball	
PowerPoint	~		1	
Pre-Activity Survey	~		25 copies	
Post-Activity Survey	~		25 copies	
Cardstock	1 sheet		1 pack	
Handouts	~		25 copies	
Paper *(For team design sketch)*	1 sheet		15 sheets	

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Activity 1

Prior Set-up:
Put the following words on the board or on chart paper before the lesson begins: Flows, Wobbles, Cascaded, Meandered, Wavered, Guzzles, Avalanche, Stampede, Wealth, Rustle, and Precious. Find these words in the book, *All the Water in the World*. You might want to mark them with post-it notes for later.

Introduction: 5 minutes
Review the Engineering Design Challenge from the last module and ask students about their favorite parts. Explain that today we are beginning a new challenge and it has to do with water. On the board, write the word "water" in big letters, and invite the students to brainstorm what they know about water. Create a web from the word "water" with the students' contributions.

Pre-Reading: 10 minutes

Ask students to close their eyes, and imagine their favorite activity with water. When you ask them to open their eyes, invite them to share what they imagined. Share some pictures of water activities (pictures are at the end of the PowerPoint presentation), and ask the students to share connections to them. Talk with the class about the important role water plays in our lives, from playing and having fun to cleaning, eating and drinking. All living things rely on water, and humans rely on clean, safe water to stay healthy.

Read Aloud: 15 minutes
Introduce the book, *All the Water in the World* by George Ella Lyon by showing the students the cover. Tell the students the book is written like a poem, and ask them to share what they know about poetry. Share that a poem is writing that plays with words. Read the book aloud, for enjoyment of the poetry and figurative language. Try to read the book with few stops for discussion or comments.

Post Reading: 20 minutes
Have the students look at the following list of words that were written on the board or on a large piece of chart paper before the lesson begins.

1. Flows
2. Wobbles
3. Cascaded
4. Meandered
5. Wavered
6. Guzzles
7. Avalanche
8. Stampede
9. Wealth
10. Rustle
11. Precious

Pass out the Vocabulary Knowledge chart handouts. Read each word, and ask the students to give a thumbs up if they think they know what the word means, and a thumbs down if

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they do not know the word. You can use this as an informal assessment of their vocabulary knowledge. Also, ask the students to mark how well they think they know each word. Tell the students to pay attention to these words as the story is read again, and try to infer their meaning from the story.

Read the book again, stopping each time you come to one of the identified words to invite inferences about its meaning. Spend just a minute or two on each word, and offer a definition after inviting the students to share inferences.

Ask the students to share a favorite word or line in the book, and talk about how the author creates beautiful images of water with specific words. Poets choose words carefully to communicate a specific message.

Wrap up: 5 minutes

- Ask the students to tell what a poem is and one new word they remember from the story, including what it means.
- Ask the students why water is important and to name some ways we use water.
- Preview next session by telling the students that they will learn about the Engineering Design Challenge.
- Distribute the parent letter to each student.

Activity 2

Introduction: 10 minutes

- Show students *All the Water in the World.*
- Remind students that we learned some new words yesterday (have anchor chart displayed). Have students use a hand signal whenever they hear one of the words in the story (could be hand to ear like they are listening, or a thumbs up).
- Re-read story and watch for student hand gestures, stop when students make hand gestures and ask them if they remember what the word means
- Have students re-state the main idea of the book to a partner ("What is this story mostly about?").

Quick Write: 20 minutes

Ask students to open up their STEM notebooks, and write "Entry #(x)" and the date on the next blank page. Pass out the strips of paper with one line from the book on each. Ask students to paste their strip at the top of the blank page.

Tell each student to read their line out loud to a partner, then write what the line makes them think or feel about water. They can write about how they use water, what their line reminds them of about water in their daily life, or something else the line makes them think or feel.

Students can also draw pictures to illustrate their line and their written response. Students should try to write or draw for 7-10 minutes. Use an online stopwatch or a timer to help students keep time. When time is up, ask students to share their responses with a different partner, then invite students to share in "author's chair" with the large group.

