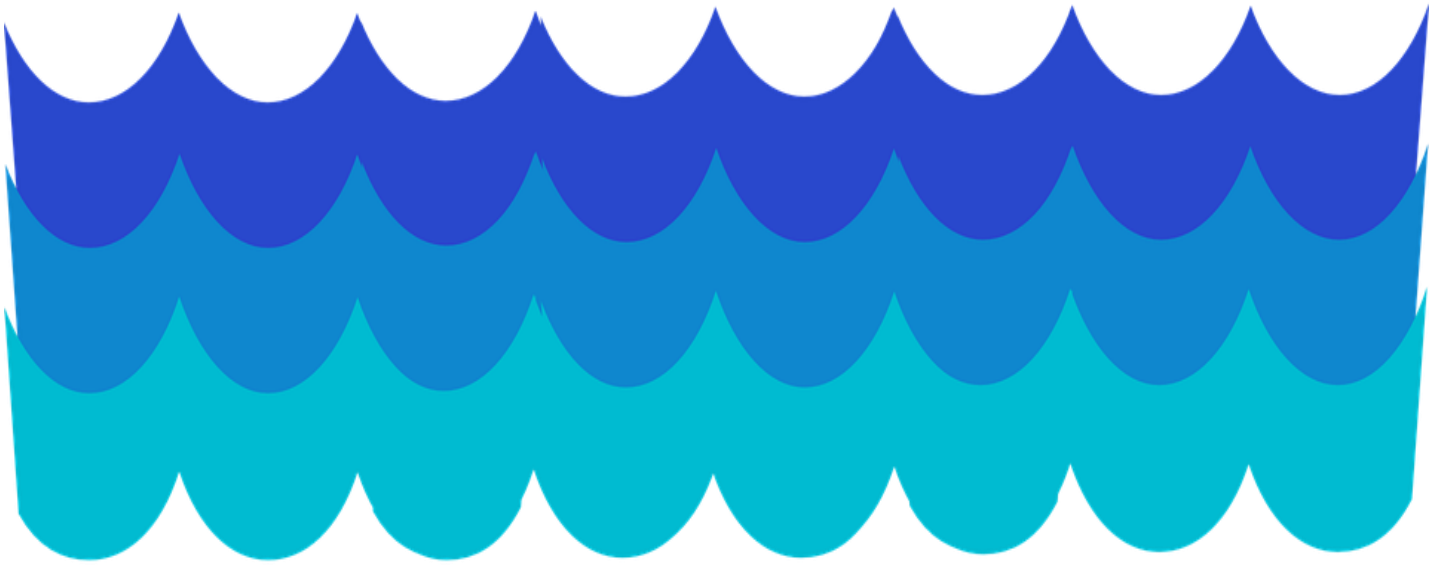
# Water, Water Everywhere!

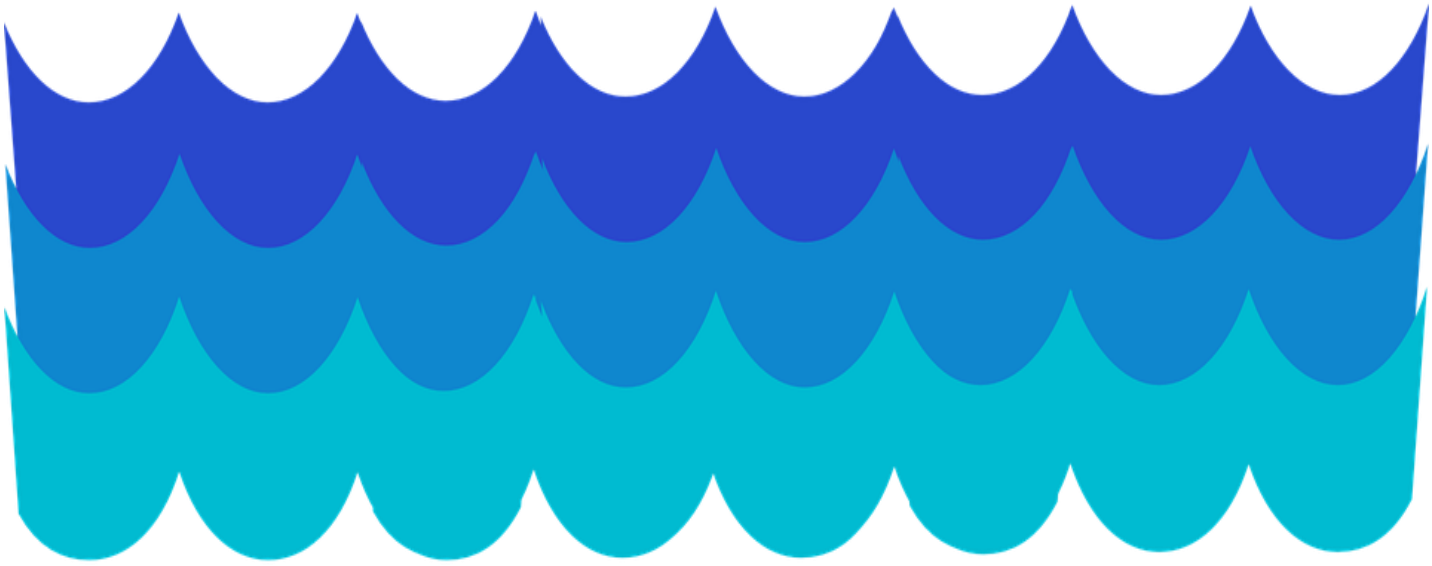
## A Unit on Sustainability

## Grades 6-8

By: Nicole DeLorenzo



# Introduction



# Rationale

This unit is designed to provide students with an opportunity to examine the water crisis that impacts many countries and communities all over the world. By living in the United States, we are often unaware of how people in other countries lack access to clean water. We don't have to worry about where we will have to travel to get water from or whether that water is even safe to drink. Yet, many people all over the world are struggling with this very issue. It is important that we bring awareness to this issue and the impact that is has on some many lives.

Students will be looking at the lessons in this unit through the conceptual lens of sustainability. Students will learn that sustainability is defined as the ability to meet the needs of the current generation without comprising the survival of future generations. Students will discover the essential understanding, sustainability impacts survival, by exploring the causes and effects of a water crisis. Students will have the opportunity to explore this issue by reading news articles, watching video clips, making connections between countries with similar situations, and even designing a low cost water filter.

# Differentiation for Gifted Learners

Gifted learners are different from their regular education peers in that they need additional differentiation in order to appropriately meet their needs. Gifted learners require a challenging curriculum that often moves at a faster pace. There are several ways to differentiate for gifted learners. You can make modifications in the content, process, product, and learning environment.

This unit is appropriate for gifted learners, because it has been specifically designed to meet the needs of gifted students. Throughout the unit, students will be exposed to a variety of challenging texts. These texts have a high Lexile level and advanced content-specific vocabulary. This is a content modification, because it is presenting the students with above-level content.

This unit also has many process modifications, because the lessons are based on highly-effective gifted education models. Each lesson is a different instructional model. The first lesson is a Taba lesson, which is appropriate for gifted education because it forces students to make generalizations about a concept and think outside the box. The second lesson is a Socratic Seminar. The benefits of this model are that students learn close reading skills while synthesizing a text, students learn to collaborate and share ideas, and the forum allows for discussion that has no right or wrong answer. The third lesson is Creative Problem Solving, which is beneficial because it encourages creativity, critical thinking, problem solving, and perseverance. The final lesson uses a Questioning model. Questioning is appropriate for gifted learners because it moves students towards a deeper understanding of a concept by asking a variety of higher level thinking questions.

Finally, this unit is appropriate for gifted learners because it is concept based. This means that students spend the entire unit focused on a concept and essential understanding. Both of these are broad and allow students to make connections across content areas. When students are able to generalize and move towards broader thinking, they will be able develop a deeper understanding.

# Population

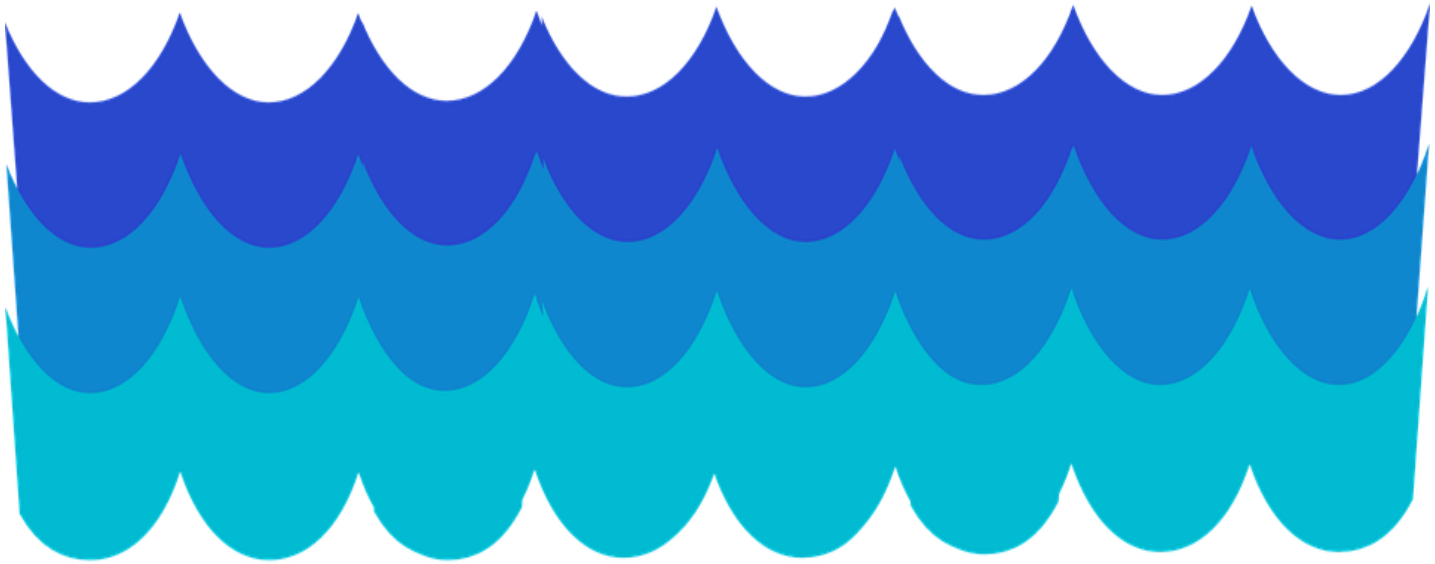
This unit was designed specifically for use in Davidson County School District in North Carolina. It was intended for an AIG enrichment summer camp at Oak Grove Middle School. Therefore the unit was designed for rising $6^{th}$-$8^{th}$ grade AIG students. That means that the students ranged in age from approximately 11-14 years old. All of the students in this program were identified as academically or intellectually gifted by Davidson County.

