Colorado Teacher-Authored Instructional Unit Sample

Science
6th Grade

Unit Title: Water, Water Everywhere

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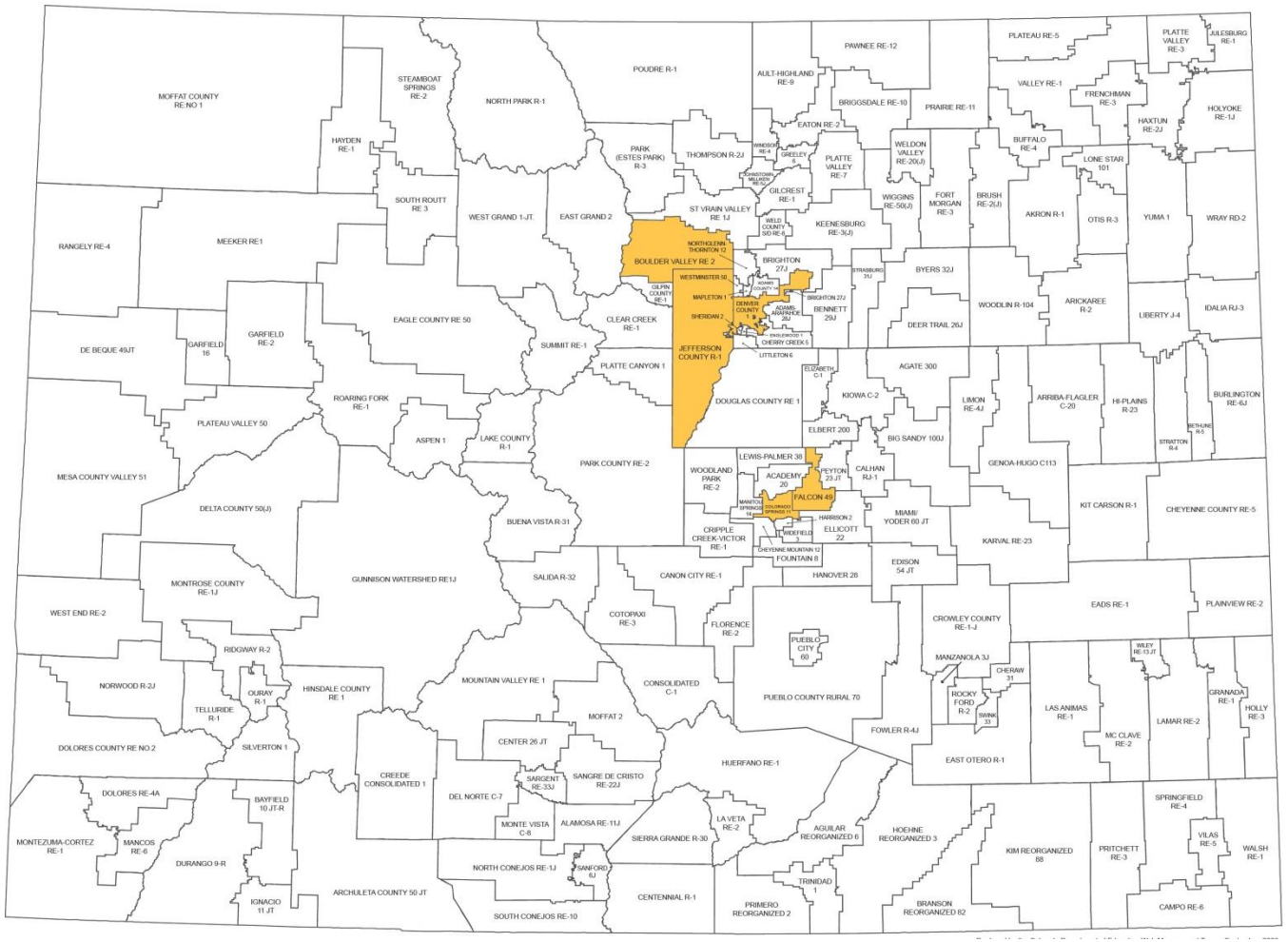

This unit was authored by a team of Colorado educators. The template provided one example of unit design that enabled teacher-authors to organize possible learning experiences, resources, differentiation, and assessments. The unit is intended to support teachers, schools, and districts as they make their own local decisions around the best instructional plans and practices for all students.

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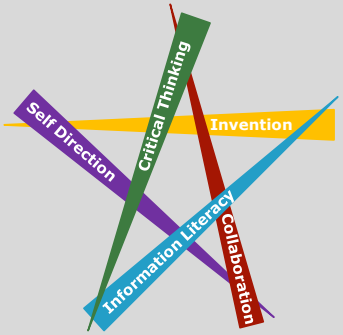
Content Area	Science	Grade Level	6th Grade
Course Name/Course Code			

Standard	Grade Level Expectations (GLE)	GLE Code
1. Physical Science	1. All matter is made of atoms, which are far too small to see directly through a light microscope. Elements have unique atoms and thus, unique properties. Atoms themselves are made of even smaller particles	SC09-GR.6-S.1-GLE.1
	2. Atoms may stick together in well-defined molecules or be packed together in large arrangements. Different arrangements of atoms into groups compose all substances.	SC09-GR.6-S.1-GLE.2
	3. The physical characteristics and changes of solid, liquid, and gas states can be explained using the particulate model	SC09-GR.6-S.1-GLE.3
	4. Distinguish among, explain, and apply the relationships among mass, weight, volume, and density	SC09-GR.6-S.1-GLE.4
2. Life Science	1. Changes in environmental conditions can affect the survival of individual organisms, populations, and entire species	SC09-GR.6-S.2-GLE.1
	2. Organisms interact with each other and their environment in various ways that create a flow of energy and cycling of matter in an ecosystem	SC09-GR.6-S.2-GLE.2
3. Earth Systems Science	1. Complex interrelationships exist between Earth's structure and natural processes that over time are both constructive and destructive	SC09-GR.6-S.3-GLE.1
	2. Water on Earth is distributed and circulated through oceans, glaciers, rivers, ground water, and the atmosphere	SC09-GR.6-S.3-GLE.2
	3. Earth's natural resources provide the foundation for human society's physical needs. Many natural resources are nonrenewable on human timescales, while others can be renewed or recycled	SC09-GR.6-S.3-GLE.3

Colorado 21st Century Skills



Critical Thinking and Reasoning: *Thinking Deeply, Thinking Differently*

Information Literacy: *Untangling the Web*

Collaboration: *Working Together, Learning Together*

Self-Direction: *Own Your Learning*

Invention: *Creating Solutions*

Reading & Writing Standards for Literacy in Science and Technical Subjects 6 - 12

