

# Unit 1: Earth's Water & Atmosphere

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## Unit 1: Earth's Water & Atmosphere

## Department of Curriculum and Instruction



**Belleville Public Schools**

**Curriculum Guide**

# ADVANCED EARTH SCIENCE, GRADE 7

## EARTH'S WATER & ATMOSPHERE

**Belleville Board of Education**

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**Belleville, NJ 07109**

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## **Unit Overview**

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Science as a System

- 7 steps of scientific methods
- Distinguish among independent variables, dependent variables, constants, and controls

Circulation of Earth Air and Water

- Circulation in Earth's Atmosphere
- Circulation in Earth's Oceans
- Water Cycle

Weather and Climate

- Influences on weather
- Weather Prediction
- Influences on Climate

## **Enduring Understanding**

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- The world of science presents itself in many different capacities.
- Scientists follow a specific process of investigation to reach conclusions and theories.
- Internationally all scientists use specific units of measure to organize data and report results.

- Connections between humans and the ocean are important.
- Tides and waves are formed and they have an impact on the surrounding areas.
- The formation of the Earth created the oceans, and the evolution of the oceans.
- The properties of water, the chemistry of seawater, temperature and salinity, how light and sound travel through the water impact sea life.
- Weather (in the short term) and climate (in the long term) involve the transfer of energy and water in and out of the atmosphere.
- Earth's components form systems. These systems continually interact at different rates of time, affecting the Earth regionally and globally.
- The composition and structure of the atmosphere allow life to be present on Earth.
- The unequal heating of the Earth's surface and the Coriolis effect cause major wind patterns, responsible for weather and climate.
- The results of the complex interactions of land, ocean and atmosphere affect the Earth's weather and climate systems.
- Climate is influenced locally and globally by atmospheric interactions with landmasses and bodies of water

## Essential Questions

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- How are scientists able to measure the age of the universe?
- How are oceans a reservoir of valuable food, energy, and mineral resources?
- How do waves and tides affect life and property in coastal areas?
- How have volcanoes contributed toward the formation of the oceans?
- What is the composition of seawater?
- What causes weather to be short term vs. climate that is long term?
- How does the sun provide energy to Earth's atmosphere, allowing life to exist?
- How does the ozone layer protect humans?
- How do air masses, pressure systems, and fronts cause weather to change?
- How do weather changes affect your daily activities?
- How do wind systems determine major weather patterns on Earth?
- How many climate zones does the Earth have?

## Exit Skills

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By the end of Unit 1, Lesson 1 students should be able to:

- Identify the 7 steps of the scientific method
- Distinguish among independent variables, dependent variables, constants, and controls

By the end of Unit 1, Lesson 2 students should be able to:

- Identify the origin of the water in Earth's oceans
- Explain how dissolved salts and other substances get in the ocean
- Describe the composition of seawater
- Explain how winds and the Coriolis effect influence surface currents
- Discuss the temperature of coastal waters
- Describe density currents

- Describe wave formation
- Analyze the formation of ocean tides

By the end of Unit 1, Lesson 3 students should be able to:

- Identify the gases in the Earth's atmosphere
- Describe the structure of the Earth's atmosphere
- Explain what causes air pressure
- Describe what happens to the energy Earth receives from the sun
- Compare and contrast heat transfer
- Explain the water cycle and its effect on the weather and climate
- Explain why different latitudes on Earth receive different amounts of solar energy
- Describe the Coriolis effect as it relates to air movement
- Locate doldrums, trade winds, prevailing westerlies, polar easterlies, and jet streams
- Explain how solar heating and water vapor in the atmosphere affect weather
- Discuss how clouds form and how they are classified
- Describe how rain, hail, sleet, snow develop
- Describe how weather is associated with front and high/low pressure areas
- Explain how different types of severe weather develop and their effects
- Explain how data are collected for weather maps and forecasts
- Identify the symbols used in a weather station model

## **New Jersey Student Learning Standards (NJSL-S)**

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SCI.6-8.MS-ESS2-4.ESS2.C.1	Water continually cycles among land, ocean, and atmosphere via transpiration, evaporation, condensation and crystallization, and precipitation, as well as downhill flows on land.
SCI.7-8.5.4.8.F	Earth's weather and climate systems are the result of complex interactions between land, ocean, ice, and atmosphere.
SCI.7-8.5.4.8.G	The biogeochemical cycles in the Earth systems include the flow of microscopic and macroscopic resources from one reservoir in the hydrosphere, geosphere, atmosphere, or biosphere to another, are driven by Earth's internal and external sources of energy, and are impacted by human activity.
SCI.6-8.MS-ESS2-6.ESS2.C.1	Variations in density due to variations in temperature and salinity drive a global pattern of interconnected ocean currents.
SCI.6-8.MS-ESS2-6	Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
SCI.6-8.MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses result in changes in weather conditions.
SCI.7-8.5.4.8.E.a	The Sun provides energy for plants to grow and drives convection within the atmosphere and oceans, producing winds, ocean currents, and the water cycle.
SCI.7-8.5.4.8.E.1	Explain how energy from the Sun is transformed or transferred in global wind circulation, ocean circulation, and the water cycle.