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Application: 20 minutes

- Display slide 1 of the PowerPoint: Ask the students to share some ideas about what engineers do for their jobs.
- Slides 2 & 3: Continue the discussion about what engineers do for their jobs.
- Slide 4: Show the Engineering Safer Drinking Water in Africa video
- Slide 5: Present the Design Challenge Problem.
    - Design Challenge Problem:
      In Africa, two out of five people do not have clean water. Because so much of Africa's water is contaminated, many people struggle to stay healthy, go to school/work, grow food, and build houses. The villagers do not have a lot of money or materials available to them, so it is a challenge for them to find a low-cost, simple way to clean their water. Your team knows that a source for clean water would help solve these problems and improve the lives of thousands of people. So you decide to plan a trip to an African village and help.
- Slide 6: Present the Engineering Design Challenge.
    - Engineering Design Challenge**:**
      Before leaving for Africa, your team's challenge is to design, build, and test a filtration system that could be used to remove harmful pollutants/contaminants from water. It is important to conserve clean water. While testing your design, beads will symbolize water and marbles will symbolize contaminated water.
- Slide 7: Explain the Design Goals.
    - Build a filtration system with a mixture of beads and marbles that will be used to symbolize water where:
        - Beads represent clean, drinkable water.
        - Marbles represent contaminates in the water.
    - Only materials provided may be used: a cup, toothpicks, rubber bands, string, and cardstock.
    - The cup must be able to collect and hold clean water (beads). The design can be attached to the cup.
    - Only clean water (beads) should fall into the cup, while the contaminated water (marbles) remain above the filter.
    - Have fun!!
- Slide 8: Introduce the resources/materials available.
- Slide 9: Explain the design testing procedures.
    - Pour a mixture of marbles and beads onto the filter.
    - A successful design will:
        - Allow only beads to collect in the cup.
        - Filter (block) all marbles from entering the cup.
- Slide 10: Explain the Engineering Design Process
    - Give students the Engineering Design Process Graphic Organizer STEM Challenge handout and the All the Water in the World: Engineering Design student handout.
- Slide 11: Have the students complete the "Ask" step of the Engineering Design Process.
    - Ask the students to notice that the word <u>Ask</u> is in one of the circles of the Engineering Design Process both on the PowerPoint and the All the Water in

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the World: Engineering Design student handout.
    - Students should Ask themselves what materials they would like to use to build their water filtration device.
    - Students should write these materials on their STEM Challenge handout.
    - Walk around as the students complete the Ask step of the Engineering Design Process.
- Explain to the students that the next time they meet, they will spend time on the Imagine step in the Engineering Design Process. In fact, you can ask students to start imagining what their product will look like when they are at home, and they can share their ideas with their families.

Wrap Up: 10 minutes

Review what was learned during today's session.

- Ask the students one word they remember from the story, including what it means.
- Ask the students why water is important and to name some ways we use water.
- Remind the students of the Engineering Design Challenge.
- Preview the next session by explaining to students that they will continue the Engineering Design Process so that they can imagine and plan building their water filtration device.
- Distribute the parent letter to each student.

Activity 3

Introduction: 5 minutes

- Remind the students that during the previous session they read and discussed the book *All the Water in the World* by George Ella Lyon and were presented with a Design Challenge Problem and Engineering Design Challenge. Generate a discussion about the Design Challenge Problem and Engineering Design Challenge. Do a "picture walk" through the book to remind students of the main idea.

Engineering Design Process: Imagine and Plan, 20 minutes

- Distribute the students' folders and ask them to take out the All the Water in the World: Engineering Design student handout and STEM Challenge handout.
- Display slide 12 of the PowerPoint:
    - Ask the students to notice that the word Imagine is in one of the circles of the Engineering Design Process both on the PowerPoint and the All the Water in the World: Engineering Design student handout.
    - Students should Imagine what their water filter will look like. Remind the students that the design should allow the small beads to pass through and land in the cup while filtering out the larger marbles.
    - Students should draw a picture or write a description of their water filter on their STEM Challenge handout.
    - Walk around as the students complete the Imagine step of the Engineering Design Process.
    - Ask the students to share their ideas with their team.