Oak Grove Middle School is in a rural area of Winston Salem. The population of this school district is not very diverse. Based on the district's statistics, approximately 94% of the population in Davidson County School District is Caucasian. About 1% of the population is Hispanic and 2% is African American. There is a low free or reduced lunch rate, with only 46% of students receiving free or reduced lunches.

There was no prior knowledge about the backgrounds or academic achievement of the students attending this camp. Therefore, the unit was designed to be engaging and challenging for all learners, since I was not aware of individual student needs. Yet, it was clear that each of the students in this class had unique characteristics and traits, such as leadership, perseverance, and creativity . Some of the students also had more background knowledge about the subject of sustainability.

Since the students in this program ranged in age and ability, students were given additional support if necessary. Students also had the chance to collaborate with and receive support from other classmates.

# Goals and Outcomes



## Content Goals and Outcomes

**Goal 1: To develop an understanding of water sustainability and how it impacts the survival of communities.**

Students will be able to…

- Identify water sources (streams, wells, lakes, rivers, etc.) and what can happen when communities do not have a viable water source
- Examine the impact on the people of a community (especially women and children) when there is little or no access to clean water
- Compare and contrast countries/ communities experiencing water sustainability issues (example: Tanzania and Flint, MI)
- Analyze how droughts can impact the sustainability of an area and the effects it has on a community
- Create a water low cost water filter that could be used to solve sustainability problems

## Process Goals and Outcomes

**Goal 2: To develop and apply critical thinking skills**

Students will be able to…

- Analyze information from different sources and perspectives
- Closely examine a text, looking for important facts and information in order to develop higher level thinking questions
- Apply critical thinking skills in order to brainstorm and develop a working water filter
- Make generalizations, inferences, and connections based on information they have learned
- Research and develop a presentation about a country experiencing a water crisis

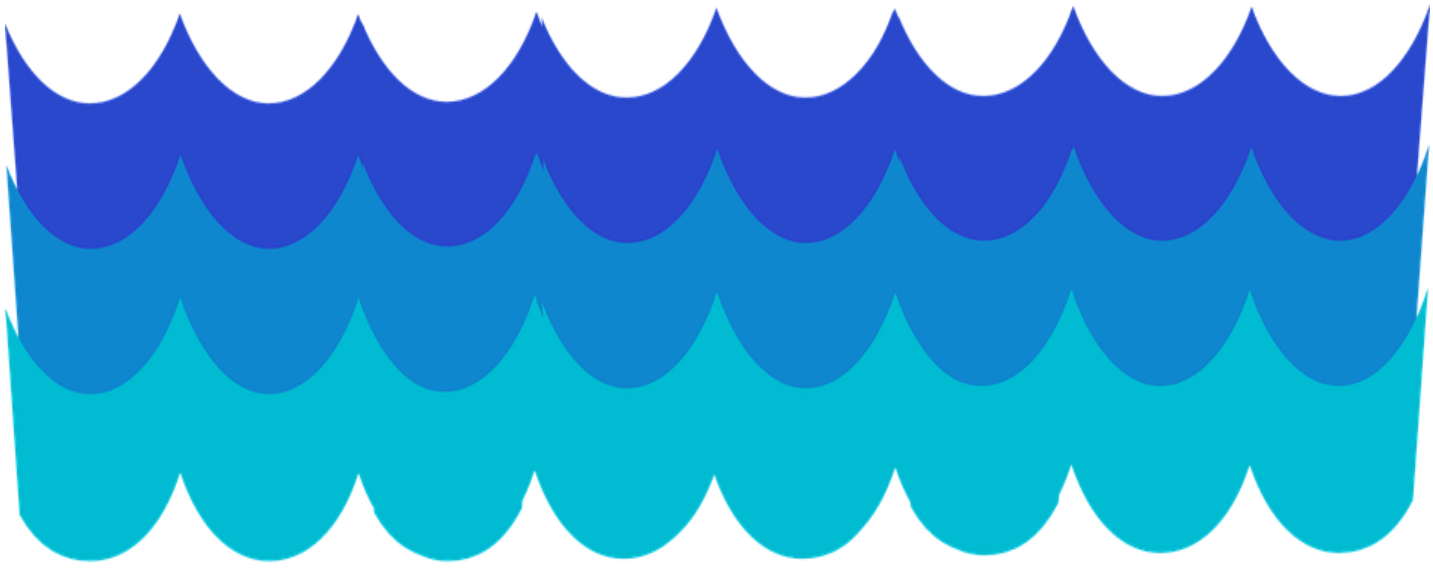
# Concept Goals and Outcomes

**Goal 3: To understand the concept of sustainability**

Students will be able to…

- Define sustainability as “meeting the needs of the present without compromising the ability of future generations to meet their own needs” and gives examples of sustainability
- Explain how sustainability is crucial to survival and how the two terms are related
- Determine possible solutions for water sustainability issues
- Analyze what is necessary for human survival

# Assessment Plan



# Formative Assessment

It is crucial to monitor students' progress throughout the course of this unit. Students should be frequently assessed through the formative assessment methods listed below. This will ensure that students meet the desired goals and outcomes of the unit.

- On the very first day, students will be completing a KWL chart about water supply and sustainability. The "Know" portion of this chart will give insight into their background knowledge and prior information they may have. The "Want to Know" section of the chart will provide a list of any items that students have questions about or would like to learn more aobut. Finally, the "Learned" portion of the chart will allow the teacher to see what new information students have gained at the end of the lesson.

- Students will fill out a daily journal prompt at the end of each class session based on the essential question, "In what ways does sustainability impact survival?" This will provide evidence of progress towards the essential understanding.

- Teacher will make observations during discussions, looking for an understanding of both the content and concepts.

- Peer evaluations will occur during Socratic Seminar, which will help students understand whether or not they stayed on topic and uses the sources they were given

- Graphic organizers will be used frequently to help students organize their thinking and process the information they have learned

# Summative Assessment

Throughout the unit, students will be working on the final summative assessment, which is the performance task. Since the performance task has several parts, students should be given time each day to work on the task. Through completion of this task, students will demonstrate an understanding of water sustainability, how it impacts the community, and what could realistically be done to help solve the problem. In addition to researching, students will need to put the information into a presentation with a visual aid. Students will be assessed on their final presentation using a rubric (provided on the next page).

# Performance Task

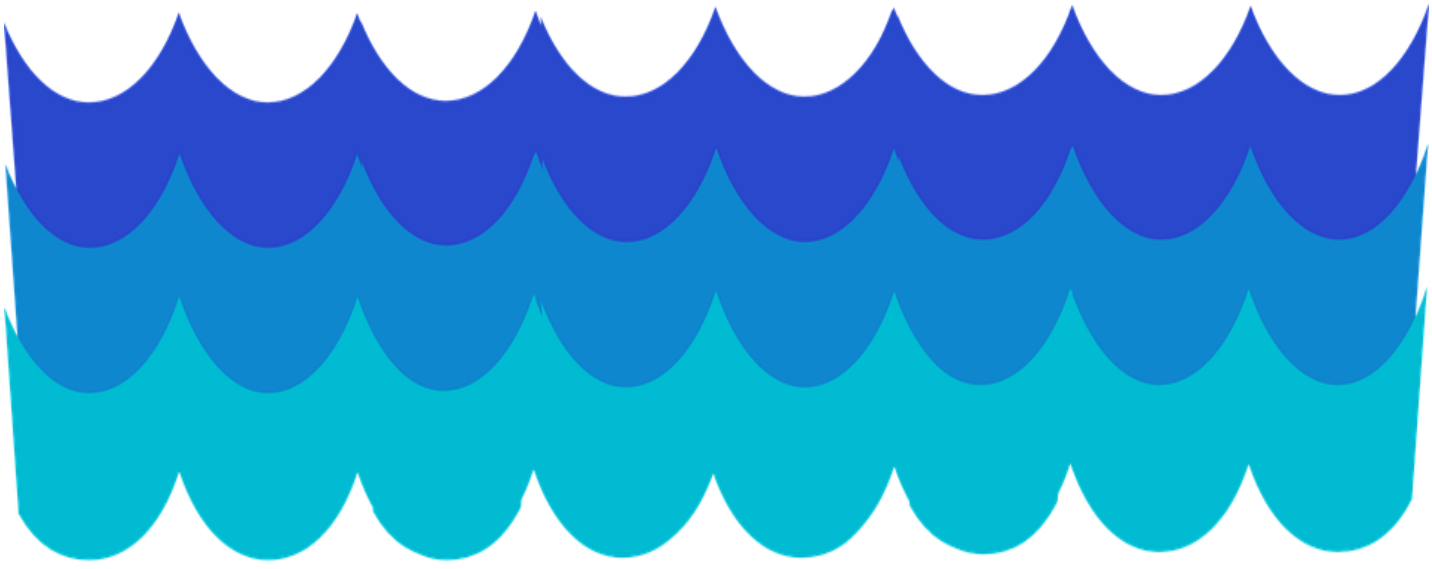
The United Nations has recently scheduled a conference in order to determine whether or not countries are working towards the Sustainable Development Goals that were adopted in 2015. As a sustainable development researcher, you have been chosen to share your expertise. You will be responsible for discussing your country's progress in front of the other countries on the United Nations panel.

Your task is to research the sustainability issues your country faces in order to represent your country at the conference. You will also need to be familiar with your country's demographics, geography, economics, etc. To prepare for the conference, you will need to create a presentation based on your research. You will need to create a PowerPoint, poster, Google Slides presentation, brochure, or other visual aid for your presentation. In your presentation, you must also show that your country has made progress towards the Sustainable Development Goals by presenting a working, viable, and economic real life model of water filtration system that would be beneficial to your country's sustainability.