Reading Standards

- Key Ideas & Details
- Craft And Structure
- Integration of Knowledge and Ideas
- Range of Reading and Levels of Text Complexity

Writing Standards

- Text Types & Purposes
- Production and Distribution of Writing
- Research to Construct and Present Knowledge
- Range of Writing

Unit Titles	Length of Unit/Contact Hours	Unit Number/Sequence
Water, Water Everywhere	4-6 weeks	2

Unit Title	Water, Water Everywhere	**Length of Unit**	4-6 weeks
Focusing Lens(es)	Cycle	**Standards and Grade Level Expectations Addressed in this Unit**	SC09-GR.6-S.1-GLE.3 SC09-GR.6-S.1-GLE.4 SC09-GR.6-S.3-GLE.2
Inquiry Questions (Engaging-Debatable):	• How do daily decisions impact the quality of water in the water cycle? • Would a new "visitor" to Earth see five oceans or only one? • Why is water an essential substance for supporting life? • How would life be different if all matter had the same density?		
Unit Strands	Physical Science, Earth Science		
Concepts	resources, cycle, balance, system, change, properties, structure/form, phase, water, activity, quality		

Generalizations **My students will Understand that…**	**Guiding Questions** **Factual**	**Conceptual**
The structure/form and availability of water changes as it cycles in predictable patterns (SC09-GR.6-S.3-GLE.2-EO.a; IQ.1)	What states of matter can water exist as on Earth? (SC09-GR.6-S.3-GLE.2-EO.a) What processes (condensation, evaporation, freezing and melting) account for changes in states of matter of water? (SC09-GR.6-S.3-GLE.2-EO.b)	How is water cycled on earth? (SC09-GR.6-S.3-GLE.2-EO.a)
Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits (SC09-GR.6-S.1-GLE.3-EO.a; RA.1)	How does the density of water change with the phase? (SC09-GR.6-S.1-GLE.3-EO.a; IQ.1) What objects of specific densities will float or sink in water? (SC09-GR.6-S.1-GLE.4-EO.c)	What would be the implications if solid water was denser than liquid water? (SC09-GR.6-S.1-GLE.4-EO.a; IQ.1)
Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect) (SC09-GR.6-S.1-GLE.3-EO.b; IQ.2)	What are the properties of water? How are volume, mass, weight and density measured (tools, units)? (SC09-GR.6-S.1-GLE.4-EO.c)	Describe situations in which mass, weight, volume, or density would be most useful to know about an object. (SC09-GR.6-S.1-GLE.4; IQ.3) How are the various properties of water inter-related? Why does weight and not mass change due to gravitational force? (SC09-GR.6-S.1-GLE.4-EO.d)
Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide (SC09-GR.6-S.3-GLE.2-EO.c, d; IQ.3; RA.1)	What factors determine water quality? (SC09-GR.6-S.3-GLE.2-EO.c; IQ.3; RA.1) What water sources exist on Earth, and how do they vary in distribution? (SC09-GR.6-S.3-GLE.2-EO.a)	Where does water go after it is used in houses or buildings? (SC09-GR.6-S.3-GLE.2-EO.e)

Critical Content: **My students will Know…**	**Key Skills:** **My students will be able to (Do)…**
• The distribution and recycling of water in various forms and locations (SC09-GR.6-S.3-GLE.2-EO.a) • How to describe water by its properties (including mass, weight, volume, and density) (SC09 – GR.6-S.1-GLE.4-EO.c) • Different phases of water (solid, liquid, and gas) and each phase's unique properties. • The reasons why changes in temperature are not always equivalent to changes in state. (SC09-GR.6-S.1-GLE.3–EO.b) • The unique properties of solids, liquids and gasses that make them useful in different situations. (SC09 – GR.6-S.1-GLE.3; RA.1) • How gravitational force can change the weight (and not the mass)of an object. (SC09–GR.6-S.1-GLE.4–EO.d) • The reasons why mass, weight and volume affect density. (SC09–GR.6-S.1-GLE.4–EO.c) • Specific tools used to gather information about mass, weight, volume and density. (SC09–GR.6-S.1-GLE.4–EO.e) • The causes and effects of water pollution in local and world water distributions (SC09–GR.6-S.3-GLE.2–EO.d) • The relationships between water systems and local, regional, and world population development. (SC09–GR.6-S.3-GLE.2; RA.2)	• Ask testable questions and make falsifiable hypotheses about water distribution (SC09-GR.6-S.3-GLE.2; NA 1) • Use evidence to model how water is transferred throughout the earth. (SC09-GR.6-S.3-GLE.2–EO.b) • Create and evaluate models to represent water circulation and distribution. (SC09–GR.6-S.3-GLE.2; NS. 2) • Gather and analyze data from a variety of print resources and investigations to account for local and world-wide water circulation and distribution patterns. (SC09–GR.6-S.3-GLE.2–EO.a) • Calculate the density of a sample, predict its ability to float or sink in a liquid of known density, design and perform the experiment, and justify discrepancies. (SC09–GR.6-S.1-GLE.4; NS.1) • Ask testable questions and make a falsifiable hypothesis about density and design an inquiry based method to find an answer. (SC09–GR.6-S.1-GLE.4;NS.2) • Select proper tools to measure the mass and volume of an object and use appropriate units. (SC09–GR.6-S.1-GLE.4; NS.3)

Critical Language: includes the Academic and Technical vocabulary, semantics, and discourse which are particular to and necessary for accessing a given discipline.
EXAMPLE: A student in Language Arts can demonstrate the ability to apply and comprehend critical language through the following statement: *"Mark Twain exposes the hypocrisy of slavery through the use of satire."*

A student in _____ can demonstrate the ability to apply and comprehend critical language through the following statement(s):	*Water on earth exists in many different forms, each with its own properties.* *Mass, weight, volume, and density are properties of water that can be measured with the right tools.*
Academic Vocabulary:	predict, measure, calculate, model (noun), model (verb)
Technical Vocabulary:	condensation, evaporation, melt, freeze, mass, weight, volume, density, units, grams, kilograms, liters, milliliters, g/cm3, g/ml, tools, gravity,

Unit Description:	This water unit focuses on its particle model (solid, liquid, gas), its unique properties, its quality and availability/usability in communities around the world, its distribution and circulation on earth, and its relationships among mass, weight, volume and density. Beginning with mass, density, and volume of water, across the unit students investigate state changes, temperature, cohesion, expansion, polarity, water cycle, and water quality indicators. The unit culminates in a performance assessment that asks students to create a product to document the journey of a water molecule.
Considerations:	**Possible misconceptions:** Mass is the same as weight Energy is matter Everything is made of matter Evaporation is a chemical change Clouds are made of tiny drops of water Water is not a chemical
Unit Generalizations	
Key Generalization:	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits
Supporting Generalizations:	The structure/form and availability of water changes as it cycles in predictable patterns
	Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)
	Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide

