



PA – 3 Region **Mathematics and Science Partnership**

UNIT #1 TITLE:
Water

For use with grades:
9-12



Developed by:

- **Leah Throckmorton**
- **Neal Thomas**

PA3 – MSP Calendar

EVENT	NOTES	DATE
<u>September 18</u> Tue night mtg.	NA	9/18/12
<u>Fall Visit 1</u>		
<u>October 16</u> Tue night mtg.	<i>LESSON #1 DUE TONIGHT</i>	10/16/12
<u>Fall Visit 2</u>		
<u>November 27</u> Tue night mtg.	<i>LESSON #2 DUE TONIGHT</i>	11/27/12
	<i>H O L I D A Y B R E A K</i>	
<u>January 15</u> Tue night mtg.	<i>UNIT #1 DUE TONIGHT</i>	1/15/13
<u>Winter/Spring</u> <u>Visit 1</u>		
<u>February 19</u> Tue night mtg.	NA	2/19/13
<u>March 19</u> Tue night mtg.	<i>LESSON #1 DUE TONIGHT</i>	3/19/13
<u>Winter/Spring</u> <u>Visit 2</u>		
<u>April 16</u> Tue night mtg.	<i>POTENTIAL SPEAKER</i> <i>LESSON #2 DUE TONIGHT</i>	4/16/13
<u>May 21</u> (possibly May 15- East only) Tue night mtg.	<i>UNIT #2 DUE TONIGHT</i> <i>POST-TESTING</i>	5/21/13 Or May 15 (East)

ROLES AND RESPONSIBILITIES

TEAM NAME: _____

Team Member	Role	Responsibilities
Leah Throckmorton	Researcher	Use NASA resources to develop lessons related to the team's theme and to the subject of Anatomy and Physiology.
Neal Thomas	Coordinator/ Researcher	Use NASA resources to develop lessons related to the team's theme and to the subject of Health. Compile Unit 1 lessons and ideas from teammates and create a portfolio of the required unit components.



PA – 3 Region **Mathematics and Science Partnership**

Participant Portfolio **2012 - 2013**

LESSON TITLE: Water

LESSON AUTHORS: Leah Throckmorton, Neal Thomas

GRADE (S) INSTRUCTING: 9-12

SUBJECT AREA(S): Health and Anatomy/Physiology

CONTACT'S SCHOOL: Achievement House Charter School

REGION COORDINATOR: Stan Terzopolos

TEAM CONTACT PHONE: 484-368-4671

TEAM CONTACT EMAIL: nthomas@achievementcharter.com

TEAM CONTACT'S SCHOOL MAILING ADDRESS:

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First Floor
Exton, Pa. 19341

Unit #1 Outline

GRADE LEVEL(S):
9-12
PA CONTENT STANDARDS:
<p>National standards:</p> <p>E.U.1 : Systems, order, and organization a. Systems—A system is an organized group of related objects or components that form a whole. Systems can consist, for example, of organisms, machines, fundamental particles, galaxies, ideas, numbers, transportation, and education. The goal is to help students think and analyze in terms of systems.</p> <p>E.C.3 : Organisms and environments d. Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.</p> <p>E.F.3 Types of resources a. Resources are things that we get from the living and nonliving environment to meet the needs and wants of a population. b. Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety. c. The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.</p> <p>E.D.1 Properties of earth materials a. Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.</p> <p>PA standards: 10.1.12.B:</p> <p>Evaluate factors that impact the body systems and apply protective/ preventive strategies.</p> <ul style="list-style-type: none">• fitness level• environment (e.g., pollutants, available health care)

- health status (e.g., physical, mental, social)
- nutrition

10.2.12.D: Examine and apply a decision-making process to the development of short and long-term health goals.

10.2.12.E: Analyze the interrelationship between environmental factors and community health. (Individual choices/maintenance of environment).

3.1.10.A1: Explain the characteristics of life common to all organisms.

ASSESSMENT ANCHORS:

ESSENTIAL QUESTION:

(DEVELOP A GLOBAL QUESTION THE UNIT IS DESIGNED TO ADDRESS)

- How do scientists compare properties of substances?
- Where do sea salts come from? Is the ocean getting saltier?
- What unique properties does water have as it changes states?
- What criteria will you use to determine if your health behaviors are responsible now and in the future?
- How can the choices you make today, influence your future health and happiness?