# Rubric

| Criteria | 4 | 3 | 2 | 1 |
|---|---|---|---|---|
| Conceptual Understanding<br><br>(Sustainability impacts survival) | Student demonstrated a complex understanding of sustainability and how it impacts survival | Student demonstrated understanding about how sustainability impacts survival | Student demonstrated some understanding about how sustainability impacts survival | Student demonstrated little or no understanding about how sustainability impacts survival |
| Content Knowledge<br><br>(Researching a country and its sustainability issues) | Student demonstrated an in depth understanding of the content and made connections across other disciplines | Student demonstrated understanding of content | Student demonstrated some understanding of content | Student did not demonstrate a clear understanding of content |
| Organization & Visual Aid | Information was clearly organized and visual aid was creative | Information was organized in an appropriate manner and visual aid was acceptable | Information was somewhat organized<br>OR<br>Visual aid needed some improvement | Information was unorganized and/ or confusing<br>OR<br>No visual aid provided |
| Presentation | Student displayed outstanding public speaking skills and was engaging to listen to | Student spoke clearly and at the appropriate voice level so all could hear | Student spoke clearly at times, but not consistently | Student did not speak clearly or at the appropriate voice level |
| Participation<br><br>(Creating water filter and designing presentation) | Student demonstrated excellent leadership skills and collaborated effectively | Student collaborated effectively with peers and contributed to the task | Student displayed some effort, but not consistently<br>OR<br>student struggled to collaborate with peers | Student demonstrated little effort and/or contribution to the task |

# Lesson Plans



| TEACHER NAME | Lesson # |
|---|---|
| Nicole DeLorenzo | 1 |

| MODEL | CONTENT AREA | GRADE LEVEL |
|---|---|---|
| Taba | Science | 5th- 8th |

| CONCEPTUAL LENS | LESSON TOPIC |
|---|---|
| Sustainability | Water |

**LEARNING OBJECTIVES** *(from State/Local Curriculum)*

**NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**
**As a result of activities in grades 9-12, all students should develop understanding of:**
**Personal and community health, Population growth, Natural resources, Environmental quality, Natural and human-induced hazards, Science and technology in local, national, and global challenges**

**NSS-G.K-12.5 ENVIRONMENT AND SOCIETY**
**As a result of activities in grades K-12, all students should:**
**Understand how human actions modify the physical environment.**
**Understand how physical systems affect human systems.**
**Understand the changes that occur in the meaning, use, distribution, and importance of resources.**

| THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?* | THE ESSENTIAL QUESTION *(What question will be asked to lead students to "uncover" the Essential Understanding)* |
|---|---|
| **Sustainability impacts survival** | **In what ways does sustainability impact survival?** |

| CONTENT KNOWLEDGE (What factual information will students learn in this lesson?) | PROCESS SKILLS (What will students be able to do as a result of this lesson?) |
|---|---|
| • Sustainability is defined as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."<br>• Students will learn about sources of water and water supply (rivers, oceans, streams, etc.)<br>• Students will learn that water supply impacts the sustainability of countries, especially 3rd world countries, by limiting the access to clean water. | • Explain water supply and how water is needed for humans to survive<br>• Analyze how sustainability can impact the way society functions<br>• Evaluate why there is a water sustainability issue and what steps are being taken to solve the problem.<br>• Examine factors that impact sustainability |

| **GUIDING QUESTIONS**<br>***What questions will be asked to support instruction?***<br>***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*** | | |
|---|---|---|
| **Pre-Lesson Questions:** | **During Lesson Questions:** | **Post Lesson Questions:** |
| • How do we get water?<br>• What do we need water for?<br>• What are some examples of sources that we get water from?<br>• Why is water necessary for life?<br>• Look at your personal water audit. In what ways could you reduce the amount of water you use?<br>• What is sustainability? (look at the root word "sustain" to help you)<br>• How could the decisions we make today impact our survival now and in the future? | • What are some challenges caused by a lack of water/no access to clean water?<br>• What common themes did you notice among the categories? What items from the list did you find were difficult to place? Why?<br>• Water is a renewable resource. So why is it that water sustainability is an issue?<br>• What are some solutions to water sustainability? How can we ensure that future generations have access to water?<br>• Based on what you know, assess the importance of having water to produce energy versus having energy to clean and transport water. Which holds more importance?<br>• Who has control over water resources? In your opinion, who should water regulation be managed by? | • What is the relationship between sustainability and humans?<br>• How does sustainability impact the survival of the people in a community?<br>• How is pollution related to sustainability? What is the relationship between the two.?<br>• What are the effects of a lack of water supply on communities? How can these effects be reversed/resolved?<br>• In what ways does sustainability impact survival? |

| **DIFFERENTIATION**<br>***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.*** | | | |
|---|---|---|---|
| **Content** | **Process** | **Product** | **Learning Environment** |
| The articles used during this lesson use advanced vocabulary and discuss real political issues. | | | |

**PLANNED LEARNING EXPERIENCES**

***(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)***

**Engage and Connect** - ***This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.***

***Accompanying Google Slides Presentation:***
***https://docs.google.com/a/dpsnc.net/presentation/d/1p5qxGJOYvvYSveC_evz9u4bRiKIEa68wXAgtPxYCIiQ/edit?usp=sharing***

**1st Day Icebreaker- "Survival vs. Sustainability":**
Write two categories on the board: Survival and sustainability. Students will be asked if they were on a deserted island what items would they bring for survival. Students will need to come up with exactly 5 items that they deem necessary for their survival. After they have chosen 5 items, students must write how that item would help sustain them on the island. Once students have had time to create their lists, students will share their lists with a partner. They will compare lists and discuss the items they would choose to bring. Before moving on, come back together as a class to talk about items that have been chosen and whether or not they are sustainable.

**KWL Chart-** Begin lesson by asking students to brainstorm what they know about "water supply" and "sustainability". (How do we get water? What do we need water for?) Students will jot down what they know on a post-it note. This will be posted on the "K" section of the chart. Next, have students write down one question that they have about water supply. Post these responses in the "W" or "want to know" section of the chart.

Students will then watch a Brainpop video about water supply. The video outlines the different reasons that a water supply could become diminished. The video will give students some necessary background knowledge about where water comes from, how it can become scarce, and factors that can impact the availability of water. (5 minutes)
https://www.brainpop.com/science/earthsystem/watersupply/

Discuss sustainability by introducing the definition, "meeting the needs of the present without compromising the ability of future generations to meet their own needs", and relating back to the Brainpop video. How can our actions today impact future generations? How does this connect to sustainability? Have students share out examples.

**PERSONAL WATER AUDIT**- Students will begin by taking a Personal Water Audit to figure out how much water they use on a daily basis (see bottom of lesson plan for worksheet) Students will begin by guessing how many gallons of water they use in 1 day.
Once students have made a prediction, they can begin the questionnaire.
Students will answer each question and do the accompanying math (example: How times you flush the toilet in 1 day **x** 3 gallons per flush). Students should try to do the math without calculators, but calculators can be provided if needed.
Once the questionnaire is complete, students will be asked to find their approximate total water footprint per year. Students will go to http://waterfootprint.org/en/resources/interactive-tools/personal-water-footprint-calculator/personal-calculator-extended/ Find "Your Footprint Calculator" on the left and choose the Extended Calculator. Fill this in and find your total. (Note: 1 kilogram = 2.20462262 pounds.)

Ask remaining pre-lesson questions:

- What are some examples of sources that we get water from?
- Why is water necessary for life?
- What is sustainability? (look at the root word "sustain" to help you
- Look at your personal water audit. In what ways could you reduce the amount of water you use? Compare this to the

average water usage.

**Explore** - ***In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.***

Listing

Students will be split into two groups- Group A and Group B. Each group will be given a different article to read. The two articles are: *Sustainable Earth: Water* from National Geographic and *Energy versus Water: Solving Both Crises Together* (see attached). As students are reading, they will be creating a list of people, places, and things that are impacted by sustainability issues. After reading the article, students will pair up with a partner from another group for a jigsaw. Each partner will summarize what they have read. The students will work together to compare the lists they have made and add any additional items to the list. After creating a list with their partner, students will share out the lists while the teacher records the answers.

Grouping and Labeling

Students will generate smaller word lists based on similarities they saw during the listing portion of the lesson. The students will work collaboratively to decide which words on the list could be grouped together based on the concept of sustainability. Students will need to create a label for the words they have grouped together. Students will have the following rules while grouping the words together: they must have at least 3 different groups, 4 or more items in each group, and items cannot be used more than once.

While students are working, the teacher will circulate, checking in on the students and how the grouping is going. Students will be encouraged to look for more similarities/differences in order to group the words in a new way. Once all students have created their groups, students will share out the labels they created for their groupings. After all groups have shared their labels, students will discuss how the groupings were the same and different. Was there a common theme? Were there items from the list that were difficult to place? Why?

**Explain -** ***Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.***

Students will participate in a whole group discussion based on the articles they have read.

Discussion Questions based on article:

- What are some challenges caused by a lack of water/no access to clean water?
- Water is a renewable resource. So why is it that water sustainability is an issue?
- What are some solutions to water sustainability? How can we ensure that future generations have access to water?
- Based on what you know, assess the importance of having water to produce energy versus having energy to clean and transport water. Which holds more importance?
- Who has control over water resources? In your opinion, who should water regulation be managed by?

Students will also fill in the "L" portion of the KWL chart with information/big ideas that they have learned from the articles, grouping, and the discussion. Ideas should relate back to understandings about sustainability and water supply.

**Elaborate** ***—Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways***

Regrouping:
Students will be asked to regroup their words from the list. They must create new groupings and new labels as they relate to sustainability. Rules for grouping: students must use new categories and labels, each category must contain at least 3 items, words may be placed in more than one category.

After students have had time to work, groups will share out their new labels and groupings. Compare and contrast how these groupings may be similar to or different from the original groupings.

**Evaluate:** ***This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.***

Wrap up lesson by having a discussion about the relationship between sustainability and survival. How does sustainability impact people, places, and things within a community? Students will end the lesson by writing a journal entry about, "In what ways does sustainability impact survival?"

In their journal, students will also create an illustrated dictionary entry for the word "sustainability." Students should sketch a simple visual that they think best illustrates the word, come up with a two- or three-sentence definition, and briefly explain why it is important

**Students will be introduced to the performance task today. Students should pick which country they would like to research (see attached list). They will begin to research about the country's water problem, the demographics, geography, economy, etc. of the country. Students will be researching and finding relevant information today.**

| | | |
|---|---|---|
| 22 | Kyrgyzstan | 4.82 |
| 23 | East Timor | 4.81 |
| 24 | Iran | 4.78 |
| 25 | Yemen | 4.67 |
| 26 | Palestine | 4.63 |
| 27 | Jordan | 4.59 |
| 28 | Lebanon | 4.54 |
| 29 | Somaliland | 4.38 |
| 30 | Uzbekistan | 4.32 |
| 31 | Pakistan | 4.31 |
| 32 | Turkmenistan | 4.30 |
| 33 | Morocco | 4.24 |
| 34 | Mongolia | 4.05 |
| 35 | Kazakhstan | 4.02 |
| 36 | Afghanistan | 4.01 |

| RANK | COUNTRY NAME | BASELINE WATER STRESS SCORE |
|---|---|---|
| 1 | Antigua and Barbuda | 5.00 |
| 1 | Bahrain | 5.00 |
| 1 | Barbados | 5.00 |
| 1 | Comoros | 5.00 |
| 1 | Cyprus | 5.00 |
| 1 | Dominica | 5.00 |
| 1 | Jamaica | 5.00 |
| 1 | Malta | 5.00 |
| 1 | Qatar | 5.00 |
| 1 | Saint Lucia | 5.00 |
| 1 | Saint Vincent and the Grenadines | 5.00 |
| 1 | San Marino | 5.00 |
| 1 | Singapore | 5.00 |
| 1 | Trinidad and Tobago | 5.00 |
| 1 | United Arab Emirates | 5.00 |
| 1 | Western Sahara | 5.00 |
| 17 | Saudi Arabia | 4.99 |
| 18 | Kuwait | 4.96 |
| 19 | Oman | 4.91 |
| 20 | Libya | 4.84 |
| 21 | Israel | 4.83 |

# Personal Water Audit

**Name:** _____ **Date:** _____

Answer the following questions about your water usage today.
If you do not know the exact numbers, please estimate as well as you can.