Performance Assessment: *The capstone/summative assessment for this unit.*	
Claims: (Key generalization(s) to be mastered and demonstrated through the capstone assessment.)	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits
Stimulus Material: (Engaging scenario that includes role, audience, goal/outcome and explicitly connects the key generalization)	You are an educational product designer asked to create a product (video, board game, storyboard, poster, children's book, etc.) which documents the journey of a water molecule. Select a beginning state of water and have the molecule travel the earth. Your product must illustrate the water cycle journey that includes all state changes, what bodies of water the molecule is cycled through, and at least three properties of water. At some point your "molecule" must interact with pollution and become a usable molecule of water.
Product/Evidence: (Expected product from students)	Students will take the role of an educational product designer asked to create a product (video, board game, storyboard, poster, children's book, etc.) which documents the journey of a water molecule. They must describe the water molecule and where it is located (ground water, glaciers, rivers, lake, ocean, reservoirs). The experience should include going through all phase changes and describe what the molecule is going through including how energy impacts the changes. They must include at least 3 properties of water as it travels within the specific region (density, melting point, freezing point, adhesion), condensation, evaporation, precipitation, and transpiration (if appropriate). They will have to include pollution (Inclusion of definition of the quality of the water and/or that water is "cleaned" or polluted at different stages of the journey) and describe how and when they are usable and available. Students may illustrate the journey by using multiple modalities (i.e., video, board game, storyboard, poster, children's book, etc.).

	Students may choose to begin the journey of their water molecule in one of the regions in Colorado (e.g., Mountainous, Desert, Tundra, high mountain desert, etc.) http://www.freetech4teachers.com/2013/04/the-five-best-tools-for-creating-videos.html (Free tech for teachers-creating videos) http://www.wikihow.com/Make-a-Flipbook (How to make a flip book) http://www.boardgame-online.com/creategame.php (How to create a board game) http://www.storyboardthat.com/welcome/classic?utm_expid=58652488-5.h6FllJhSTyisCU7j_9_BBg.1&utm_referrer=https%3A%2F%2Fwww.google.com%2F (Free on-line storyboard creator)
Differentiation: (Multiple modes for student expression)	• The teacher may incorporate accommodations/modifications of IEP such as extended time, oral presentation, use of dictionaries, etc. • The teacher may reduce the number of options proposed • The teacher may provide appropriate formulas and tools for use during calculations • To extend this work, students conduct their own research on a regional option to collect their own data around the specific precipitation rate, annual rainfall, annual temperatures, etc.

Texts for independent reading or for class read aloud to support the content

Informational/Non-Fiction	Fiction
Measuring Area, Volume, and Density- Barbara A. Somervill [lexile level 880] *Water* – Lionel Bender [lexile level 1210] *States of Matter* –Perfection Learning Corporation [lexile level 820] *States of Matter* – Robert Snedden [lexile level 1110] *Properties of Water* – Alfred J. Smuskiewicz [lexile level 1210] *Measuring the Benefits of Clean Air and Water* – Allen V. Kneese [lexile level 1410] *Earth's Water Cycle* – Amy Bauman [lexile level 820]	*Beyond the Sea of Ice* – Joan Elizabeth Goodman [lexile level 870] *The Hoover Dam* –Elizabeth Mann [lexile level 1020] *The Properties of Water* – Hannah Roberts McKinnon [lexile level 1210]

Ongoing Discipline-Specific Learning Experiences

1.	Description:	Thinking like a scientist: Scientific method and experimentation	Teacher Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (Near middle of page teacher resources page with activities) http://undsci.berkeley.edu/teaching/misconceptions.php (A list of common misconceptions about the nature of science) http://undsci.berkeley.edu/teaching/ (Tips for introducing and teaching scientific method and experimentation) http://www.livescience.com/6727-invisible-gorilla-test-shows-notice.html (Video in which most people fail to observe large "gorilla" moving across room) http://www.shodor.org/succeed-1.0/forensic/teacher/lessons/observation.html (Lesson plan devoted to developing observation skills) http://blogs.loc.gov/teachers/2011/06/look-again-challenging-students-to-develop-close-

				observation-skills/ (Library of Congress brief of tools for helping students develop observation skills)
			Student Resources:	http://www.brainpopjr.com/science/scienceskills/scientificmethod/grownups.weml (At top of page student link for movie and activities about scientific method) http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation) http://www.brainpop.com/science/scientificinquiry/scientificmethod/preview.weml (Movie and quiz for scientific method/inquiry) http://lifehacker.com/5960811/how-to-develop-sherlock-holmes+like-powers-of-observation-and-deduction (Explanation of tools to increase observation skills with hook related to Sherlock Holmes)
	Skills:	Measure volume, density, temperature and pH Measure mass and weight Write a testable question to be answered in an experiment Design an experiment that controls for independent and dependent variables Understand and use scientific and academic language Analyze experimental results with respect to their support of the hypothesis Critique research methodology of scientists or other students	Assessment:	The student will be assessed within the learning experiences
2.	Description:	Working like a Scientist: Create and analyze graphs	Teacher Resources:	Power Point presentation (Dealing with identification of dependent and independent variables) http://professionaldevelopment.ibo.org/files/ocd/TaughtPractice%20with%20%20identifying%20variables.pdf (Practice worksheet for identifying dependent and independent variables) http://www.clemson.edu/ces/phoenix/tutorials/graph/index.html (Rules for graphing) http://www.wtamu.edu/academic/anns/mps/math/mathlab/beg_algebra/beg_alg_tut9_bar.htm#line3 (Teaches how and why to use different graphs and also teaches how to read a graph) http://www.teachervision.fen.com/skill-builder/graphs-and-charts/48946.html?page=1&detoured=1 (Provides questions to ask students as they analyze a graph) http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)

			Student Resources:	http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs)
	Skills:	Label and title axes Identify dependent and independent variables Determine the appropriate type of graph Identify trends in graphs and tables. Read different types of graphs Compare two or more sets of data to relate and draw conclusions Synthesize given information in graphic organizer	Assessment:	Students will create graphs using data from learning experiences in order to analyze relationships between variables.

Prior Knowledge and Experiences

Students must have a basic understanding of the water cycle, the states of matter (solid, liquid, and gas), where water comes from and its uses (i.e., farming, industry, health, etc.), weather (pressure, precipitation, etc.), temperature, pollution and where it comes from, the relationship between Earth's living and non-living components, cause and effect, observational skills, data collection, graphing, and mathematical operations.

Vertical alignment of physical science: Students have last seen concepts within this unit in 5th, 3rd, 1st grade.
Vertical alignment of earth science: Students have last seen concepts within this unit in 5th and 1st grade.