SCI.7-8.5.4.8.F.a	Global patterns of atmospheric movement influence local weather.
SCI.7-8.5.4.8.F.b	Climate is influenced locally and globally by atmospheric interactions with land masses and bodies of water.
SCI.7-8.5.4.8.F.c	Weather (in the short term) and climate (in the long term) involve the transfer of energy and water in and out of the atmosphere.
SCI.7-8.5.4.8.F.3	Create a model of the hydrologic cycle that focuses on the transfer of water in and out of the atmosphere. Apply the model to different climates around the world.
SCI.7-8.5.4.8.G.a	Water in the oceans holds a large amount of heat, and therefore significantly affects the global climate system.
SCI.6-8.MS-ESS2-2.ESS2.C	The Roles of Water in Earth's Surface Processes
SCI.MS-ESS2-4	Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun and the force of gravity.
SCI.6-8.MS-ESS2-5.ESS2.C.1	The complex patterns of the changes and the movement of water in the atmosphere, determined by winds, landforms, and ocean temperatures and currents, are major determinants of local weather patterns.

## Interdisciplinary Connections

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MA.8.8.EE	Expressions and Equations
SOC.6.1.8.B	Geography, People, and the Environment
TECH.8.1.8	All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.8.B	Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.2.8.D.3	Build a prototype that meets a STEM- based design challenge using science, engineering, and math principles that validate a solution.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
MA.8.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
SOC.6.1.8	All students will acquire the knowledge and skills to think analytically about how past and present interactions of people, cultures, and the environment shape the American heritage. Such knowledge and skills enable students to make informed decisions that reflect fundamental rights and core democratic values as productive citizens in local, national, and global communities.

## Learning Objectives

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- Students will be able to independently use their learning of the scientific method to form conclusions on various experiments connected to the earth sciences.
- Students will be able to independently use their learning of ocean composition determine the differences of fresh, brackish and seawater.

- Students will be able to independently use their learning of ocean currents to identify that surface currents are the results of the Earth's rotation and deep ocean currents result from differences of salinity and temperature.
- Students will be able to independently use their learning of tides to infer that the differences in tidal heights is not just caused by the rotation of the earth but also the interactions of sun and moon
- Students will be able to independently use their learning to explore atmospheric conditions, as well as how humans affect weather and climate throughout their lives so that in the long run they will make smart decisions about their environment.
- Students will be able to independently use their learning of the atmosphere to create an analogous diagram depicting the structure of the atmosphere and the particular characteristics to explain how they impact weather and climate.
- Students will be able to independently use their learning of weather patterns to accurately predict the future weather for several days



## **Suggested Activities & Best Practices**

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Utilization of various DefinedStem.com projects which recognizes the different learning styles of the students. DefinedStem is both problem and project-based learning.

## **Evidence of Student Learning - Checking for Understanding (CFU)**

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- Anticipation Guide
- Admit Tickets
- Common benchmarks.
- Compare & Contrast.
- Create a Multimedia Poster.
- Define.
- Describe.
- Evaluate.
- Evaluation rubrics.
- Exit Tickets.
- Explaining.
- Fist- to-Five or Thumb-Ometer.

- Illustration.
- Journals.
- KWL Chart.
- Outline.
- Question Stems.
- Quickwrite.
- Quizzes.
- Red Light, Green Light.
- Self- assessments.
- Study Guide.
- Teacher Observation Checklist.
- Think, Pair, Share.
- Think, Write, Pair, Share.
- Unit test

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- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite

- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

## **Primary Resources & Materials**

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- Textbook and Dimensions supplementary materials
- Internet resources
- Science Department video DVD library
- Laboratory materials

## **Ancillary Resources**

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- Outdoor area of school
- Computer carts for research when available

## **Technology Infusion**

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- Smart board
- DefinedStem.com
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams
- Laptops
- Khan Academy
- Power Point presentation
- MS Word