**Pre-Question:** Before completing the chart below, take a guess at how many gallons of water you use in 1 day ___
Compare your guess with totals below when you finish your water audit and calculations!

| Question | Answer | Calculation - Try not to use a calculator! | Answer |
|---|---|---|---|
| 1. How many times today have you flushed your toilet? | | **Multiply this number by 3.** The average toilet uses 3 gal of water per flush. | Gal |
| 2. Did you take a shower or bath? | | **Write down 40 gal if you took a bath. Write down 7 gal for every minute you were in the shower.** You may adjust your number if you did not fill the tub all the way or if you have a low-flow showerhead. | Gal |
| 3. How many times did your family run the dishwasher today? | | **Account for about 10 gal per load.** | Gal |
| 4. How many loads of laundry did your family do today? | | **Multiply this number by 40.** (If you have a front-loading washer, multiply by 25 per load.) | Gal |
| 5. How many minutes today did you run your sink faucet? Think about brushing teeth, washing hands and face, washing dishes, shaving, etc. | | **Factor 4 gal per minute.** | Gal |
| 6. Check the faucets in your house to see if any are leaky. Count the number of drips per minute. | | **For every 10 drips in a minute, multiply by 1.4.** This should be done for each leaky faucet. | Gal |
| 7. How many glasses of water did you drink today? | | **Multiply each glass by 0.0625.** There are about 8 oz in an average glass. 128 oz = 1 gal (or about 16 glasses of water). | Gal |
| 8. Did you use a hose today? Think about watering a garden, washing a car, or bathing a pet. | | **Factor 10 gal per minute.** | Gal |
| **Daily Total** | | **Add up the numbers in the right-hand column.** This is how many gallons of water you used today domestically. | Gal |

Figures for calculations estimated from "Conducting a Household Water Audit," Maryland Department of the Environment, .

This is your **personal daily domestic water usage**. Remember that this does not include the general water used to run your household, school, car, or other shared space. In addition, water is used to produce almost everything you buy, eat or drink.

To find your approximate **total water footprint per year**, visit www.waterfootprint.org.
Find "Your Footprint Calculator" on the left and choose the Extended Calculator. Fill this in and find your total.
(Note: 1 kilogram = 2.20462262 pounds.)

My total water footprint in cubic meters per year is: _____.
Multiply this by 1000 to find your usage in liters: _____.
Divide this by 3.785411784 to find your **average yearly water usage** in gallons: _____ .
Divide this number by 365 to find your **average daily total water usage** in gallons: _____.

Compare this to your original guess at the top. Are you surprised? In addition to your **personal daily domestic water usage** total, how much water do you use each day without turning on a faucet? _____

**Sustainable Earth: Water**

Brian Handwerk For National Geographic News

Clean water is essential for life, but most people in the developed world don't think much about the water they use for drinking, food preparation, and sanitation. In developing nations, however, the search for safe drinking water can be a daily crisis. Millions of people die each year, most of them children, from largely preventable diseases caused by a lack of access to clean water and proper sanitation.

Sandra Postel, director of the Global Water Policy Project and the National Geographic Society's freshwater fellow, said freshwater scarcity presents a growing problem to be addressed during the United Nations Conference on Sustainable Development (Rio+20) in Brazil from June 20 to 22. "It manifests itself in the depletion of groundwater, and the drying up of rivers and lakes upon which people depend for irrigation to grow their food," she said. "The intersection of water scarcity, food security, and a changing climate on top of it all raises a suite of water concerns that urgently need to be addressed."

Much progress is possible. In fact, due to the dedicated efforts of governments and NGOs since the 1992 Earth Summit, safe drinking water has been made available to some 1.7 billion people around the world, with projects ranging from modern piped plumbing to rainwater collection and storage.

But an estimated 880 million people still don't have regular access to clean water. "And we haven't made nearly as much progress on sanitation," Postel said. "Something like 2.7 billion people are without adequate sanitation, so that challenge still looms very large." Policymakers will struggle to lower both numbers even as the planet's population rises by an expected three billion over the next 50 to 75 years.

**Serious Challenges**

About 5,000 children die each day due to preventable diarrheal diseases such as cholera and dysentery, which spread when people use contaminated water for drinking or cooking. A lack of water for personal hygiene leads to the spread of totally preventable ailments like trachoma, which has blinded some six million people.

Water woes also trap many low-income families in a cycle of poverty and poor education—and the poorest suffer most from lack of access to water. People who spend much of their time in ill health, caring for sick children, or laboriously collecting water at distances averaging 3.75 miles (6 kilometers) a day are denied educational and economic opportunities to better their lives.

Competition can be fierce for this precious commodity. Agriculture claims the lion's share of freshwater worldwide, soaking up some 70 percent, and industrial uses consume another 22 percent. Watersheds and aquifers don't respect political borders and nations don't always work together to share common resources—so water can be a frequent source of international conflict as well.

Day-by-day demand keeps growing, further draining water sources, from great rivers to underground aquifers. "We're going deeper into debt on our groundwater use," Postel said, "and that has very significant impacts for global water security. The rate of groundwater depletion has doubled since 1960."

Some of Earth's groundwater is fossil water, created when Earth's climate was far different. Today such water is as finite as petroleum. Other aquifers are renewable. "But we're pumping many of them out faster than precipitation is recharging them," Postel explained. "This is the case underneath the breadbasket of India, underneath the wheat and cornfields on the plains of north China, under California's Central Valley. We need to bring withdrawals into balance with recharge."

Humanity's growing thirst also poses a major problem for aquatic ecosystems. "When we take water from rivers, floodplains, and watersheds, those ecosystems bear the brunt of water scarcity and begin to be degraded or disappear," she said. "And that also creates a cost to us, not just to nature, because we also depend upon those ecosystems."

**The Path to Solutions**

The silver lining, Postel noted, is that many opportunities exist to use the water we do have more productively. Change begins with more efficient management of water resources.

"Seventy percent of all the water we use globally is for agriculture, so that's where we first have to become a lot more efficient through methods like drip irrigation and growing crops that are more suitable to the local climate," Postel said. "We still have too few incentives for farmers to use water more efficiently. Farmers are good businesspeople; they respond to incentives that affect their bottom line."

The United National General Assembly has recognized "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights." Making that right become a universal reality, and providing each person on the planet with affordable access to the 20 to 50 liters of daily water required to sustain life, is a clear goal for the decades ahead.

*Excerpted from Scientific American Special Editions (www.sciam.com) - October 22, 2008*

**Energy versus Water: Solving Both Crises Together**

*Water is needed to generate energy. Energy is needed to deliver water. Both resources are limiting the other—and both may be running short. Is there a way out?*

By Michael E. Webber

In June the state of Florida made an unusual announcement: it would sue the U.S. Army Corps of Engineers over the corps's plan to reduce water flow from reservoirs in Georgia into the Apalachicola River, which runs through Florida from the Georgia-Alabama border. Florida was concerned that the restricted flow would threaten certain endangered species. Alabama also objected, worried about another species: nuclear power plants, which use enormous quantities of water, usually drawn from rivers and lakes, to cool their big reactors. The reduced flow raised the specter that the Farley Nuclear Plant near Dothan, Ala., would need to shut down.

Georgia wanted to keep its water for good reason: a year earlier various rivers dropped so low that the drought-stricken state was within a few weeks of shutting down its own nuclear plants. Conditions had become so dire that by this past January one of the state's legislators suggested that Georgia move its upper border a mile farther north to annex freshwater resources in Tennessee, pointing to an allegedly faulty border survey from 1818. Throughout 2008 Georgia, Alabama and Florida have continued to battle; the corps, which is tasked by Congress to manage water resources, has been caught in the middle. Drought is only one cause. A rapidly growing population, especially in Atlanta, as well as overdevelopment and a notorious lack of water planning, is running the region's rivers dry.

Water and energy are the two most fundamental ingredients of modern civilization. Without water, people die. Without energy, we cannot grow food, run computers, or power homes, schools or offices. As the world's population grows in number and affluence, the demands for both resources are increasing faster than ever.

Woefully underappreciated, however, is the reality that each of these precious commodities might soon cripple our use of the other. We consume massive quantities of water to generate energy, and we consume massive quantities of energy to deliver clean water. Many people are concerned about the perils of peak oil—running out of cheap oil. A few are voicing concerns about peak water. But almost no one is addressing the tension between the two: water restrictions are hampering solutions for generating more energy, and energy problems, particularly rising prices, are curtailing efforts to supply more clean water.

The paradox is raising its ugly head in many of our own backyards. In January, Lake Norman near Charlotte, N.C., dropped to 93.7 feet, less than a foot above the minimum allowed level for Duke Energy's McGuire Nuclear Station. Outside Las Vegas, Lake Mead, fed by the

Colorado River, is now routinely 100 feet lower than historic levels. If it dropped another 50 feet, the city would have to ration water use, and the huge hydroelectric turbines inside Hoover Dam on the lake would provide little or no power, potentially putting the booming desert metropolis in the dark.

Research scientist Gregory J. McCabe of the U.S. Geological Survey reiterated the message to Congress in June. He noted that an increase in average temperature of even 1.5 degrees Fahrenheit across the Southwest as the result of climate change could compromise the Colorado River's ability to meet the water demands of Nevada and six other states, as well as that of the Hoover Dam. Earlier this year scientists at the Scripps Institution of Oceanography in La Jolla, Calif., declared that Lake Mead could become dry by 2021 if the climate changes as expected and future water use is not curtailed.

Conversely, San Diego, which desperately needs more drinking water, now wants to build a desalination plant up the coast, but local activists are fighting the facility because it would consume so much energy and the power supply is thin. The mayor of London denied a proposed desalination plant in 2006 for the same reason, only to have his successor later rescind that denial. Cities in Uruguay must choose whether they want the water in their reservoirs to be used for drinking or for electricity. Saudi Arabia is wrestling with whether to sell all its oil and gas at record prices or to hold more of those resources to generate what it doesn't have: freshwater for its people and its cities.