UNIT OBJECTIVES:

- Properties of water determine its uses.
- There are limited resources but they can be recycled (water and salts)
- Water is a resource.
- Students will be able to explain the need for hydration of the body in order to participate in physical activity.
- Students will be able to describe how the application of scientific principles impacts complex movements.
- Students will identify ways that water is often wasted.
- Students will advocate personal water conservation.

GENERAL MATERIALS NEEDED FOR UNIT: (include technology, NASA resources, etc...)

Salt
Water

2 glass cups

Eggs

<http://phet.colorado.edu/en/simulation/soluble-salts>

<http://www.youtube.com/watch?v=aTcyACmiaho>

PowerPoint

(Textbook "Life on an Ocean Planet" Current Publishing 2006, chapter 6)

Canola oil

Colored ice cubes

Glass cups

PowerPoint

<http://phet.colorado.edu/en/simulation/states-of-matter>

Density worksheet

<http://www.youtube.com/watch?v=917UC2MZOGU>

(Textbook "Life on an Ocean Planet" Current Publishing 2006, chapter 6)

<http://www.livestrong.com/article/238201-water-loss-during-exercise/>

<http://www.cdc.gov/nutrition/everyone/basics/water.html>

<http://newswatch.nationalgeographic.com/2012/03/06/human-body-water/>

http://www.active.com/nutrition/Articles/Hydration_101.htm

<http://www.active.com/women/Articles/4-Common-Hydration-Myths.htm>

<http://www.mtv.com/videos/news/120283/together-we-can-do-this.jhtml#id=1545981>

<http://environment.nationalgeographic.com/environment/freshwater/water-footprint-calculator/>

<http://www.healthteacher.com/lesson/index/48/>

MODELING AND GUIDED INSTRUCTION: (the whole class will be involved in the following learning experience)

- Lecture on density and saltwater using PowerPoint
- Show video of water density <http://www.youtube.com/watch?v=aTcyACmiaho>
- Ask students why they think the sea is salty, and how the dead sea came about
- Explain how the dead sea is a closed system

- Lecture on stratified zones of ocean using PowerPoint
- Explain how as the ice cube's temperature changes(melts), its density changes (sinks)
- Show video of Galileo thermometer
<http://www.youtube.com/watch?v=917UC2MZOGU>
- Ask students why they think the thermometer works
- Explain why ice floats, and how water has unique properties concerning density

- Independent practice for lesson reading.
- Guided practice during live class.

COLLABORATION/GROUP WORK: (problem-based/inquiry learning)
<ul style="list-style-type: none"> • Have students predict what will happen when an egg is placed in saltwater versus freshwater and test their predictions. • Have students predict what will happen when an ice cube is placed in oil
INDEPENDENT PRACTICE: (student exploration and elaboration)
<ul style="list-style-type: none"> • Students will complete a lab report using the phet simulation • Students will explore the states of matter using the phet simulation
ASSESSMENT/EVALUATION: (authentic student products and how assessed)
<p>Formative:</p> <p>Students will show their understanding of the concepts through their responses in class.</p> <p>Students will utilize the water footprint calculator to determine their own water footprint and discuss ways to decrease usage.</p> <p>. Students will recognize when a person has lost water balance in their system and determine the steps needed to rehydrate.</p>
<p>Summative:</p> <p>Students will be graded on their submitted lab report.</p> <p>Students will submit their density worksheets and receive a grade.</p>

Lesson Plan #1 – Unit #1

Author: Leah Throckmorton
Grade Level: 11th and 12th grade
Topic/Title: Water: Salinity and Density
Standards: Math - PA Common Core; Science - National Standards
<p>E.F.3 Types of resources</p> <p>a. Resources are things that we get from the living and nonliving environment to meet the needs and wants of a population.</p> <p>b. Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety.</p> <p>c. The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.</p> <p>E.D.1 Properties of earth materials</p> <p>a. Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.</p>
Objectives:
<p>Properties of water determine its uses. There are limited resources but they can be recycled (water and salts)</p> <p>Essential Questions:</p> <ul style="list-style-type: none">• How do scientists compare properties of substances?• Where do sea salts come from? Is the ocean getting saltier?
Materials:
<p>Salt Water 2 glass cups Eggs http://phet.colorado.edu/en/simulation/soluble-salts http://www.youtube.com/watch?v=aTcyACmiaho PowerPoint (Textbook “Life on an Ocean Planet” Current Publishing 2006, chapter 6)</p>