Learning Experiences # 1 – 2
Instructional Timeframe: Weeks 1-2

Learning Experience # 1

The teacher may provide opportunities using various density gradients for investigation on the mass, density and volume of water so that students can understand the concepts and measure and/or calculate density, mass and volume.

Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)
Teacher Resources:	www.middleschoolchemistry.com (American Chemical Society)

<table>
<tr><td></td><td colspan="2">http://van.physics.illinois.edu/qa (University of Illinois answers questions)
Hsu, T., Eldridge, P., Kissel, S., Eddleman, S., Benton, E., & Hughes, M. B. (2007). Investigations: Physical science. (pp. 52-58). Nashua, NH: Delta Education LLC.
www.readworks.org (Leveled readings with lexiles)</td></tr>
<tr><td>Student Resources:</td><td colspan="2">http://www.brainpop.com/science/matterandchemistry/statesofmatter/ (This BrainPop on matter is free)
http://app.discovereducation.com (The States of Water 2:40 minute video clip)
Graybill, G. (2010). Properties of matter. Glenview, Illinois: Pearson Education, Inc.</td></tr>
<tr><td>Assessment:</td><td colspan="2">Students will complete a lab write-up to demonstrate their ability to measure mass and volume in order to calculate density.

http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation)</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may preview vocabulary
The teacher may provide appropriate formulas and tools for use during calculations
The teacher may provide template for lab write-up</td><td>The student may explain (in their home language) as opposed to in writing
The student may demonstrate knowledge with visual representation</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may allow students to investigate how dissolving materials in water affects its density
The teacher may allow students to calculate the relationship between mass and volume in relation to density
The teacher may allow students to use other mathematical formulas to find the volume of different shapes</td><td>The student may provide evidence (e.g., lab write-up, report, presentation, graphical representation, etc.) of their findings</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• Volume
• Mass
• Density
• Weight
• Water’s unique density variation
• Introductory unit analysis</td></tr>
<tr><td>Key Skills:</td><td colspan="2">• Use measurement tools.
• Measure mass and volume
• Calculate density and volume
• Relate mass, volume and density
• Use mathematical skills (multiplying and dividing)</td></tr>
<tr><td>Critical Language:</td><td colspan="2">Volume, mass, density, weight, measure, calculate, relate, units, relationship, water</td></tr>
</table>

<table>
<tr><th colspan="3">Learning Experience # 2</th></tr>
<tr><td colspan="3">The teacher may facilitate student investigations of temperature changes among the three states of water so that students can understand energy (heat) is required and as temperature changes water goes through its states.</td></tr>
<tr><td>Generalization Connection(s):</td><td colspan="2">Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits
Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)</td></tr>
<tr><td>Teacher Resources:</td><td colspan="2">www.middleschoolchemistry.com (American Chemical Society)
http://van.physics.illinois.edu/qa (University of Illinois answers questions)
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<tr><td>Student Resources:</td><td colspan="2">http://www.brainpop.com/science/matterandchemistry/statesofmatter/ (This BrainPop on matter is free)
http://app.discovereducation.com (The States of Water 2:40 minute video clip)
Graybill, G. (2010). Properties of matter. Glenview, Illinois: Pearson Education, Inc.</td></tr>
<tr><td>Assessment:</td><td colspan="2">Students will complete a presentation (e.g., comic strip, story board, poster, song and dance, etc.) demonstrating how energy contributes to phase change.

http://www.postermywall.com/index.php/p/classroom-posters (Free classroom poster creator)
http://www.printablepaper.net/category/storyboard (Storyboard graphic organizer)</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may preview vocabulary
The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides
The teacher may scaffold information</td><td>The student may explain verbally (in their home language) as opposed to in writing
The student may select from reduced number of options (e.g., Key concepts, regions, test questions)
The student may demonstrate knowledge with visual representation</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may add impurities to the water, which may affect the results
The teacher may allow students to explore the energy change required for water to go from a gas to a solid</td><td>The student may provide evidence (lab write-up, graphically representation, report, presentation, etc.) of their findings</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• External factors of temperature changes state/phase
• Boiling point
• Freezing point
• Temperatures relationship to energy</td></tr>
</table>

Key Skills:	• Using measurement tools • Measure temperature • Accurately record and present data of temperature change over time • Create a line graph of the data
Critical Language:	Boiling point, freezing point, temperature, line graph, phase/state of matter, use, measure, create, record, present

Learning Experiences # 3 – 5
Instructional Timeframe: Weeks 2-3

Learning Experience # 3

The teacher may provide the opportunity for students to explore the particulate model through simulations (e.g., "States of Matter Basics" PhET, kinesthetic activity) so that students can conceptualize the molecular structure of water.

Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)	
Teacher Resources:	www.middleschoolchemistry.com (American Chemical Society) http://van.physics.illinois.edu/qa (University of Illinois answers questions) Hsu, T., Eldridge, P., Kissel, S., Eddleman, S., Benton, E., & Hughes, M. B. (2007). *Investigations: Physical science*. (pp. 52-58). Nashua, NH: Delta Education LLC. www.readworks.org (Leveled readings with lexiles)	
Student Resources:	http://www.brainpop.com/science/matterandchemistry/statesofmatter/ (This BrainPop on matter is free) http://app.discovereducation.com (The States of Water 2:40 minute video clip) Graybill, G. (2010). *Properties of matter*. Glenview, Illinois: Pearson Education, Inc. (4th grade level reader Select page)	
Assessment:	Students will complete a reflection (lab write-up, exercise, etc.) on their understanding of the changing of the states of water with appropriate graphs. http://nces.ed.gov/nceskids/createagraph/default.aspx (Online way to create different types of graphs) http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may preview vocabulary The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may provide appropriate formulas and tools for use during calculations The teacher may provide template for lab write-up The teacher may scaffold information	The student may explain verbally (in their home language) as opposed to in writing The student may select from reduced number of options (eg. Key concepts, regions, test questions) The student may demonstrate knowledge with visual representation

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to explore other substances and the effects of pressure on phase/state changes	The student may provide expanded lab write-up and graphical analysis
Critical Content:	• External Factors of temperature changes state/phase • Boiling point • Freezing point • Temperature's relationship to energy	
Key Skills:	• Using measurement tools • Measure temperature • Accurately record and present data of temperature change over time • Create graphical interpretation of data	
Critical Language:	Boiling point, freezing point, temperature, line graph, phase/state of matter, create, record, present, measure	

