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| **Lesson Title : Importance of Water** | **Unit #:**  1 | **Lesson #:**  1 | **Activity #:**  2 |
| **Activity Title: Build a Better Hand Washing Technique** |

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| **Estimated Lesson Duration:** | **9 days** |
| **Estimated Activity Duration:** | **5 days** |

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| **Setting:** | **Classroom** |

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| **Activity Objectives:** |

The student will be able to:

* Define solute, solvent, solution
* Explain the importance of water being a universal solvent
* Explain the behavior of water molecules in terms of adhesion and cohesion
* Draw a water molecule and label to illustrate polarity
* Explain the importance of water in terms of the states of matter
* Observe the properties of water and explain the role of water in living things

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| **Activity Guiding Questions:** |

* Why is dehydration a danger?
* Why is water important to life?
* What are the properties of water that make it useful in hand washing?
* What does a water molecule look like?
* Why is water good at dissolving other substances?
* What are the substances dissolved in water called?
* What are the states of matter of water?
* Why does ice float?

| **Next Generation Science Standards (NGSS)** | |
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| **Science and Engineering Practices (Check all that apply)** | **Crosscutting Concepts (Check all that apply)** |
| ☒ Asking questions (for science) and defining problems (for engineering) | ☐ Patterns |
| ☐ Developing and using models | ☒ Cause and effect |
| ☒ Planning and carrying out investigations | ☐ Scale, proportion, and quantity |
| ☐ Analyzing and interpreting data | ☐ Systems and system models |
| ☐ Using mathematics and computational thinking | ☐ Energy and matter: Flows, cycles, and conservation |
| ☐ Constructing explanations (for science) and designing solutions (for engineering) | ☐ Structure and function. |
| ☐ Engaging in argument from evidence | ☐ Stability and change. |
| ☒ Obtaining, evaluating, and communicating information |  |

| **Ohio’s New Learning Standards for Science (ONLS)** |
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| **Expectations for Learning - Cognitive Demands (Check all that apply)** |
| ☒ Designing Technological/Engineering Solutions Using Science concepts **(T)** |
| ☒ Demonstrating Science Knowledge **(D)** |
| ☐ Interpreting and Communicating Science Concepts **(C)** |
| ☐ Recalling Accurate Science **(R)** |

| **Common Core State Standards -- Mathematics (CCSS)** | |
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| **Standards for Mathematical Practice (Check all that apply)** | |
| ☐ Make sense of problems and persevere in solving them | ☐ Useappropriate tools strategically |
| ☒ Reason abstractly and quantitatively | ☒ Attendto precision |
| ☐ Construct viable arguments and critique the reasoning of others | ☐ Look for and make use of structure |
| ☐ Model with mathematics | ☐ Look for and express regularity in repeated reasoning |

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| **Unit Academic Standards (NGSS, ONLS and/or CCSS):** |

Cells: • The essential functions of cells involve chemical reactions that involve water and carbohydrates, proteins, lipids and nucleic acids

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| **Materials**: (Link Handouts, Power Points, Resources, Websites, Supplies) |

* Properties of water investigation hand outs
* Pipettes
* Wax paper
* Slides
* Pennies
* Dish detergent
* Kool-Aid
* Sugar and Sugar cubes
* Cups
* 2 Clear pitchers
* Measuring cups
* Long handled spoon
* White carnations
* Food coloring
* Flasks
* Glo-germ kit
* Hand soap
* Paper towels
* Feedback form
* Poster paper
* Markers
* Glue stick
* Computers

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| **Teacher Advance Preparation:** |

* Copy handouts for each water station.
* Gather supplies and place at each station
* Student communication feedback form

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| **Activity Procedures:** |

Day 4 Properties of Water Investigations

* Warm up question on board: Draw a water molecule and label to illustrate polarity.
* Collect answers then ask volunteers to put their answers on the board. Discuss as a class. Address any questions from the homework.
* Teams are to make observations of petri dishes and record in notebook.
* Set expectations: Today teams will be investigating the properties of water. There are 3 stations. Teams are to send 1 person to stations 1, another to station 2, and another to station 3. Follow directions at each station and work cooperatively with members from the other teams. Record information carefully and make certain you can explain the results to your team mates when you return to home base today. Teacher will call when it is time to clean up.