We cannot build more power plants without realizing that they impinge on our freshwater supplies. And we cannot build more water delivery and cleaning facilities without driving up energy demand. Solving the dilemma requires new national policies that integrate energy and water solutions and innovative technologies that help to boost one resource without draining the other.

**Vicious Cycle**

The earth holds about eight million cubic miles of freshwater—tens of thousands of times more than humans' annual consumption. Unfortunately, most of it is imprisoned in underground reservoirs and in permanent ice and snow cover; relatively little is stored in easily accessible and replenishable lakes and rivers.

Furthermore, the available water is often not clean or not located close to population centers. Phoenix gets a large share of its freshwater via a 336-mile aqueduct from, of course, the Colorado River. Municipal supplies are also often contaminated by industry, agriculture and wastewater effluents. According to the World Health Organization, approximately 2.4 billion people live in highly water-stressed areas. Two primary solutions—shipping in water over long distances or cleaning nearby but dirty supplies—both require large amounts of energy, which is soaring in price.

Nationwide, the two greatest users of freshwater are agriculture and power plants…. At the same time, we use a lot of energy to move and treat water, sometimes across vast distances. The California Aqueduct, which transports snowmelt across two mountain ranges to the thirsty coastal cities, is the biggest electricity consumer in the state. As convenient resources become tapped out, providers must dig deeper and reach farther…. In addition, local municipalities have to clean incoming water and treat outgoing water, which together consume about 3 percent of the nation's electricity. Health standards typically get stricter with time, too, so the degree of energy that needs to be spent per gallon will only increase.

**New Mind-set Needed, Too**

Regardless of which energy source the U.S., or the world, might favor, water is ultimately more important than oil because it is more immediately crucial for life, and there is no substitute. And it seems we are approaching an era of peak water—the lack of cheap water. The situation should already be considered a crisis, but the public has not grasped the urgency…. Peak oil might cause some human suffering, but peak water would have more extreme consequences: millions already die every year from limited access to freshwater, and the number could grow by an order of magnitude.

Perhaps signposts will wake our collective minds. Kansas lost a lawsuit to Missouri recently over interstate water use, causing Kansan farmers to reconfigure how they will grow their crops. Rationing should certainly put society on notice, and it is beginning. My hometown of Austin, Tex., now imposes strict lawn-watering restrictions. California, suffering record low snowfalls, has issued statewide requirements for municipal water conservation and rationing of water that are reminiscent of gasoline controls in the 1970s.

Someday we might look back with a curious nostalgia at the days when profligate homeowners wastefully sprayed their lawns with liquid gold to make the grass grow, just so they could then burn black gold to cut it down on the weekends. Our children and grandchildren will wonder why we were so dumb.

| TEACHER NAME | | | Lesson # |
|---|---|---|---|
| Nicole DeLorenzo | | | 2 |
| **MODEL** | **CONTENT AREA** | **GRADE LEVEL** | |
| **Socratic Seminar** | **Science** | **5th-8th** | |

| CONCEPTUAL LENS | LESSON TOPIC |
|---|---|
| Sustainability | Clean Water Access |

**LEARNING OBJECTIVES** *(from State/Local Curriculum)*

**Next Generation Science Standards**

5th Grade- ESS2.C: THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

ESS3.C: Human Impacts on Earth Systems- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

**NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**

**As a result of activities in grades 9-12, all students should develop understanding of:**

**Personal and community health, Population growth, Natural resources, Environmental quality, Natural and human-induced hazards, Science and technology in local, national, and global challenges**

**NSS-G.K-12.5 ENVIRONMENT AND SOCIETY**

**As a result of activities in grades K-12, all students should:**

**Understand how human actions modify the physical environment.**

**Understand how physical systems affect human systems.**

**Understand the changes that occur in the meaning, use, distribution, and importance of resources.**

**RI.5.1-** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text

| THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?* | THE ESSENTIAL QUESTION *(What question will be asked to lead students to "uncover" the Essential Understanding)* |
|---|---|
| Sustainability impacts survival | In what ways does sustainability impact survival? |

| CONTENT KNOWLEDGE (What factual information will students learn in this lesson?) | PROCESS SKILLS (What will students be able to do as a result of this lesson?) |
|---|---|
| Students will learn<br>- About improved vs unimproved water sources<br>- What actions are being taken to | Students will be able to:<br>- Closely examine a text, looking for important facts and information, making connections, and posing |

| | |
|---|---|
| provide countries with access to clean water?<br>- Sustainability is meeting the needs of the present without jeopardizing the future.<br>- 650 million people live without access to an improved water source<br>- The five countries with the lowest access to clean drinking water (Equatorial Guinea, Angola, Chad, Mozambique, and Papua New Guinea<br>- Actions being taken to provide countries with access to clean water | questions.<br>- Analyze the impact of sustainability on survival<br>- Craft open ended questions using the provided text<br>- Dialogue with other students about a particular topic in order to reach a deeper understanding<br>- Research and analyze facts in order to come up with possible solutions |

| **GUIDING QUESTIONS**<br>***What questions will be asked to support instruction?***<br>***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*** | | |
|---|---|---|
| **Pre-Lesson Questions:** | **During Lesson Questions:** | **Post Lesson Questions:** |
| **Content**<br>- According to the video, what is the major problem in Papua New Guinea?<br>- What are some factors that caused this problem?<br>- What effects does this problem have on the citizens of Papua New Guinea?<br>- What steps are being taken to eliminate/solve this problem?<br>- Where else in the world do you think this same problem may be occurring?<br><br>**Concept**<br>- What is sustainability? Give examples of sustainability.<br>- How do the decisions we make about sustainability today impact our survival now and in the future?<br>-<br><br>**Instructional Model**<br>- What are some strategies for close reading? What should you pay attention to while reading? | **Content**<br>- What countries ranked the lowest for access to clean water? What do these countries have in common?<br>- What is the difference between improved water sources and unimproved water sources? Give examples.<br>- Besides scarcity, what other factors are parts of the global water crisis?<br>- Why does clean water cost more in countries without public water access?<br><br>**Concept**<br>- How does sustainability impact the citizens that live in impoverished countries with little access to clean water?<br>- What can be done to improve sustainability in third world countries? How would this improve the survival of the people living in these countries?<br><br>**Instructional Model**<br>- What are the rules for Socratic seminar? How should we interact and treat each other? | **Content**<br>- How might you compare and contrast Papua New Guinea and Flint, Michigan? What connections can be made? What are some differences between the two situations?<br><br>**Concept**<br>- In what ways does sustainability impact the citizens of Papua New Guinea?<br>- What is the impact of sustainability on survival?<br>- What generalizations can you make about sustainability and survival?<br><br>**Instructional Model**<br>- What new ideas did you discover during the seminar?<br>- What challenges did you face during the seminar? How did your role pose a challenge?<br>- What was the big idea of this seminar? |

**DIFFERENTIATION**

***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***

| Content | Process | Product | Learning Environment |
|---|---|---|---|
| **News ELA articles can be differentiated by Lexile level. The article chosen was a 1040 L. However, there are 2 versions of the article that are of a higher Lexile level (1170 L and MAX).** | | | **Students will have the opportunity to work in a variety of settings, as there will be independent work, small group, and seminar discussion.** |

**PLANNED LEARNING EXPERIENCES**

***(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)***

**Engage and Connect** - ***This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.***

As students come in, they will have a sustainability journal prompt to work on. Since sustainability involves more than just water, this journal prompt will get students to transfer what they know about sustainability to other areas. Students should answer the following question in their journal, "Many cities suffer from serious air and noise pollution—as well as endless traffic jams—because of too many cars. Some people feel that cities with extensive public transportation systems should ban passenger cars and force people to walk, bike, or use public transportation. What is your position about banning passenger cars from cities where there is extensive traffic?" After students have had time to respond, students may share out their responses and discuss the journal prompt together.

Students will begin by watching a video about Papua New Guinea's access to clean water. This will be the subject of today's lesson. https://www.youtube.com/watch?v=oi0UP-3iMb4 Students will be given a 5W graphic organizer that they can use to take notes while watching the video.

After watching, discuss the video using the following questions:

- What is the major problem in Papua New Guinea?
- What are some factors that caused this problem?
- What effects does this problem have on the citizens of Papua New Guinea?
- What steps are being taken to eliminate/solve this problem?
- Where else in the world do you think this same problem may be occurring?
- What is sustainability? Give examples of sustainability.
- How do the decisions we make today impact our survival now and in the future?

**Explore** - ***In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.***

Before beginning the activity, we will do a model lesson of a close read using the article http://scienceworld.scholastic.com/Chemistry-News/2016/01/Flint-s-Water-Crisis . Students will use the provided graphic organizer (see attached) to help them follow the steps for close reading. During the first read, students will look for things they notice and words they are unfamiliar with. During the second read, they will focus on key ideas and context clues. During the final read, students will focus on what they have learned and what connections they can make to the text.

We will also practice forming and writing questions about what we have read. Students will be given some question stems that use Costa's levels of questioning (see attached). This will help students craft open ended, higher level questions. We will go over examples and non-examples of open ended questions that would be appropriate.

When students are ready, they will be provided with a copy of the NewsELA article "Papua New Guinea Ranks Last for Access to Clean Water" by Carla Kweifio-Okai. Each student will read the article independently at their seat. Students will use the same graphic organizer as earlier to complete another close read using this article. Students will be expected to take notes and underline important information in the article. Review close reading expectations- Students should be making connections, posing questions, and finding important facts while reading.

Each student will be asked to craft at least 5 questions based on the article that they read. Students should refer back to the Costa question stems to help them create open ended questions. Students are not allowed to create yes/no questions.

After, students will be given the opportunity to read through the article again with a small group. The group will also read over questions that have been crafted, facts that have been underlined, and will begin crafting at least 1 more question that could be discussed during the seminar.

**Explain** - ***Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.***

Once students have had the opportunity to read the text with their small group and discuss, the teacher will ask the following questions:

- What countries ranked the lowest for access to clean water? What do these countries have in common?
- What is the difference between improved water sources and unimproved water sources? Give examples.
- Besides scarcity, what other factors are a part of the global water crisis?
- Why does clean water cost more in countries without public water access?
- How does this impact the citizens that live in impoverished countries with little access to clean water?

Students will respond to the questions orally.

**Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways***

Students will be divided into 2 groups. The first group will be the inner circle during the seminar. The second group will be the outer circle. Only the inner circle students will participate in the dialogue. The outer circle students will be responsible for taking notes, observing a partner that is in the inner circle, and crafting additional questions that could be discussed. One student will be designated by the teacher as the leader for the seminar. The seminar will begin with an opening question from the leader. Students will have expectations and rules for participating in the seminar, which will be discussed beforehand. Teacher will also post Socratic Seminar rules poster as a reminder (see attached)

Students will be posed with the opening question: Why is sustainability critical to survival? What is the relationship between sustainability and survival?