Learning Experience # 4		
The teacher may guide students in construction of a water molecule complete with polarity and the accurate molecular angle so that students can determine the unique molecular structure of water.		
Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect) The structure/form and availability of water changes as it cycles in predictable patterns	
Teacher Resources:	www.middleschoolchemistry.com (American Chemical Society) www.msnucleus.org/membership/html/k-6/wc/water/3/wcwa3_3a.html (Science Matters Water Cycle Post Lab)	
Student Resources:	http://discoveryeducation.com (Water's Molecular Structure 4:07 minutes long)	
Assessment:	Students will use manupulatives (e.g., marshmallows and toothpicks, elements and bonds models, etc.) to create an accurate water molecule model.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may review vocabulary	The student may demonstrate knowledge with visual representation (i.e., drawing)
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to include the electron alignment and bonding structure The teacher may allow students to get together with their models to demonstrate solid, liquid, and gas structures of water	The student may provide visual examples of their models together in the various phase/state structures of water

Critical Content:	• Phases/states of matter • Increase/decrease energy to change states • Particulate theory of matter
Key Skills:	• Illustrate and explain the molecular model of water in its different states/phases
Critical Language:	Solid, liquid, gas, energy, state/phase, particulate theory, illustrate, explain

Learning Experience # 5		
The teacher may have students explore the concept of expansion (water freezing in film canisters) so that students can better recognize this unique property of water.		
Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)	
Teacher Resources:	www.middleschoolchemistry.com (American Chemical Society) http://van.physics.illinois.edu/qa (University of Illinois answers questions) Hsu, T., Eldridge, P., Kissel, S., Eddleman, S., Benton, E., & Hughes, M. B. (2007). *Investigations: Physical science*. (pp. 52-58). Nashua, NH: Delta Education LLC. www.readworks.org (Leveled readings with lexiles)	
Student Resources:	http://www.brainpop.com/science/matterandchemistry/statesofmatter/ (This BrainPop on matter is free) http://app.discovereducation.com (The States of Water 2:40 minute video clip) Grabill, G. (2010). *Properties of matter*. Glenview, Illinois: Pearson Education, Inc.	
Assessment:	Students will actively participate in class discussions of observations and reasons for the unique expansion of solid water. Students will also record (written, pictures, etc.) the exploration in their science notebooks.	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may preview/review vocabulary The teacher may scaffold information	The student may explain what is known (in their home language) as opposed to in writing The student may demonstrate knowledge with visual representation
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to repeat the activity using water with impurities to explore the different results The teacher may allow students to repeat the activity to quantify (mm expansion on the side of the canister) the volume expansion at various impurity concentrations	The student may elaborate on the previous class discussion with the impurity results The student may graphically display the relationship between the quantity of impurity and the quantity of volume change

Critical Content:	• Phases/states of matter • Increase/decrease energy to change states • Water's unique density variation as expressed by volumetric change
Key Skills:	• Illustrate and explain the molecular model of water in its different states/phases • Respectful scientific discussion • Observe and interpret observations. • Record scientific observations in science notebook.
Critical Language:	Solid, liquid, energy, state/phase, volume, expansion, illustrate, observe, discuss, record, interpret

Learning Experiences # 6 – 7
Instructional Timeframe: Weeks 4-5

Learning Experience # 6	
The teacher may provide real-world scenarios (e.g., fish in a lake in the winter, leaving cabinets open in the winter, letting faucets drips, boiling for cooking) so that students can relate and analyze the concepts of density, freezing point, and boiling point to their own experiences.	
Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits
Teacher Resources:	http://teacherweb.com/NJ/ValleyMiddleSchool-Oakland/DeRoker/why-density-is-important.pdf (Floating "Eggsperiment" to investigate floating an egg in fresh water vs. salt water) http://www.scienceclarified.com/everyday/Real-Life-Chemistry-Vol-3-Physics-Vol-1/Density-and-Volume-Real-life-applications.html (Comparing densities, specific gravity, and determining authentic quality of material using density) http://www.biologyjunction.com/waterproperties.ppt (Downloadable power point presentation of cohesion, adhesion, specific heat, density, etc. with examples) http://www.discoveryeducation.com Specific Video Segment: Water Strider and Water Spider (Video and resource website for teachers and students, free account required) http://www.chem.purdue.edu/gchelp/liquids/boil.html (Resource for graphs of pressure vs. boiling point) http://www.engineeringtoolbox.com/boiling-points-water-altitude-d_1344.html (Data table and graphs for boiling points at elevations) http://astro.uchicago.edu/cara/southpole.edu/boil.html (Boiling point and pressure laboratory)
Student Resources:	http://teacherweb.com/NJ/ValleyMiddleSchool-Oakland/DeRoker/why-density-is-important.pdf (Floating "Eggsperiment" to investigate floating an egg in fresh water vs. salt water) http://www.pitara.com/discover/5wh/online.asp?story=25 (Article about fish surviving in frozen water) http://www.csgnetwork.com/h2oboilcalc.html (Boiling point calculator for altitude) http://www.wildbackpacker.com/backpacking-food/articles/high-altitude-cooking/ (Article about cooking at different altitudes including the length of time it takes to cook at higher altitudes)

<table>
<tr><td>Assessment:</td><td colspan="2">Students will create a visual representation (e.g., graphic organizer, cartoons, etc.) of the relationship between density, freezing point, and/or boiling point to real-world scenarios.

http://www.worksheetworks.com/miscellanea/graphic-organizers/tchart.html (T-chart example)
http://www.printablepaper.net/category/storyboard (Storyboard graphic organizer)</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may preview vocabulary
The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides
The teacher may provide appropriate formulas and tools for use during calculations
The teacher may scaffold information</td><td>The student may demonstrate knowledge with visual representation (i.e., drawing)</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may provide the opportunity for researching methods of changing the freezing point of water
The teacher may provide opportunities (e.g., data table, field trip, laboratory activity, etc.) to investigate the effect of pressure on boiling point so that students can explain the relationship between pressure and boiling point.

http://news.discovery.com/earth/coldest-water-can-get-before-freezing-111123.htm (Article relating to a study done about the lowest temperature water will begin to freeze)
http://www.biologyjunction.com/waterproperties.ppt (Downloadable power point presentation of cohesion, adhesion, specific heat, density, etc. with examples)
http://phet.colorado.edu/en/simulation/gas-properties (Simulation for changes in gas laws)</td><td>The student may demonstrate various freezing points through a visual presentation (e.g., classroom demo, graphical representation, data table, etc.)
The student may construct an appropriate graph to show the relationship between pressure and boiling point</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• Density
• Freezing point
• Boiling point
• Unique properties of water</td></tr>
<tr><td>Key Skills:</td><td colspan="2">• Data analysis
• Graph production
• Connect content to self</td></tr>
<tr><td>Critical Language:</td><td colspan="2">Density, freezing point, boiling point, relationship, analyze, graph, connect, analyze</td></tr>
</table>