Stations:

1. Universal Solvent: define solute, solvent, solution

Make Kool-Aid using sugar record time to dissolve

Make Kool-Aid using sugar cubes record time to dissolve

Why the difference in the amount of time to dissolve into solution? What can you conclude about solutes, solvents, and solutions? What else could you do to speed up the process? What could you do to slow down the process? What are the properties of water that make it a good solvent?

Take cups of Kool-Aid back to home base to share with team mates.

1. Water on a Penny: hydrogen bonds and the effect of detergent

Students predict how many drops of water a penny can hold

Use a pipette and carefully put drops of water on the surface of a penny before it overflows.

Explain the difference between the predicted and observed number of drops.

Rub detergent onto the surface of the penny. Repeat the procedure.

Explain the difference in results in terms of hydrogen bonds.

1. Adhesion and Cohesion: hydrogen bonds

Put drops of water on a piece of wax paper. Record observations.

Put drops of water on a glass slide. Record observations.

Explain the difference in terms of hydrogen bonds.

Observe the flowers in water and blue water.

Explain the observation in terms of adhesion and cohesion.

Why is this important to flowers?

* Return to home base and share findings with team mates. Discuss as a class.

Day 5 Properties of Water

* Warm-Up: What do the term hydrophobic and hydrophilic mean? Wad up answers and those who think they have it right toss to the basket on front table. Share answers and discuss.
* Glo-germ activity. Place solution on hands of one team member. Wash hands like you would if you just finished using restroom. Start record wash time. Observe hands under black light. Record observations.
* Return to home base. Each team member is to come up with 3 strategies for improving hand washing technique. Share ideas with team mates. Choose one technique as a team. Write out the steps to be taken.
* Glo-germ a second time. Record observations.
* Return to home base. Brainstorm ways to improve. Redesign hand washing technique.
* Glo-germ a third time. Record observations.
* Share out to the class.

Day 6 and 7. Build a better hand washing technique

* Video: How does soap work? <https://www.youtube.com/watch?v=AdylCTJ4Zy0&src_vid=ga2ff1nO0uo&feature=iv&annotation_id=annotation_807844>
* Review data from hygiene survey with teams. What factors stood out the most? Where can improvement of personal hygiene habits be made?
* Team members are to come up with 3 strategies each for improving student hand washing habits.
* Teams are to review all strategies and select 1 to focus on.
* Team members are to come up with 3 strategies each for communicating their new hand washing technique and the need to improve personal hygiene habits with the student body.
* Teams are to review all strategies and select 1 to implement (make a communication prototype).
* Teams are to create a communication prototype.
* Teams share out, audience fills in feedback form.

Day 7. Eliciting participation

* Make final observation of petri dishes and draw conclusions.
* Which areas in the school had the most “germs”? The least?
* Was hand sanitizer or hand washing more effective for removing germs?
* Teams share out.
* Teams redesign communication prototype using yesterday’s feedback from classmates.
* Turn in final communication.

**Formative Assessments:** Link the items in the Activities that will be used as formative assessments.

Warm-up answers.

Answers to activity questions.

Information shared with team members.

Hand washing communication.

**Summative Assessments:** These are optional; there may be summative assessments at the end of a set of Activities or only at the end of the entire Unit.

Challenge Notebooks

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| **Differentiation:** Describe how you modified parts of the Lesson to support the needs of different learners.  Refer to Activity Template for details. |

Heterogeneous grouping

Collaborative water investigations allow for peer tutoring

Peer teaching

Textbooks available at each station for verbal learners

Power Point directions and verbal directions

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| **Reflection**: The properties of water stations were very successful. I added time for class discussion of the stations to address misconceptions. The need for more time was again a factor. I added a day for the build a better hand washing technique to allow more time for students to collaborate on the communication requirement. The Glo-germ activity was very successful. The students were fascinated by how easily germs can spread and how difficult it is to get hands really clean. There was much discussion about the amount of time needed to get hand clean versus the amount of time allotted for class change when bathroom breaks and hand washing can occur. I would emphasize that personal hygiene goes beyond hand washing. The majority of my groups did not consider addressing anything other than hand washing when making recommendations for improving personal hygiene. |