Students will participate in Inner and Outer Circle discussion. Inner circle will discuss the question first, while outer circle participants observe a partner and take notes. Then, after approximately 10 minutes of discussion, the two groups will switch roles and continue the discussion.

Once students have completed the seminar, the teacher will ask the following questions:

- What is the impact of sustainability on survival? What generalizations can you make about sustainability and survival?
- What new ideas did you discover during the seminar?
- Compare and contrast Papua New Guinea and Flint, Michigan? What connections can be made? What are some differences between the two situations?
- What challenges did you face during the seminar? How did your role pose a challenge?
- What was the big idea of this seminar?

**Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.***

Students will reflect on the seminar through an individual writing assignment. Students will answer the essential question, “In what ways does sustainability impact survival?” Students should include ideas they may have discussed during the seminar, new ideas/understandings, and factual information from the text to support their ideas.

Student’s individual performance/participation during the seminar will be assessed based on effort, work, and observation notes from partner.

**Students will continue to work on performance task today. Students may continue research on their country. Students should start to form a plan for their oral presentation and what they will use as a visual aid (poster, powerpoint, photograph, etc.)**

# The Five *Ws* and *How*

| | | |
|---|---|---|
| Who? | TOPIC | When? |
| What? | | Where? |
| Why? | | How? |

# Flint's Water Crisis

Dangerous levels of lead have been found in the water in Flint, Michigan.

BY JENNIFER MARINO WALTERS

In Flint, Michigan, the water that flows out of residents' faucets isn't safe to drink. That's because the town's water supply is contaminated with lead (Pb), an element that can cause harmful health effects in humans and animals. The crisis has led Flint Mayor Karen Weaver, Michigan Governor Rick Snyder, and President Barack Obama to all declare a state of emergency for the city.

Flint's water crisis began in April 2014, when the state temporarily switched the town's water source from nearby Lake Huron to the Flint River in an effort to save money. Locals soon began noticing that their water smelled bad, looked dirty, and tasted funny.

Last summer, scientists from Virginia Tech tested the water in 271 Flint homes. They found dangerous levels of lead in the water. Some of the lead levels were so high that the contaminated water met the criteria for "toxic waste" as defined by the U.S. Environmental Protection Agency (EPA).

## THE DANGERS OF LEAD

Lead, which is found in small amounts in Earth's crust, can be toxic to humans—especially kids. Children with too much lead in their blood can experience long-term health issues, including behavior and learning problems, developmental delays, slowed growth, hearing problems, irritability, fatigue, vomiting, and stomach pain.

The EPA has taken measures over the last 20 years to greatly reduce the amount of lead in tap water. So how did so much lead get into Flint's water? Water in the Flint River is highly corrosive (able to break down materials through chemical reactions).

The Flint River needed to be treated with an anti-corrosive agent for it to be considered a safe drinking-water source. But Michigan's Department of Environmental Quality failed to do so, breaking a federal law. The corrosive water ended eating away at the pipes that carried water to homes in Flint. About half of those pipes are made of lead, which leached into the water.

## TACKLING THE CRISIS

Last October, Flint switched its water supply back to Lake Huron. But the damage done to the pipes is still causing unusually high lead levels in Flint's tap water. Experts say Flint's water is

now safe for bathing but still not safe for drinking. Flint's 100,000 residents are depending on bottled water and water filters being handed out by National Guard members.

In the meantime, the state has appointed a task force to try to determine who's to blame for the water crisis. Since the crisis, the proportion of Flint's children with above-average levels of lead in their blood had nearly doubled. President Obama has released $80 million in federal aid to help Michigan improve its cities' water supplies.

"Our children should not have to be worried about the water they're drinking in American cities," he said at a White House reception. "That's not something that we should accept."

# Papua New Guinea ranks last for access to clean water

By Carla Kweifio-Okai, The Guardian, adapted by Newsela staff on 03.25.16
Word Count **688**

Children fetch drinking water at a pump well in Myanmar, Aug 5, 2015. World Water Day is held every year on March 22. It is a day for understanding problems related to water. A group called WaterAid said that Papua New Guinea is the hardest place in the world to get clean water. Photo: AP/Khin Maung Win. BOTTOM: A vendor delivers water to residents in Papua New Guinea. **Tom Greenwood/WaterAid**

Papua New Guinea has the worst access to clean water in the world. Sixty percent of the South Pacific country's population live without a safe water supply. This figure comes from a report released on World Water Day 2016.

World Water Day is held every March 22. It is an opportunity for the world to focus on water related problems. This year, a report by the charity WaterAid focused on the problem of water access, or how easy it is for people to get safe drinking water.

WaterAid's report ranked countries based on the percentage of households with access to clean water. The five countries ranked lowest for this were Equatorial Guinea (Central Africa), Angola (Southern Africa), Chad (Central Africa), Mozambique (Southeastern Africa) and Papua New Guinea.

Globally, 650 million people live without an "improved" source of drinking water. "Improved" sources of water include protected wells, rainwater or water piped into households. "Unimproved" sources include rivers and ponds.

## Water Delivery Is The Problem

WaterAid also ranked countries by the total number of people without access to safe water. India (Southeast Asia), where 75.8 million people have no access to safe water, was ranked last. The next three lowest countries were China (Eastern Asia), Nigeria (Western Africa) and Ethiopia (Eastern Africa).

Henry Northover is the head of policy for WaterAid. He said the global water crisis was not based on a limited supply of water. Instead, he said it was based on not being able to deliver water to people.

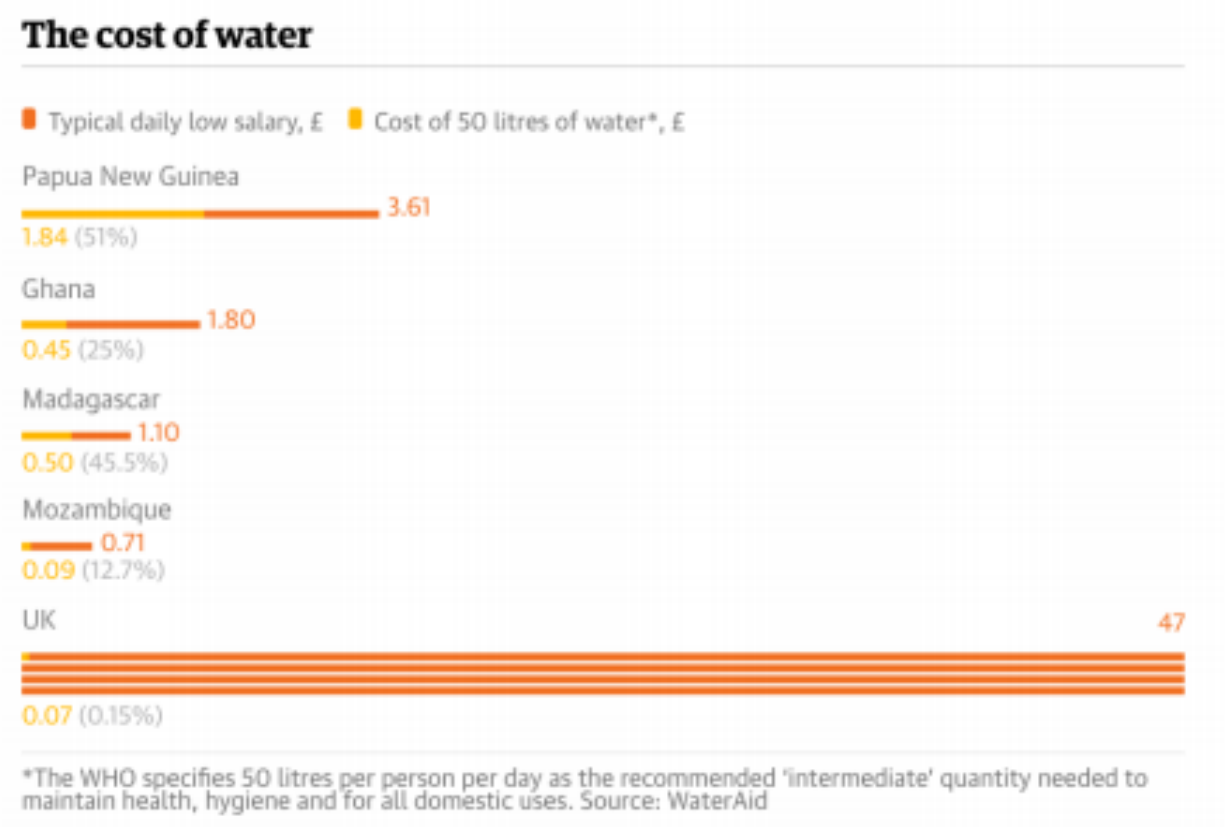
"This is not always an issue of scarcity – by and large we are dealing with a distributional crisis. It is fixable with clear and coherent government policies, and with the focused support of international agencies," Northover said.

## Poor Often Pay The Most For Water

WaterAid's report also detailed the high costs of water access and why the poorest communities often pay the most for water. When there is no public access to clean water, people are forced to buy their water from other sources. Street merchants, tanker trucks and other informal delivery services sell water in these places. None sell their water cheaply.

Port Moresby is the capital of Papua New Guinea. There, the average cost for 50 litres (13.2 gallons) of water from a delivery service is £1.84 ($2.61). That is half the daily salary of some workers. In the U.K., which has piped water, the same amount of water costs only £0.07 ($0.10).

The following chart shows how much of a daily salary is spent on water in four countries. Three are countries without public water access, the other is the U.K.:




## Billions More People Have Access To Clean Water

Northover made this point even clearer by putting it into words. He said that if you live in a country without public water access, you pay more for water "than if you were living in Manhattan."

WaterAid's report was not all bad news. It also showed that efforts to make clean water more available have worked, with 2.6 billion people gaining access since 1990. Cambodia (Southeast Asia) is the country with the greatest improvement in this area. It is followed by Mali (Western Africa), Laos (Southeast Asia) and Ethiopia (Eastern Africa):

## Increasing access to safe water

| Country | Increase between 2000 and 2015 (percentage points) | Percentage of population with access to safe water in 2015 |
|---|---|---|
| Cambodia | 33.9 | 75.5 |
| Mali | 30.4 | 77.0 |
| Laos | 30.2 | 75.7 |
| Ethiopia | 28.4 | 57.3 |
| Malawi | 27.7 | 90.2 |
| Guinea-Bissau | 27.2 | 79.3 |
| Afghanistan | 25.0 | 55.3 |
| Paraguay | 24.6 | 98.0 |
| Uganda | 22.6 | 79.0 |
| Burkina Faso | 22.4 | 82.3 |

Various programs have been credited for this progress. Two of these are corporate and governmental partnerships to distribute water, and reduced prices for communities that buy water.