Learning Experience # 7		
The teacher may facilitate demonstrations on the properties of water (e.g., dropping water/salt or water/soapy water on a penny, demonstrating meniscus of water, floating an object on water) so that students can visualize the concepts of cohesion, adhesion, and polarity.		
Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)	
Teacher Resources:	http://www.biologyjunction.com/waterproperties.ppt (Downloadable power point presentation of cohesion, adhesion, specific heat, density, etc. with examples) http://www.msichicago.org/fileadmin/Education/learninglabs/lab_downloads/EvidenceLab_ink_act.pdf (Example lab for chromatography to show the properties of polarity in water) http://sciencespot.net/Media/pennylab.pdf (Water drops on a penny lab) www.discoveryeducation.com Specific Segment: Sticky Water: Explanation (Kari from Mythbusters explaining cohesion, adhesion, polarity and the electrical attraction of water molecules)	
Student Resources:	www.discoveryeducation.com Specific Segment: Sticky Water: Explanation (Kari from Mythbusters explaining cohesion, adhesion, polarity and the electrical attraction of water molecules) http://ga.water.usgs.gov/edu/adhesion.html (USGS article about cohesion and adhesion) http://watereducation.utah.gov/WaterScience/Properties/default.asp (Brief description of water polarity, capillary action, surface tension, density)	
Assessment:	Students will produce an exit ticket that accurately defines and/or depicts cohesion, adhesion, and polarity. http://exitticket.org/?gclid=CMKZt6Xsir0CFQ5qfgod_YEAFw (Online exit tickets)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may preview/review vocabulary The teacher may allow the use of home language for instruction	The student may explain what is known (in their home language) as opposed to in writing The student may demonstrate knowledge with visual representation
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to research other examples of cohesion, adhesion, and polarity in their world experiences http://www.biologyjunction.com/waterproperties.ppt (Downloadable power point presentation of cohesion, adhesion, specific heat, density, etc. with examples)	The student may produce a visual report (e.g., picture book, diary, brochure, etc.) to demonstrate various examples of cohesion, adhesion, and polarity

Critical Content:	• Adhesion • Cohesion • Polarity
Key Skills:	• Observation • Define • Measurement of angles
Critical Language:	Adhesion, cohesion, polarity, observe, define, measure

Learning Experiences # 8 – 9
Instructional Timeframe: Weeks 5-6

Learning Experience # 8		
The teacher may provide opportunities to explore the water cycle (e.g. water cycle dice game, water cycle in a bag) so that students can create their own water cycle model and evaluate other models.		
Generalization Connection(s):	The structure/form and availability of water changes as it cycles in predictable patterns	
Teacher Resources:	http://www.nps.gov/wica/forteachers/upload/Hydrology-Water_Cycle_Game-2.pdf (Water Cycle Dice Game) http://floridaswater.com/challenge/water_cycle.html (Water Cycle in a Bag) http://www.ucar.edu/learn/1_1_2_4t.htm (Example of water cycle model)	
Student Resources:	http://www.eo.ucar.edu/kids/green/cycles3.htm (Explains the water cycle) http://ga.water.usgs.gov/edu/watercycle-kids-adv.html (Interactive water cycle)	
Assessment:	Students will create a product (comic strip, skit, rap/song, poem, etc.) to demonstrate their understanding of the process of the water cycle and evaluate other products. http://www.printablepaper.net/category/storyboard (Storyboard graphic organizer)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may scaffold information The teacher may scribe, voice-to-text	The student may present in home language The student may select from reduced number of options (e.g., Key concepts, regions, test questions) The student may demonstrate knowledge with visual representation
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide students the opportunity to explore the outcome of increasing or decreasing earth's water	The student may create a model (e.g., terrarium, miniature landscape, etc.) to predict the outcome of increasing or decreasing earth's water

Critical Content:	• Water cycle • Evaporation • Precipitation • Condensation • Forms of water on earth
Key Skills:	• Create an authentic product • Diagram and describe the water cycle
Critical Language:	Water cycle, evaporation, precipitation, condensation, lake, glacier, pond, groundwater, ocean, river, reservoir, create, diagram, describe

Learning Experience # 9		
The teacher may facilitate research (e.g., weather channel scavenger hunt, tracking weather at a station over a period of time) of water distribution and circulation in a specified region so that students can track, visualize and predict weather patterns as it pertains to the water cycle.		
Generalization Connection(s):	The structure/form and availability of water changes as it cycles in predictable patterns Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)	
Teacher Resources:	http://www.weather.com/ (Allows weather tracking as well as maps, explanations) http://theweatherprediction.com (Background information on weather patterns) http://www.slideshare.net/gosomers/olm-science616 (Power Point showing relationship between water cycle and weather)	
Student Resources:	http://www.weather.com/ (Allows weather tracking as well as maps, explanations) http://www.middleschoolscience.com/earth.htm (Explanation of weather terminology) http://www.brainpop.com/science/weather/humidity/preview.weml (Background information about weather formation) Hughes, M. B. A., Pennell, L., Eddleman, S., & Benton, E. (2007). *Investigations: Earth science*. (1st ed., pp. 37-40). Nashua, NH: CPO Science.	
Assessment:	Students will work in small groups to present findings about water distribution and circulation in a specified region (e.g., Power Point, video, poster board, Prezi, etc.).	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may scaffold information	The student may explain what is known in their home language The student may select from reduced number of options (e.g., Key concepts, regions, test questions) The student may demonstrate knowledge with visual representation

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may provide research opportunities for students to take a position on the effects of Earth's water from global warming www.pitara.com/discover/earth/online.asp?story=140 (Article about global warming and the effects on the polar bear). http://www.readwritethink.org/files/resources/printouts/persuasion%20map.pdf (Persuasive template)	The student may generate a position paper supporting their views, with evidence on the effect of global warming on Earth's water and water cycle
Critical Content:	• Water cycle • Precipitation • Condensation • Evaporation • Weather • Weather maps • Weather patterns/forecasts	
Key Skills:	• Research • Data collection • Data analysis • Reading weather maps/tables/graphs	
Critical Language:	Water cycle, precipitation, condensation, evaporation, weather, forecast, patterns, analysis, compare, position	

Learning Experiences # 10 – 12
Instructional Timeframe: Weeks 7-8

Learning Experience # 10	
The teacher may demonstrate how to measure water quality indicators (dissolved oxygen, turbidity, pH, and salinity) so that students can begin applying these skills to real world water samples.	
Generalization Connection(s):	Many properties of water are interrelated; one property change (e.g., temperature) often causes changes in another property (chain reaction or cause and effect)
Teacher Resources:	http://estuarychesapeake.files.wordpress.com/2011/10/water-quick-notes.pdf (Water testing, vocabulary & tips on page 2) http://www.sasta.asn.au/may08/adc/datalogging/DataSinglePagePDFs/ADCBookDatalog13-23.pdf (Water quality tests) http://people.chem.duke.edu/~jds/cruise_chem/water/wattest.html (What tests are run on water?)
Student Resources:	http://www.youtube.com/watch?v=AdfJ1D3An3Q&feature=share&list=PLf3WD4fy30u1bg3B8KP28QDLYzzZtcXc8 (Youtube video on testing water turbidity) http://www.youtube.com/watch?v=kAs7rgc8Jb4&feature=share&list=PLf3WD4fy30u1bg3B8KP28QDLYzzZtcXc8 (Youtube video on testing water salinity)