Anticipatory Set:
http://www.youtube.com/watch?v=dFJWMmsnUU8 What is different about the dead sea that causes this phenomenon?
Activities: (modeling, guided practice, independent practice & group work)
<ul style="list-style-type: none"> • Lecture on density and saltwater using PowerPoint • Have students predict what will happen when an egg is placed in saltwater versus freshwater and test their predictions. • Students will complete a lab report using the phet simulation • Show video of water density http://www.youtube.com/watch?v=aTcyACmiaho • Ask students why they think the sea is salty, and how the dead sea came about • Explain how the dead sea is a closed system
Wrap-up:
<p>The Curiosity rover discovered a Martian lake! How would scientists compare the Martian lake to our water on earth?</p> <p>Have students brainstorm together their response to the question in groups.</p>
Evaluation / Assessment:
<p>Students will be graded on their submitted lab report. Students will also show their understanding of the concepts through their responses in class.</p>

Lesson Plan #2 – Unit #1

Author: Leah Throckmorton
Grade Level: 11th and 12th grade
Topic/Title: Water: Temperature and Density
Standards: Math - PA Common Core; Science - National Standards
<p>E.F.3 Types of resources</p> <p>a. Resources are things that we get from the living and nonliving environment to meet the needs and wants of a population.</p> <p>b. Some resources are basic materials, such as air, water, and soil; some are produced from basic resources, such as food, fuel, and building materials; and some resources are nonmaterial, such as quiet places, beauty, security, and safety.</p> <p>c. The supply of many resources is limited. If used, resources can be extended through recycling and decreased use.</p> <p>E.D.1 Properties of earth materials</p> <p>a. Earth materials are solid rocks and soils, water, and the gases of the atmosphere. The varied materials have different physical and chemical properties, which make them useful in different ways, for example, as building materials, as sources of fuel, or for growing the plants we use as food. Earth materials provide many of the resources that humans use.</p>
Objectives:
<p>Properties of water determine its uses.</p> <p>Water is a resource.</p> <p>Essential Questions:</p> <ul style="list-style-type: none">• What unique properties does water have as it changes states?
Materials:
<p>Canola oil</p> <p>Colored ice cubes</p> <p>Glass cups</p> <p>PowerPoint</p> <p>http://phet.colorado.edu/en/simulation/states-of-matter</p>

Density worksheet

<http://www.youtube.com/watch?v=917UC2MZOGU>

(Textbook "Life on an Ocean Planet" Current Publishing 2006, chapter 6)

Anticipatory Set:

Give this challenge question:

"Why does the ocean water get colder and denser the deeper you go yet ice floats?"

Activities: (modeling, guided practice, independent practice & group work)

- Lecture on stratified zones of ocean using PowerPoint
- Have students predict what will happen when an ice cube is placed in oil
- Explain how as the ice cube's temperature changes (melts), its density changes (sinks)
- Students will explore the states of matter using the phet simulation
- Show video of Galileo thermometer
<http://www.youtube.com/watch?v=917UC2MZOGU>
- Ask students why they think the thermometer works
- Explain why ice floats, and how water has unique properties concerning density

Wrap-up:

If the properties of water suddenly changed, and ice now sank, what would happen?

Have students discuss their answer to the challenge question in a group. Have groups give predictions of the effects.

Evaluation / Assessment:

Students will submit their density worksheets and receive a grade. Students will also show their understanding of the concepts through their responses in class.