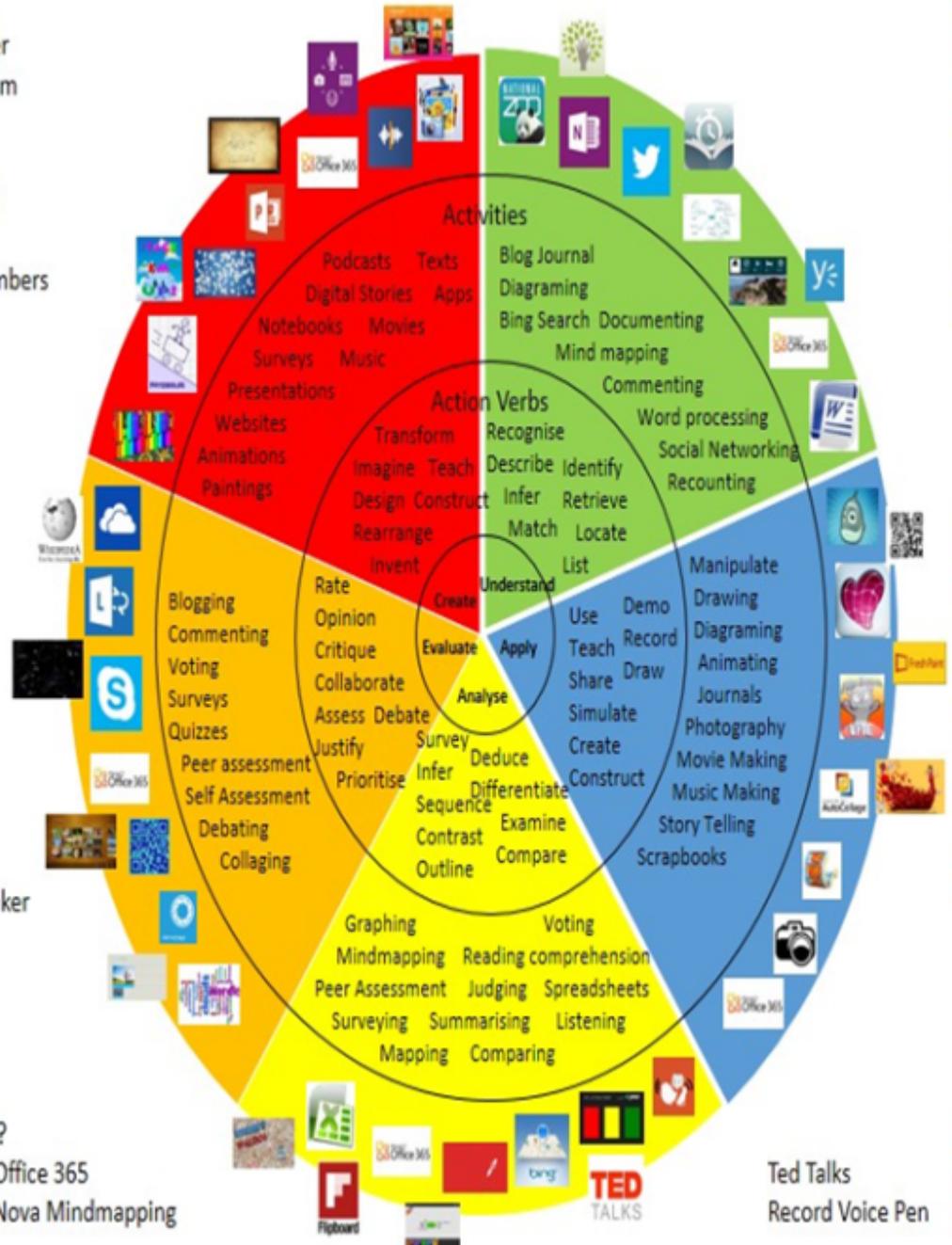
# Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts  
 Photostory 3  
 Kid Story Builder  
 Music Maker Jam  
 Paint A Story  
 Office 365  
 MS PowerPoint  
 Stack 'Em Up  
 NqSquared Numbers  
 Physamajig  
 Xylophone 8

Wikipedia  
 Skydrive  
 Lync  
 SkyMap  
 Skype  
 Office 365  
 Puzzle Touch  
 Easy QR  
 Memorylage  
 Life Moments  
 Word Cloud Maker

Where's Waldo?  
 MS Excel      Office 365  
 Flipboard      Nova Mindmapping

Ted Talks  
 Record Voice Pen



Originally taken from <http://www.coetail.com/vzimmer/files/2013/02/1Padagogy-Wheel.001.jpg>  
 And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

## **Alignment to 21st Century Skills & Technology**

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Mastery of key subjects and 21st century themes is essential for all students in the 21st century.