Assessment:	The student will complete a lab write-up analyzing the quality of water samples. http://www.glencoe.com/sites/common_assets/science/virtual_labs/E16/E16.html (Virtual lab to practice use of scientific method and experimentation)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may scaffold information The teacher may scribe, voice-to-text	The student may explain what is known in their home language as opposed to in writing The student may select from reduced number of options (e.g., Key concepts, regions, test questions) The student may demonstrate knowledge with visual representation The student may choose from vocabulary picture/ pollution origin choice cards to participate in class discussion
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow the student to investigate the quality of water from different local areas The teacher may the student to inspect the water for the presence of microorganisms http://www.msnucleus.org/watersheds/mission/plankton.pdf (Fresh water microorganism index with pictures)	The student may produce a comparative analysis of the different locations' water quality and the environmental influences for each area The student may identify the species of organisms in the water and provide an illustration
Critical Content:	• Turbidity • pH • Acidity • Oxygen ranges in water • Salinity	
Key Skills:	• Water sample gathering techniques • Measuring turbidity, pH, dissolved oxygen, and salinity	
Critical Language:	turbidity, pH, acidity, dissolved oxygen, salinity, parts per million, gather, measure, observe	

Learning Experience # 11	
The teacher may explain the process of how water is cleaned in a community so that students may analyze and describe how their usable water is processed.	
Generalization Connection(s):	Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide
Teacher Resources:	http://www.xcelenergy.com/Safety_&_Education/Educational_Resources (Presentation from a local water utility representative (speaker, website, etc.) http://water.epa.gov/drink/hotline/index.cfm (Safe Drinking Water Hotline 1-800-426-4791)

Student Resources:	http://www.trendhunter.com/slideshow/inventive-water-filters (31 different water purification systems)	
Assessment:	The student will create and communicate a process to filter and test "contaminated" water (using cotton, charcoal, sand, gravel, chlorine tablets, or other materials).	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may preview vocabulary The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may scaffold information The teacher may scribe, voice-to-text	The student may demonstrate knowledge with visual representation The student may copy/recreate an already existing process for filtering "contaminated" water and present to teacher
Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow the student to research various water purification systems http://thewaterproject.org/?gclid=COHLyMOO9LoCFadcMgodBwUAOA (The water projects-ideas for student research) The teacher may allow the student to investigate current methods for preventing water pollution	The student may design a water purification system using available technology The student may create a poster to promote how to stop water pollution
Critical Content:	• Filtration • How water is polluted • Contaminants in water • Water filtration processes • Acceptable levels of contaminants	
Key Skills:	• Measuring contaminants in water	
Critical Language:	Chlorination, contaminant, parts per million, particulate, measure, observe, create	

Learning Experience # 12	
The teacher may provide real world pollution source examples (e.g., article, class discussion, news story) so that students can analyze where pollution comes from and how it affects water in the bio-indicators and environment.	
Generalization Connection(s):	Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide
Teacher Resources:	http://www.soest.hawaii.edu/GG/ASK/waterpol3.html (Ask-an-Earth-Scientist reply about sources of water pollution) http://zoology.muohio.edu/oris/cunn06/cs6_20.htm (Environmental Science, Chapter 20 – Water Pollution) http://msue.anr.msu.edu/news/whats_the_point_and_non_point_in_water_quality (Defining point and non-point pollution) http://ucanr.edu/repository/cao/landingpage.cfm?article=ca.v051n04p11&fulltext=yes (University of California, Non-point water

<table>
<tr><td></td><td colspan="2">pollution on California coastline)
http://www.ext.colostate.edu/ptlk/1620.html (Phosphate fertilizers and water pollution)
http://people.oregonstate.edu/~muirp/eutrophi.htm (Eutrophication explanation)
http://www.groundwater.org/get-informed/groundwater/ (Groundwater Foundation website)
http://www.mnn.com/earth-matters/translating-uncle-sam/stories/how-polluted-is-us-drinking-water (2011 article on water pollution in the U.S.)
http://app.discoveryeducation.com/search?Ntt=colorful+coastal+waters (Video from discoveryeducation.com about the effects of pollution on coastal waters. You will need a discovery education account to access the video)
https://www.csu.org/CSUDocuments/projectwetrecipeforcleanwater.pdf (Pdf document of a home activity asking kids to take inventory of possible water contaminants they may have in their homes)</td></tr>
<tr><td>Student Resources:</td><td colspan="2">http://www.pitara.com/discover/eureka/online.asp?story=88 (Pitara website article about pollution preventing rain)</td></tr>
<tr><td>Assessment:</td><td colspan="2">The student will participate in a class discussion about pollution’s origins and its effect on the environment
and/or
The student will create a poster, brochure, etc. describing real world examples and proposing solutions.</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may allow students to work with a partner
The teacher may allow students to work one-on-one with the teacher or aide</td><td>The student may present their proposed solutions to the teacher verbally
The student may draw a picture of real world examples and their proposed solutions</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may allow students to research other forms/locations of water pollution
The teacher may allow students to monitor the effects of living and non-living things on the quality of water in a closed system
The teacher may allow students to design an experiment to test the effects of acid rain on plant growth</td><td>The student may provide a written summary of their findings and/or report to the class
The student may create and present their findings using flowcharts, graphic organizers, graphs, etc.
The student may create a presentation illustrating the effects of water acidity (lemon juice or other acid) to model acid rain’s effect on plant growth</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• Pollution
• Phosphates
• Sulfates
• Bioindicators
• Living/non-living factors to water quality</td></tr>
<tr><td>Key Skills:</td><td colspan="2">• Interpret data
• Read non-fiction text
• Analyze data critically</td></tr>
<tr><td>Critical Language:</td><td colspan="2">Pollution, phosphates, sulfates, bio-indicators, living/non-living factors to water quality, acid rain, leeching, analyze, read, interpret, create, illustrate, describe</td></tr>
</table>