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- Walk around as the students share their ideas with their teammates. Make sure that each student is given ample time to share his or her ideas. Students get excited about wanting to make a water filter and often rush through the sharing process. Remind students that the sharing process is extremely important as engineers often alter their designs based on ideas shared during the brainstorming process.
- Ask the students to notice that the word Plan is in one of the circles of the Engineering Design Process both on the PowerPoint and the All the Water in the World: Engineering Design student handout.
- Students should Plan as a team what their water filter will look like.
- Students can use a teammates' ideas or a combination of the teams' ideas, but remind them that they must create one water filter together as a team!
- Students should draw a picture or write a description of their water filter on their STEM Challenge handout.
- Walk around as the students complete the Plan step of the Engineering Design Process.
- Make sure all students are contributing to the planning process. Often the dominant students expect the other students to use his or her ideas. Remind students that coming to a team consensus is important as engineers are often expected to work and plan with a group of people.
- Ask the students probing questions about their water filter:
  - How did you combine your individual design ideas?
  - Why did you choose that design?
  - How did you create the idea for this design?
  - What are your reasons for selecting the materials for your water filter?
  - Suppose a company decided to use your team's ideas for an actual water filter that they plan to build. How easy would it be for them to mass produce your design?
- Before allowing teams to build their water filter, require them to gain approval of their sketch of the team's prototype design idea. You can write "Approved" beside the sketch on a student's paper or hand them a note card with "approved" written on it. A colored note card works nicely as you can easily see if a team has the note card on their desk or table before they begin to work with the materials.

Buying Time!: 15 minutes

- Students work as a team to decide what materials they want to purchase to create a water filter. The materials are on the All the Water in the World: Buying Time! handout. Students should use the table in the handout to record the number of each item they want to purchase, the cost associated with each item, and the total cost of all items.
- Walk around the room as the students discuss the materials they would like to purchase.
- Once a team is ready to purchase their materials, have them tell you the cost of the materials they would like to purchase and the change they should receive.

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Teams Build Their Water Filters: 20 minutes

- Slide 12:
    - Ask the students to notice that the word Create is in one of the circles of the Engineering Design Process both on the PowerPoint and the All the Water in the World: Engineering Design student handout.
    - As the students are building their water filters, walk around the room and ask them probing questions about their design. For example:
        - Why did you select that material for your design?
        - How big are the beads? How big are the marbles?
        - Will your design be sturdy enough if we pour marbles on it?

Notes for design and building:

The goal is to design a filtration system that will filter out the beads from the marbles. The filter can be placed on top of the cup so that the beads collect inside the cup, while the marbles remain above the filter (assuming the marbles are larger than the beads). Thus, the design needs to be placed inside the lip of the cup. The filter should be built using toothpicks, rubber bands, string, and cardstock. Filters may be integrated into the cup (the design doesn't need to have a removable filter).

Informal Testing: If time allows or for early finishers

- Slide 12:
    - Ask the students to notice that the word Improve is in one of the circles of the Engineering Design Process both on the PowerPoint and the All the Water in the World: Engineering Design student handout.
    - Tell the students that the official testing of the water filters will take place next time, but that they can try pouring marbles and beads on their designs as a means for helping them to improve their designs.

Wrap Up: 5 minutes

- Ask students to place their handouts and materials in a safe location and to clean up their area.
- Distribute the parent letter to each student.

Activity 4

Introduction: 10 minutes

- Show the students the book, *All the Water in the World*, and ask them to raise their hands and offer a one-sentence summary of the book. Invite as many one-sentence summaries as time allows. Alternatively, ask the students to turn to a partner and tell a one-sentence summary of the book. Remind students that they are working on designing a water filter.
- Help teams of students locate their handouts and materials.
- Remind the students that during the previous session they built a water filter.
- Today, students are going to test their water filter.

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Water Filter Official Testing: 20 minutes

- Each team tests their prototype water filters while other teams observe.
    - A mixture of marbles and beads are poured onto the filter. A successful design will:
        - Allow only beads to collect in the cup.
        - Filter (block) all marbles from entering the cup.
    - After each test, place the team's cup in a safe place so that the beads and marbles stay in the cup. Students will need to count the beads and marbles in their cup after each team's water filter is tested.
    - Celebrate each team's design by having the class applaud for that team after that team shares their design.