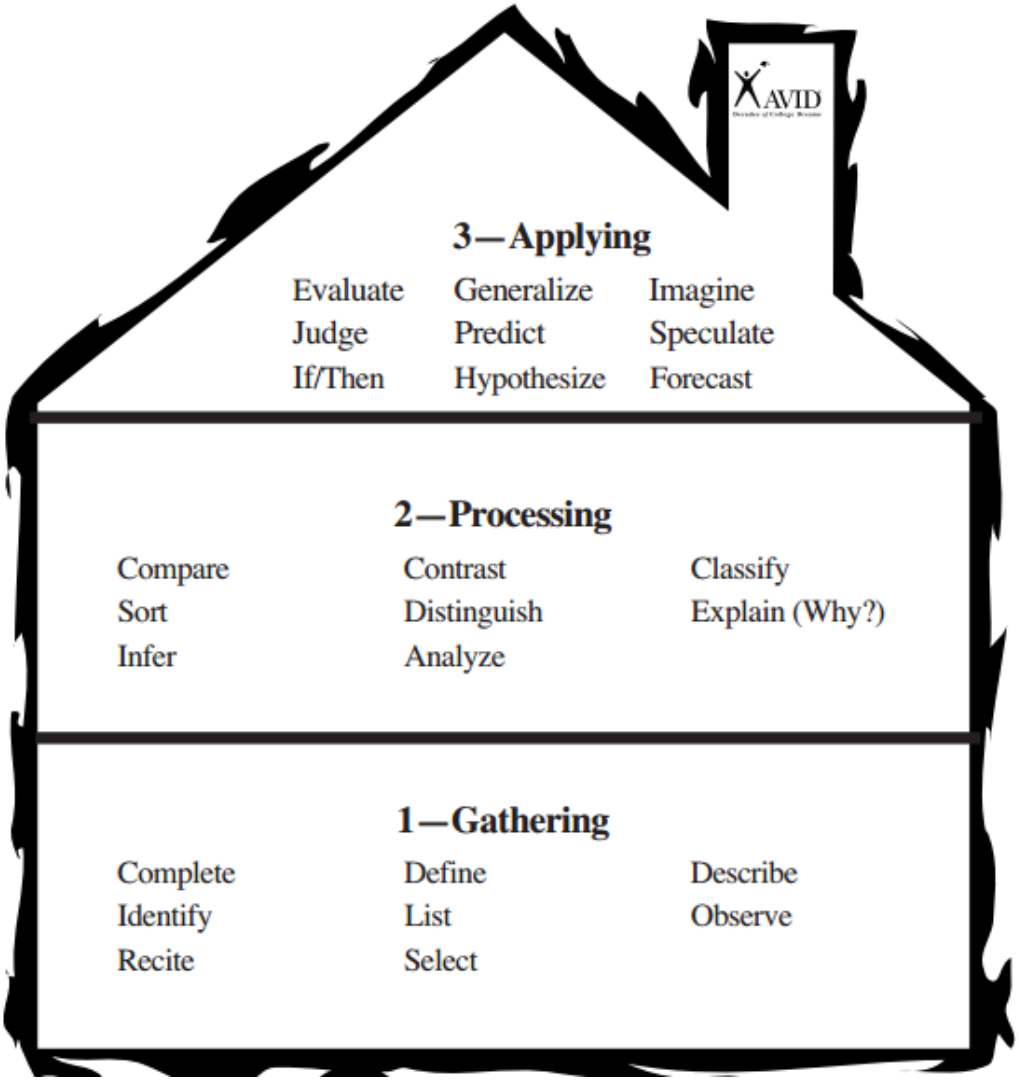
### Still More Work To Do

In 2001, the United Nations set a series of millennium development goals (MDGs) to improve life for those living in poverty. One MDG was to cut in half the proportion of people without access to safe drinking water by 2015. This MDG was achieved, but WaterAid's Northover believes there is still more work to do.

"The MDG target was met, but that was largely due to progress made in China and Southeast Asia," Northover noted.

"We know it's still achievable," Northover said of increasing water access for more people. "Many countries have proved it's possible." But rather than celebrating success in one country or one region, he wants "water access to be a global priority."

Costa's Levels of Questioning-



# Close Reading

Name:

## 1st Read

First Impressions

What were two things you noticed during your first read?

Circle all unfamiliar words in the text. How will you find out their meanings during the second read?

Where did you have questions during your first reading? Mark all areas with a question mark.

## 2nd Read

Structure

What were some of the key ideas in the text?

How did you use context clues to determine the meanings of new words? Give an example.

Look for the important details and main ideas during your second reading. Mark these areas with a star.

## 3rd Read

Reflections

What have you learned from reading this text?

What connections did you make while reading?

During the third reading, mark areas that made you stop and think with an exclamation mark.

Title:

Author:

F T P

| TEACHER NAME | | | Lesson # |
|---|---|---|---|
| Nicole DeLorenzo | | | 3 |
| **MODEL** | **CONTENT AREA** | **GRADE LEVEL** | |
| **Creative Problem Solving** | **Science** | **5th-8th** | |

| CONCEPTUAL LENS | LESSON TOPIC |
|---|---|
| Sustainability | Clean Water |

**LEARNING OBJECTIVES** *(from State/Local Curriculum)*

**Next Generation Science Standards**

5th Grade- ESS2.C: THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

ESS3.C: Human Impacts on Earth Systems- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

**NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**

**As a result of activities in grades 9-12, all students should develop understanding of:**

**Personal and community health, Population growth, Natural resources, Environmental quality, Natural and human-induced hazards, Science and technology in local, national, and global challenges**

**NSS-G.K-12.5 ENVIRONMENT AND SOCIETY**

**As a result of activities in grades K-12, all students should:**

**Understand how human actions modify the physical environment.**

**Understand how physical systems affect human systems.**

**Understand the changes that occur in the meaning, use, distribution, and importance of resources.**

**RI.5.1-** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text

| THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?* | THE ESSENTIAL QUESTION *(What question will be asked to lead students to "uncover" the Essential Understanding)* |
|---|---|
| Sustainability impacts survival | In what ways does sustainability impact survival? |
| **CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)** | **PROCESS SKILLS (What will students be able to do as a result of this lesson?)** |

| | |
|---|---|
| Students will learn<br>- That people in many countries around the world have limited access to clean water<br>- That a water walk is when individuals (mainly women and young girls) walk long distances (on average 4-5 miles) just to get a small of amount of water. This is done daily.<br>- A water walk impacts the people in the community because it prevents women from obtaining jobs and it keeps girls out of school.<br>- Water filters could be impactful and help with sustainability because it would eliminate the need for water walks. It would also allow for women and children to be productive members of society. It would also improve the health of the community.<br>- About materials that could be used to create a successful water filter | Students will be able to:<br>- Design and create a water filter<br>- Collaborate effectively with team members<br>- Analyze and critique design choices and materials<br>- Apply critical thinking skills |

**GUIDING QUESTIONS**

***What questions will be asked to support instruction?***

***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding***

| Pre-Lesson Questions: | During Lesson Questions: | Post Lesson Questions: |
|---|---|---|
| **Content**<br>- How many people are living without clean drinking water?<br>- Where is the water crisis occurring?<br>- What are some examples of things that women and children miss out on by spending time gathering water?<br>- What could happen if someone drinks contaminated water?<br>- What issues factored into Helen's decisions about where to collect her water?<br>- How does Helen decide where to use her water, and what uses does she | **Content**<br>- What is the problem in Tanzania?<br>**Concept**<br>- How does the water crisis in Tanzania impact the survival of the people there? What could be done to improve the sustainability of this country?<br>**Instructional Model**<br>- Why did your group decide on the materials you chose for your water filter?<br>- What needs do you intend to meet by using the items you selected for your water filter?<br>- What problems have you | **Content**<br>- What can be done to improve the lives of people in Tanzania and other countries experiencing a water crisis?<br>**Concept**<br>- In what ways does your water filter prove that sustainability impacts survival?<br>- How does creating a water filter improve sustainability in a community?<br>**Instructional Model**<br>- What challenges did you come across during this process? How did you |

| | | |
|---|---|---|
| prioritize?<br>- Self-esteem is an important part of our well-being as humans. How did having access to clean water improve Helen's self-esteem in many ways.<br>- Why is it important to have efficient access to clean water?<br>-<br><br>**Concept**<br>- What social and environmental factors do you think are contributing to the global water crisis?<br>- How does the water crisis impact sustainability in these countries?<br><br>**Instructional Model**<br>- What materials do you think you would need to create something to solve this water crisis issue? | come across as you are designing and building? | overcome those challenges?<br>- What changes would you make to your decision? Why?<br>- What designs did you see from other teams that you thought worked well? Why?<br>- |

**DIFFERENTIATION**

***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***

| Content | Process | Product | Learning Environment |
|---|---|---|---|
| | | **Students products will vary based on creativity and design. The task is open ended and allows students to design their own product.** | **Students will work collaborative in groups and will assume a role of their choice within the group.** |

**PLANNED LEARNING EXPERIENCES**

***(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)***

**Engage and Connect** - ***This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.***

Students will arrive and will be given a jug/pail of water for a water walk. Students will walk for approximately 5-7 minutes carrying their "water". Students should try their best to avoid putting the object down or stopping (unless necessary). Afterwards students will have a discussion about how difficult the task was and how it could present challenges to those who have to do this on a daily basis.

Students will then watch "Water Changes Everything".
https://www.youtube.com/watch?v=VieZ3hqztlE&feature=c4-overview-vl&list=PLtaayxEPf2h4zsZsX6yBd

- How many people are living without clean drinking water?
- Where is the water crisis occurring?
- What are some examples of things that women and children miss out on by spending time gathering water?
- What could happen if someone drinks contaminated water?

Next, students will read *I Feel Beautiful for the First Time*. This is a story about how traveling for water walks impacts a community, especially women and children.
**http://www.charitywater.org/projects/stories/i-feel-beautiful-for-the-first-time**

- What issues factored into Helen's decisions about where to collect her water?
- How does Helen decide where to use her water, and what uses does she prioritize?
- Self-esteem is an important part of our well-being as humans. How did having access to clean water improve Helen's self-esteem in many ways.
- Why is it important to have efficient access to clean water?
- How does the water crisis impact sustainability in these countries?