Key subjects include:

- English, reading or language arts
- World languages
- Arts
- Mathematics
- Economics
- Science
- Geography
- History
- Government and Civics

## **21st Century Skills/Interdisciplinary Themes**

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- Environmental Literacy.
  - Financial, Economic, Business and Entrepreneurial Literacy.
  - Global Awareness.
  - Health Literacy
  - Civic Literacy
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- Communication and Collaboration
  - Creativity and Innovation
  - Critical thinking and Problem Solving
  - ICT (Information, Communications and Technology) Literacy
  - Information Literacy
  - Life and Career Skills
  - Media Literacy

## **21st Century Skills**

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- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving.
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills

- Media Literacy
- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

## **Differentiation**

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- Have students choose Earth Science topics to research. Have them list tools, equipment, and instruments used by scientists to study these topics.
- Have students find out the location of the world's most popular surfing sites and the reasons for the big waves at those sites. Have them create a poster or write a report of their findings.
- Have students research about the Grunion fish off the waters of southern California and write about their egg laying, reproductive cycle during tidal changes
- Have students jigsaw the following information: ocean currents, tides, and waves
- Have students hypothesize which sunscreen provides the best UV protection from the sun
- Have students construct an interactive notebook activity on the water cycle
- Have students construct an interactive notebook activity on global winds
- Have students graph the temperature, humidity, wind, precipitation, and air pressure of their local community for a month
- Have students construct a choropleth map to determine the frequency of tornadoes over a period of time

### **Differentiations:**

- Small group instruction
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Study guides
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Highlight text

### **Lo-Prep Differentiations**

- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities

- Think-Pair-Share

### **Hi-Prep Differentiations:**

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

### **Intervention Strategies**

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- Allowing students to correct errors (looking for understanding).
- teaching key aspects of a topic. Eliminate nonessential information.
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing.
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments.
- reducing the number of answer choices on a multiple choice test

- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain
  - allowing students to correct errors (looking for understanding)
  - teaching key aspects of a topic. Eliminate nonessential information
  - allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
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  - reducing or omitting lengthy outside reading assignments
  - reducing the number of answer choices on a multiple choice test
  - tutoring by peers
  - using authentic assessments with real-life problem-solving
  - using true/false, matching, or fill in the blank tests in lieu of essay tests
  - using videos, illustrations, pictures, and drawings to explain or clarify

## **Special Education Learning**

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- printed copy of board work/notes provided
- additional time for skill mastery.
- assistive technology
- behavior management plan.
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes

- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length.
- multiple test sessions.
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary.
- reduced/shortened reading assignments
- Reduced/shortened written assignments.
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner.
- teacher initiated weekly assignment sheet.
- Use open book, study guides, test prototype
  - printed copy of board work/notes provided
  - additional time for skill mastery
  - assistive technology
  - behavior management plan
  - Center-Based Instruction
  - check work frequently for understanding
  - computer or electronic device utilizes
  - extended time on tests/ quizzes
  - have student repeat directions to check for understanding
  - highlighted text visual presentation
  - modified assignment format
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- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

## **English Language Learning (ELL)**

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- teaching key aspects of a topic. Eliminate nonessential information.
  - using videos, illustrations, pictures, and drawings to explain or clarify.
  - allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
  - allowing students to correct errors (looking for understanding)
  - allowing the use of note cards or open-book during testing
  - decreasing the amount of work presented or required
  - modifying tests to reflect selected objectives
  - providing study guides
  - reducing or omitting lengthy outside reading assignments
  - reducing the number of answer choices on a multiple choice test
  - tutoring by peers
  - using computer word processing spell check and grammar check features
  - using true/false, matching, or fill in the blank tests in lieu of essay
- 
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- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
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- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

## **Sample Lesson**

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**Unit Name:** Circulation in Earth's Oceans

**NJSLS:** See Link

**Interdisciplinary Connection:** See Link

**Statement of Objective:** Students will create a desalination apparatus after reading an accompanying article entitled "The Ocean- An abundant Source of Salt"

**Anticipatory Set/Do Now:** Hot SEAT

### **Learning Activity:**

- 1 - Students will take five minutes and play two rounds of hot seat in order to review vocab before the test.
- 2 - Students will read article, highlighting important information and answering questions at the end.
- 3 - Class discussion on article and questions
- 4- Class to be divided into groups
- 5 - Students given tin container, saran wrap, cup, and pebble.
- 6- Students will demonstrate the process of desalination by creating 2 classroom models.
  - 1<sup>st</sup> pair will demonstrate the distillation based method
  - 2<sup>nd</sup> pair will demonstrate the reverse osmosis method. Each will assemble their models using ordinary household items.
- 7- Students will create an illustration depicting how water and salt travels in the desalination process.

**Student Assessment/CFU's:** See Link (As an exit ticket- all students will explain the following questions:  
 What is the purpose of a desalination apparatus?  
 What purpose does the saran wrap serve in the desalination apparatus?  
 What purpose does the pebble serve?)

**Materials:** 1. Smart Board  
 2. Tin Container

3. Saran Wrap
4. Cup
5. Pebble
6. Article

**21st Century Themes and Skills:** See Link

**Differentiation:** See Link (Groups determined according to interest with at least one proactive student within each group to take initiative and try to construct the desalination apparatus.)

**Integration of Technology:** Smart Board