Fractions of the Mixture: 10 minutes

- Ask students to:
    - Count the number of beads in their cup.
    - Count the number of marbles in their cup.
    - Calculate the sum of the number of beads and marbles.
    - Create a fraction that represents the number of beads in the total mixture.
    - Create a fraction that represents the number of marbles in the total mixture.
- Have students share their results with the entire class.

Reflection/Wrap up: 15 minutes

- Slide 13: Ask students to discuss with their team:
    - What do you like best about your water filter design?
    - What would you change about your water filter design?
    - What aspects of other team designs stood out to you?
    - Did other designs give you ideas for ways to improve your design?
    - What modifications would you make if we had time to complete the design challenge again?
    - How did the materials affect the ability of your water filter to withstand the forces applied to them?
    - Why is it important to protect the Earth's water?
    - How does having the ability to filter contaminants from polluted water benefit an ecosystem's living things, including humans?
- Students should complete the All the Water in the World: Test and Improve Your Device handout.
- If time permits, ask some students to share their ideas with the entire class.
- Ask the students if they have any ideas as to what type of scientist or engineer might work with water filters?
- Ask students to place their handouts and materials in a safe location and to clean up their area.

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Activity 5

Introduction: 5 minutes

- Last time we tested our designs and reflected on how we can make our designs better.
- Today we are going to redesign our water filters and test them again to see if we have made them better.

Water Filter Redesign and Construction: 30 minutes

- Slide 14:
    - Students use what they have learned testing their first designs to build a second redesigned water filter.
    - As the students are building their redesigned water filters, walk around the room and ask them probing questions about their redesign. For example:
        - How well did your first design work?
        - Why are you making that change?

Redesigned Water Filter Testing: 20 minutes

- Each team tests their redesigned water filters while other teams observe.
    - A mixture of marbles and beads are poured onto the filter. A successful design will:
        - Allow only beads to collect in the cup.
        - Filter (block) all marbles from entering the cup.
    - Celebrate each team's design by having the class applaud for that team after that team shares their design.

Wrap Up: 10 minutes

- Ask students to place their handouts and materials in a safe location and to clean up their area.
- Slide 15: Conclude by discussing the following questions as post-activity surveys are distributed.
    - What ideas do you have for engineering a better world?
    - How can you turn ideas into reality?
- Allow time for students to complete their post-activity survey.
- Distribute the parent letter to each student.

Activity 6 (Optional)

Optional Day:

- This is a follow up to the poetry book, *All the Water in the World* and gives the students time to work on writing poetry.
- This is also a follow up to the water filtration activity that sorted objects based on their size. It discusses the ideas of mass, volume, and density.

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Materials:

- Scale
- Large clear cups
- Small clear cups
- Small bowls
- Plastic spoons
- Snacks such as raisins, Oyster crackers, dried peas, Cheese Puffs, etc…
- Salt
- Sugar

Introduction: 5 minutes

- Help teams of students locate their handouts and materials.
- Remind the students that during the previous session they read a book and explored water filtration.
- Today, students are going to create poetry and make a snack.

Physical Properties of Materials: 15 minutes

- Place the words “filter” and “sort” on the board.
- Ask the students how these words are the same and how they are different.

(Sort: to separate according to certain criteria)

(Filter: verb: to sort, sift, or isolate, noun: a device used to separate items)

- Ask the students what criteria they used to sort the marbles from the beads. Collect the ideas of the students on the board and discuss them. Typically, all of the student’s designs for a water filter are designed to sort based on the criteria of size.
- Ask the students for other physical properties that can be used to sort objects. Collect these ideas on the board. Some possible physical properties are size, shape, color, phase (solids, liquids, gases), material, density, etc.
- Ask the students to name their five senses and which of them could be used to sort objects by the physical characteristics on the board.