Lesson Plan #1 – Unit #1

Author: Neal Thomas
Grade Level: 9-12
Topic/Title: Water and the human body
Standards: Math - PA Common Core; Science - National Standards
National standards: E.U.1 : Systems, order, and organization a. Systems—A system is an organized group of related objects or components that form a whole. Systems can consist, for example, of organisms, machines, fundamental particles, galaxies, ideas, numbers, transportation, and education. The goal is to help students think and analyze in terms of systems. E.C.3 : Organisms and environments d. Humans depend on their natural and constructed environments. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms. PA standards: 10.1.12.B: Evaluate factors that impact the body systems and apply protective/ preventive strategies. <ul style="list-style-type: none">• fitness level• environment (e.g., pollutants, available health care)• health status (e.g., physical, mental, social)• nutrition 10.2.12.D: Examine and apply a decision-making process to the development of short and long-term health goals. 3.1.10.A1: Explain the characteristics of life common to all organisms.
Objectives:
<ul style="list-style-type: none">• Students will be able to explain the need for hydration of the body in order to participate in physical activity.• Students will be able to describe how the application of scientific principles impacts complex movements.
Materials:

<http://www.livestrong.com/article/238201-water-loss-during-exercise/>
<http://www.cdc.gov/nutrition/everyone/basics/water.html>
<http://newswatch.nationalgeographic.com/2012/03/06/human-body-water/>
http://www.active.com/nutrition/Articles/Hydration_101.htm
<http://www.active.com/women/Articles/4-Common-Hydration-Myths.htm>

Anticipatory Set:

Place one gallon of water in front of the class. Ask students to imagine how many gallons of water are needed to represent the amount present in a person. Have students put their heads down on their desk and ask them to put their head up when the teacher has reached the number they are imagining. The teacher will count to 10-15 or until all students have their heads up off the desk. Explain to students that each person has the equivalent of 10-15 gallons of water (or 120 pounds, depending on the body composition of the person).

Activities: (modeling, guided practice, independent practice & group work)

Independent practice for lesson reading.
Guided practice during live class.

Wrap-up:

Exit ticket question –

What are the steps involved when a person loses the water balance in their system?

- Loss of one quart – lessened concentration/alertness
- Loss of one gallon – lethargy and headaches are heightened
- Loss of two gallons – in the hospital
- Loss of three gallons - deceased

Evaluation / Assessment:

Exit ticket

Lesson Plan #2 – Unit #1

Author: Neal Thomas
Grade Level: 9-12
Topic/Title: Water and the environment
Standards: Math - PA Common Core; Science - National Standards
10.1.12.B: Evaluate factors that impact the body systems and apply protective/ preventive strategies. <ul style="list-style-type: none">• fitness level• environment (e.g., pollutants, available health care)• health status (e.g., physical, mental, social)• nutrition 10.2.12.D: Examine and apply a decision-making process to the development of short and long-term health goals. 10.2.12.E: Analyze the interrelationship between environmental factors and community health. (Individual choices/maintenance of environment). 3.1.10.A1: Explain the characteristics of life common to all organisms.
Objectives:
Students will identify ways that water is often wasted. Students will advocate personal water conservation.
Materials:
http://www.mtv.com/videos/news/120283/together-we-can-do-this.jhtml#id=1545981 http://environment.nationalgeographic.com/environment/freshwater/water-footprint-calculator/ http://www.healthteacher.com/lesson/index/48/
Anticipatory Set:
Students will view a video of entertainer Jay-Z visiting towns in Africa who struggle with gathering water. The videos show how school children must walk long distances just to provide for their classmates. Discussion would follow based on the differences between the students in the video and our own experiences.

Activities: (modeling, guided practice, independent practice & group work)
Independent practice for lesson reading. Guided practice during live class.
Wrap-up:
Water footprint site: Students will go through a water footprint calculator on their own during class. We will discuss the results (whether or not each student uses more or less water than the average American household)
Evaluation / Assessment:
Exit ticket

IMPLEMENTATION PLAN

Unit #1

A. One videotaped lesson is required per unit, saved on CD-ROM (include in CD ROM sleeves in portfolio).

Anticipated Lesson for Taping ____January 4, 2013____

Planned Taping date(s) ____January 4, 2013____

B. A professional development component is required for each unit. This requirement may be met in any one of the following forms (or another of your choice):