Learning Experiences # 13 – 14
Instructional Timeframe: Week 8

Learning Experience # 13		
The teacher may demonstrate and present the total quantity versus the usable quantity of water on Earth so that students can evaluate their personal water consumption in relation to the usable and available water.		
Generalization Connection(s):	Some properties of water change based on its phase which leads to greater understanding of its limitations and benefits The structure/form and availability of water changes as it cycles in predictable patterns Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide	
Teacher Resources:	http://www.waterfootprint.org (Water usage) http://www.beloit.edu/sepm/Water_Works/how_much_water.html (Available water demonstration) http://www.bozemanscience.com/ngw-ess2c-the-role-of-water-in-earths-surface-processes/ (Video about how much water is on earth) http://www.crwcd.org/page_143 (Lesson plan on how to demonstrate the quantity of usable water on earth) http://www.threeactionsproject.org/Actions/Track-Your-Daily-Water-Use.php (Example of how to track and graph water usage) http://www.watercan.com/h2oh/1-4.shtml (Lesson plans with analysis on how to track water usage) http://www.edhelper.com/teachers/General_graphic_organizers.htm (Printable graphic organizers)	
Student Resources:	http://ga.water.usgs.gov/edu/earthhowmuch.html (Article that discusses how much water is on earth and where it is located) http://www.waterfootprint.org/?page=cal/WaterFootprintCalculator (Allows you to enter your water usage and calculate totals) http://environment.nationalgeographic.com/environment/freshwater/water-conservation-tips/ (Water conservation tips)	
Assessment:	The student will record their water usage over four days (2 weekdays & 2 weekend days) and compare/contrast their data to local averages. http://www.waterfootprint.org/?page=cal/WaterFootprintCalculator (Allows you to enter your water usage and calculate totals) http://www.eduplace.com/science/hmxs/es/pdf/5rs_3_4-4.pdf (Simple water tracking worksheet) http://www.epa.gov/WaterSense/pubs/indoor.html (Average U.S. water use)	
Differentiation: (Multiple means for students to access content and multiple modes for student to express understanding.)	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may preview vocabulary The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides The teacher may provide pre-written table and/or graph for students to record water usage The teacher may scaffold information The teacher may scribe, voice-to-text	The student may demonstrate knowledge with visual representation The student who does not have the skills to independently collect their own data and who does not have support from home may analyze data collected by someone else or the student may analyze to different sources of data, evaluating and comparing each

Extensions for depth and complexity:	**Access** (Resources and/or Process)	**Expression** (Products and/or Performance)
	The teacher may allow students to calculate the water usage for a family of four over four days and make comparable comparisons The teacher may allow students to compare their findings to other areas around the world http://www.epa.gov/region1/eco/drinkwater/water_conservation_schools.html (Water conservation at school) http://library.thinkquest.org/06aug/00442/schoolwater.html (Water conservation at school)	The student may create a presentation (poster, video, newspaper article, etc.) expressing their findings on water usage and how to conserve water https://www.google.com/search?q=water+conservation+at+school&tbm=isch&tbo=u&source=univ&sa=X&ei=N_6MUv_oCYKd2gXJsYGADA&ved=0CEcQsAQ&biw=1280&bih=683 (Examples of ways to present water conservation ideas)
Critical Content:	• Cubic feet • Estimation • Consumption • Gallons • Glacier	
Key Skills:	• Reading/interpreting a utility bill • Measuring time • Estimating quantities • Compare and analyze water usage data	
Critical Language:	Cubic feet, estimation, consumption, gallons, glacier, compare, analyze, estimate, measure, interpret	

Learning Experience # 14	
The teacher may present different ways to conserve water so that students can evaluate how their actions impact available water quantities.	
Generalization Connection(s):	Human activities (including increased atmospheric pollution) can determine the quality and availability of water locally and worldwide
Teacher Resources:	http://www.ext.colostate.edu/pubs/consumer/09952.html (Ways to conserve water) http://www.ext.colostate.edu/pubs/consumer/09952.pdf (Facts about water conservation and usage) http://www.cultec.com/stormwater-advantages.html (Advantages of using storm water) http://www.ext.colostate.edu/pubs/natres/06702.html (Use of gray water as a resource) http://www.pikespeakstormwater.org/colorado-water-law/ (Water laws)
Student Resources:	http://wateruseitwisely.com/100-ways-to-conserve/ (100 ways to conserve water) http://eartheasy.com/live_water_saving.htm (25 ways to conserve water) http://www.ripuc.ri.gov/consumerinfo/ConservationWater.pdf (Practical water conservation ideas)

<table>
<tr><td>Assessment:</td><td colspan="2">The student will engage in a Socratic seminar regarding the pros and cons of different water conservation methods (e.g., rainwater collection, xeriscaping, household water conservation, etc.).</td></tr>
<tr><td rowspan="2">Differentiation:
(Multiple means for students to access content and multiple modes for student to express understanding.)</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may preview vocabulary
The teacher may provide pre-written notes to highlight key terms, fill-in-the-blank notes, main idea summaries study guides
The teacher may scaffold information
The teacher may scribe, voice-to-text</td><td>The student may explain what is known in home language as opposed to in writing
The student may demonstrate knowledge with visual representation
The student may s select from reduced number of options (eg. Key concepts, regions, test questions)
The student impacted by significant needs may choose among listed pros and cons, matching them to specific water conservation methods</td></tr>
<tr><td rowspan="2">Extensions for depth and complexity:</td><td>Access (Resources and/or Process)</td><td>Expression (Products and/or Performance)</td></tr>
<tr><td>The teacher may allow the student to examine alternative methods of water conservation
The teacher may allow the student to research global usages of water
The teacher may allow students to propose a plan for the school to conserve water
http://thewaterproject.org/rain_catchment.asp (How a rain harvest system works)
http://www.rainharvest.com/shop/ (Rain harvest systems)
The student may research global usages of water.
https://www.csu.org/wa/xeri/xeriscape.jsp (Xeriscaping plants for Colorado)
http://www.pinterest.com/jolley536/xeriscape-ideas/ (xeriscaping ideas)
http://facilities.unlv.edu/landscape/xeriscaping.html (Article on what is xeriscaping)</td><td>The student may create a poster demonstrating the effectiveness of different water conservation methods
The student may complete a graphic organizer comparing local usage to global usages
The student may write a letter to the school Principal proposing water conservation methods for the school</td></tr>
<tr><td>Critical Content:</td><td colspan="2">• Xeriscape
• Gray water
• Runoff
• Stormwater runoff
• Conservation
• Consumption</td></tr>
</table>

Key Skills:	• Write an argument and counter argument • Present persuasive reasoning in a logical manner • Presentation & debate abilities • Analyze data • Develop cause/effect relationships (between human activity and water quality/quantity)
Critical Language:	Xeriscape, gray water, runoff, stormwater runoff, conservation, consumption, persuasion, counterargument, thesis statement, justification/support, reasoning, develop, cause and effect, present, analyze, debate, persuade