Sorting Using Gravity: 15 minutes

- Place the words “mass” and “volume” on the board.
- Have the students discuss with each other:
    - The definition of these words.
    - How we can measure these physical properties.
- Ask the students if the words are related. Will an object with a bigger volume always have a bigger mass? The answer is yes if they are made of the same material, but only if they are made of different materials.
- Different materials have different densities, which is a physical property that tells us how tightly packed together the matter is in an object. A material that packs its matter into a small volume is said to be dense. For two objects with the same volume, the one that has less mass is less dense.
- To be specific, density is mass/volume.

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- Gravity sorts objects by density, with the less dense objects floating on top of the more dense objects. For example, wood floats in water because it is less dense than water. Metal sinks in water because it is more dense than water.

Snack Density: 15 minutes

- Students will rank the density of the snack foods by measuring the mass of one large cupful of the snack food. Each student should be given a Snack Density Handout. After entering the masses of the snack foods in the table, the students should rank the snacks by density.
- This works best if each cup is filled to level at the top.

Sorting using gravity: 15 minutes

- Place two different snacks in a bowl. Do not fill the bowl more than half full. Using a spoon, mix them up.
- Gently shake the bowl to allow gravity to sort the snacks. Which snack ended up on the bottom and which snack ended up on the top?
- Record your test and results on the back of your Snack Density Handout. For example, “Raisins and Oyster Crackers: Raisins on bottom and crackers on top”.
- Does this agree with your ranking for the snack densities?
- Repeat with other snacks.

Discussion about conserving water: 15 minutes

When Max brushes his teeth, he leaves the water on. It takes him two minutes to brush his teeth. Max’s sister told him to turn off the water while he brushes his teeth because he is wasting water. Max doesn’t think he is wasting much water. To prove his sister wrong, Max puts a small bucket in the sink to collect the water while he brushes his teeth. He then put the water in a measuring cup and was surprised that he wasted four cups of water. Max decided to figure out how much water his class would waste if they each left the water on while brushing their teeth. There are 25 students in Max’s class, including himself. How much water would Max and his class waste in one day if they each brush their teeth twice per day? How much water would Max and his class waste in one week? One month? One year?

Depending on the ability of your students, you can ask them to convert the total cups of water wasted to gallons of water wasted for each question.

Wrap up: 5 minutes

- Ask students to place their handouts and materials in a safe location and to clean up their area.
- Distribute the parent letter to each student.

Activity 7 (Optional)

Introduction: 5 minutes

- Talk about how *All the Water in the World* was written in poetry form.

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- Have students describe the characteristics of a poem.
- Discuss what happened last class and what they learned about physical properties and using their senses.
- Explain that students will be writing their own poems today and then get to test out the physical properties of something using taste.

Poetry: 30 minutes

- Thinking about our senses and the world around us, discuss writing a poem that describes objects using our senses and the object's physical properties.
- Remind students of our five senses, and give an example of each.
- Using interactive writing, create a short poem together as a class on the board or chart paper about a familiar object, using the five senses.
- Ask the students to open their STEM journals and date and title a new entry, "Entry #x, Poem".
- Pass out some objects, or ask the students to find something in their desk or in the classroom, and ask the students to write a poem about it. If the students are stuck, they can list words or connections they make to the object in their notebook. This is a poem, too!

Sorting Using Taste: 10 minutes

- Prepare small cups for tasting by adding a little sugar to one set of cups and a little salt to another set.
- Give the students one cup of sugar water and one cup of salt water.
- Ask them if they can sort them using their eyes.
- Ask them if they can sort them using their taste buds.
- We cannot see the salt and sugar because they have dissolved in the water making a homogeneous mixture that we call a solution.

Finding Invisible Contamination: 5 minutes

- There is a career connection with work being done at Wright Patterson Air Force Base and the University of Dayton.
- We can use our taste buds to find the invisible salt and sugar in the water, but we would not want to use our taste buds to check for types of contamination that might make us sick.
- Scientists and engineers at The University of Dayton and Wright Patterson Air Force Base are doing research to find these contaminants using lasers and other devices.

Wrap Up: 10 minutes

- Ask students to place their handouts and materials in a safe location and to clean up their area.
- Distribute the parent letter to each student.

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