- Professional development training to colleagues
- Local program to share with community
- Presentation at a conference
- Video documentary to duplicate and share with others
- Online resources and video for district website
- Professional publication
- Other: _____
- Other: _____

C. Plan of implementation (Meetings, events, etc.): Student lab
is recorded and shared with staff. ____

UNIT PROGRESSION FORM: Unit #1

Group/Coordinator: Neal Thomas

Date: 1/15/13

UNIT ASSESSMENT

The degree to which the lesson(s):	✓	Write a statement to describe how this item was met.
Identified the prior knowledge required by the students.	✓	Each teacher's anticipatory set identified a knowledge base for students.
Identify and/or provide an authentic real-world problem relevant to the students for them to solve	✓	Discussions of student's water footprint and closed systems were included.
Was aligned with PA standards.	✓	Lessons were aligned with PA standards and national Science standards.
Followed problem-based/inquiry learning model.	✓	Yes.
Allowed for student exploration and elaboration.	✓	Each set of lessons allowed student exploration through lab simulations or online resources.
Required authentic student products.	✓	Summative assessments and lab reports were included.
Integrated technology into the lesson(s).	✓	Use of interactive online labs and videos throughout.
Clearly defined how students would be assessed.	✓	Evaluation/assessment included in each lesson.
Utilized and incorporated NASA resources throughout lesson(s).	✓	NASA sites and images were used throughout the lessons.

GROUP ASSESSMENT (see next page for details)

The group showed:	✓	Write a statement to describe how this item was met.
Contributions/participation, Attitude	✓	Extensive - Equal contributions to the unit from each participant willingly.
Cooperation/Working with others	✓	Extensive - Excellent cooperation throughout.
Focus on task/commitment	✓	Extensive - Planning time utilized well to determine content.
Team role fulfillment	✓	Extensive -

Group Signatures: _____ Date: _____
 _____ Date: _____

Group Work Rubric

Team Participant Names: Leah Throckmorton, Neal Thomas

Skills	Basic	Sound	Thorough	Extensive
Contributions /participation Attitude	Seldom cooperative, rarely offers useful ideas. Is disruptive.	Sometimes cooperative, sometimes offered useful ideas. Rarely displays positive attitude.	Cooperative, usually offered useful ideas. Generally displays positive attitude.	Always willing to help and do more, routinely offered useful ideas. Always displays positive attitude.
Working with others/cooperation	Did not do any work – does not contribute, does not work well with others, usually argues with teammates.	Could have done more of the work – has difficulty, requires structure, directions and leadership, sometimes argues.	Did their part of the work – cooperative. Works well with others, rarely argues.	Did more than others – highly productive Works extremely well with others, never argues
Focus on task/commitment	Often is not a good team member. Does not focus on the task and what needs to be done. Lets others do the work.	Sometimes not a good team member. Sometimes focuses on the task and what needs to be done. Must be prodded and reminded to keep on task.	Does not cause problems in the group. Focuses on the task and what needs to be done most of the time. Can count on this person.	Tries to keep people working together. Almost always focused on the task and what needs to be done. Is very self-directed.
Team role fulfillment	Participate in few or no group meetings. Provided no leadership. Did little or no work assigned by the group.	Participated in some group meetings. Provided some leadership. Did some of the work assigned by the group.	Participated in most group meetings. Provided leadership when asked. Did most of the work assigned by the group	Participated in all group meetings, assumed leadership role as necessary. Did the work that was assigned by the group.
Communication/listening Information sharing	Rarely listens to, shares with, or supports the efforts of others. Is always talking and never listens to others. Provided no feedback to others. Does not relay any information to teammates	Usually listens to, shares with, and supports the efforts of others. Sometimes talks too much. Provided some effective feedback to others. Relays some basic information – most relates to the topic.	Almost always listens to, shares with, and supports the efforts of others. Seldom talks too much. Provides good feedback to others. Relays solid basic information – usually relates to the topic.	Always listens to, shares with, and supports the efforts of others. Provided effective feedback to other members. Relays a great deal of information – all relates to the topic.

<http://www.google.com/#hl=en&q=group+work+rubric&aq=f&oq=&aqi=g4&fp=flbC24gbdiA>