Students will participate in a simulation of a water walk. Read this statement to students: "Almost one billion people on the planet don't have access to safe and clean drinking water. This is a jerry can. To us it says 'gasoline,' but for almost a billion people on the planet, this represents water. It weighs 40 pounds

when full, and people all over the world walk up to three hours each day carrying water from its source to their homes. The water they bring home to their families often makes them sick. Women and children are responsible for this daily task, which prevents the kids from getting an education and the women from earning a much needed extra income. "

- What materials do you think you would need to create something to solve this water crisis issue?

**Explore** - ***In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.***

Present students with the Tanzania case study (see attached). Tanzania and many other countries, even some cities in the United States, are in the midst of a water crisis. Many people in these countries travel for hours to get clean water. Your goal is to help provide these countries with a sustainable, cost-effective, and efficient water filtration system. Your task will be to create a water filter system that could be used to help solve this problem.

- How does the water crisis in Tanzania impact the survival of the people there? What could be done to improve the sustainability of this country?

**Mess Finding-** The teacher provides the students with the following challenge: Students are to design a working water filter that could be easily replicated at a low cost, using the information they have learned about sustainability and water. Students will be access to the following items: 2 liter bottles, rocks, sand, coffee filters, cotton balls, Styrofoam cups, cloth, plastic cups, plastic bags, rubber bands, tape , paperclips, plastic wrap, and uncooked macaroni.

**Fact Finding-** Students can first view the items, but cannot choose any items at this time. Teams will be given time to view the materials and take notes if desired. Groups will then begin to gather data and facts that are needed to solve the problem presented. Students may also further research Tanzania (or another country in a water crisis) to get more information about the geography and situation. However, groups are not allowed to search for "how to make a water filter".

**Explain** - ***Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.***

**Problem Finding**- Students will begin to brainstorm and determine the different ways of designing a working water filter. Working as a team, they will determine their objective, what they hope to accomplish, and how it would meet the needs of the people of Tanzania (or other countries).

**Idea Finding**- Teams will be given 25 minutes (more if necessary) to sketch out a design/blueprint for what they are going to build. They must also list out all of the materials they plan on using. Prior to going to the materials table, students must have a blueprint completed and a materials list prepared. It will be up to each team to determine the best techniques/materials to use. Students will begin by brainstorming all possibilities. The teacher circulates, acting as a facilitator and makes sure all students are participating.

**Elaborate —*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways***

**Solution Finding**- Students use convergent thinking to narrow down their ideas and decide on the best approach for building a working water filter. All ideas are evaluated and the best idea is selected for building a water filter. Students may use a decision making matrix (see attached) to narrow down possibilities and choose a reasonable design.

Teacher will circulate and ask the following questions:

- Why did your group decide on the materials you chose for your water filter?
- What needs do you intend to meet by using the items you selected for your water filter?
- What problems have you come across as you are designing and building?

**Evaluate:** ***This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.***

**Acceptance Finding-** Students develop a work plan for putting their idea into action. Students will assign each team member with a responsibility. Students are given 40 minutes to build their working water filter. Only 1 student, the materials manager, will be allowed to go and collect/exchange supplies from the materials table. The teacher will be circulating and checking on student participation to make sure each team member is actively involved. Students will be allowed to test their water filter periodically to check and see whether it works or not.

At the end of the building time, groups will present their final water filter. Groups will be asked to describe what they made their water filter with and why they chose those materials. Groups will then test their water filter one final time by adding "dirty" water to the filter and testing what comes out.

Afterwards, students will return to their seats and complete some reflective questions in their journals:

- What challenges did you come across during this process? How did you overcome those challenges?
- What changes would you make to your decision? Why?
- What designs did you see from other teams that you thought worked well? Why?
- In what ways does your water filter prove that sustainability impacts survival?
- What can be done to improve the lives of people in Tanzania and other countries experiencing a water crisis?

I Feel Beautiful for the First Time by Becky Straw

Driving down a bumpy road in the middle of Northern Uganda, we were kicking up dust as we headed into the rural countryside. I was traveling with teams from two other non-profit organizations to evaluate the work of our shared local partner, Joy Drilling, who was drilling wells and training communities in sanitation and hygiene. Before piling in, I made a last minute decision to jump into the truck's flatbed. The Ugandan drilling crew looked stunned that I'd do such a thing, but I didn't care. I was happy to suffer a little dust for the view.

I have a pretty incredible job. As charity: water's Water Project Manager, I travel to some of the most desperate places on earth in search of clean water. And while the landscape changes, there's always one thing that remains the same: the women are always walking. Whether I'm trekking the mountains of Haiti, taking cover from a rainstorm in rural Liberia, or tramping through the jungles of Central African Republic, the women are always carrying water.

From my vantage point in the truck, I watch women gather up their children and move to the edge of the road to let us pass. Their feet are gnarled and calloused: a result of thousands of miles walked barefoot over rocks and mud. With babies strapped to their backs, their brightly colored skirts sway and their knees quiver and brace under the weight of water and children. Most balance pails on their heads, while some grip 80 pounds of water with sweaty palms, a bright yellow 5-gallon Jerry Can in each hand.

I'm in awe of how they manage. But of course, they have no choice. The average woman in Africa walks three miles every day for water. Often, it's water from putrid rivers or disease-infested swamps. Worldwide, women are more than twice as likely as men to collect drinking water.

Without warning, our truck swerves off the road and up over an embankment. Dried corn stalks thump against the side of the truck as we plow through a field. My knuckles are white as I try to hold on and not bounce out.

Moments later, we find ourselves in a clearing and in the middle of a huge celebration. Esther, our photographer, pokes her head out the window, smiles, and yells back at me, "Looks like our mission's been compromised!" I usually prefer to surprise communities by our arrival because it makes it easier to monitor how our water points are functioning without hundreds of people watching. But once you visit a few communities in the neighborhood, rumors of your presence spread like wildfire.

We jump out of the truck and walk into a party. The women meet us with exuberant cheering and dancing. Pure and loud joy rocks the village.

This is when I met Helen Apio. While most women hung back politely, Helen jumped toward me and screamed two inches from my face. Technically, it was singing. But the high-pitched shrieking was so loud and reverberated with such energy and emotion, I knew I had to talk with her.

She told me about the new freshwater well in her village.

“I am happy now,” Helen beamed. “I have time to eat, my children can go to school. And I can even work in my garden, take a shower and then come back for more water if I want! I am bathing so well.”

A few of the men chuckled to hear a woman talk about bathing. But all I noticed was Helen's glowing face, the fresh flowers in her hair, and the lovely green dress she wore for special occasions. Touching her forearm, I replied, “Well, you look great.”

“Yes,” she paused. Placing both hands on my shoulders and smiling, she said, “Now, I am beautiful.”

That really hit me.

My job is to focus on sustainable development, health, hygiene and sanitation; to make sure charity: water’s projects are working in 20 years. But nowhere on any of my surveys or evaluations was a place to write, “Today we made someone feel beautiful.”

How Helen became beautiful is the real story.

Before she had clean water, she would wake up before dawn, take her only two 5-gallon Jerry Cans, and walk almost a mile and a half to the nearest water point, which happened to be at a school. Because there simply wasn’t enough water for the area’s population, she’d wait in line with hundreds of other women who also valued clean water. Helen’s only other option was to skip the wait and collect contaminated water from a pond.

Helen spent most of her day walking and waiting. She told me each day she’d say to herself, “How should I use this water today? Should I water my garden so we can grow food? Should I wash my children’s uniforms? Should I use it to cook a meal? Should we drink this water?” With two children, one husband and 10 gallons, Helen had to make choices.

I saw the shame in her eyes when she described how she would return from her long trek to find her two young children waiting for her. They were often sent home from school because their uniforms were dirty. Helen just never had enough water.

I saw now why she was so eager to scream out her joy and gratitude. She wanted me to understand that this gift from charity: water was real. With the new well in her village, her life was transformed. She now had choices. Free time. Options. Also, Helen has been chosen to be the Water Committee Treasurer, collecting nominal fees from 51 households to use for the maintenance of their well. Water Committees are often the first time women are ever elected to leadership positions in villages.

Last month, Helen was standing in line waiting for water.
This month, she's standing up for her community. And now, she is beautiful.

**ABOUT TANZANIA**

**Population: 47,780,000**
**47% lack access to water**
**88% lack access to sanitation**
**33.4% live below poverty line**

## Tanzania Case Study

### Overview

Tanzania is known for its beautiful parks, expansive lakes, and the soaring Mount Kilimanjaro-- the highest mountain in Africa. Tanzania is the largest country in East Africa and is home to over 46 million people.

Despite recent growth in its economy, Tanzania remains one of the world's poorest countries. Most of the country is too dry and scarce of water to support agriculture. It is one of many nations facing a water crisis. Although water issues affect the majority of the country, the problem is especially severe in northern Tanzania.

In northern Tanzania, water and sanitation systems in schools are either highly overburdened or non-existent. The region's lack of clean water, hygiene, and sanitation at schools is increasingly causing students to miss class or altogether abandon their education. Women and children spend up to four hours per day collecting water from sources likely to make them sick; in fact, roughly 200,000 children die each year after contracting waterborne diseases. And all that time women and children spend collecting water could be spent doing other work, attending school, or caring for families in other ways.

# Decision Making Matrix

Things to consider as you decide

| Write your ideas here | How much time will this take? | What resources will you need? | How much would this idea cost? | Does this idea meet your goals? | Give the idea a score out of 10 |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Which idea is most practical for you to achieve your goals?

| TEACHER NAME | Lesson # |
|---|---|
| DeLorenzo | 4 |

| MODEL | CONTENT AREA | GRADE LEVEL |
|---|---|---|
| Questioning | Science | 5th-8th |

| CONCEPTUAL LENS | LESSON TOPIC |
|---|---|
| Sustainability | Conservation |

**LEARNING OBJECTIVES** *(from State/Local Curriculum)*

**Next Generation Science Standards**

5th Grade- ESS2.C: THE ROLES OF WATER IN EARTH'S SURFACE PROCESSES- Nearly all of Earth's available water is in the ocean. Most fresh water is in glaciers or underground; only a tiny fraction is in streams, lakes, wetlands, and the atmosphere.

ESS3.C: Human Impacts on Earth Systems- Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth's resources and environments.

**NSS-G.K-12.5 ENVIRONMENT AND SOCIETY**
**As a result of activities in grades K-12, all students should:**
**Understand how human actions modify the physical environment.**
**Understand how physical systems affect human systems.**
**Understand the changes that occur in the meaning, use, distribution, and importance of resources.**

**RI.5.1-** Quote accurately from a text when explaining what the text says explicitly and when drawing inferences from the text

| THE ESSENTIAL UNDERSTANDING *(What is the overarching idea students will understand as a result of this lesson?* | THE ESSENTIAL QUESTION *(What question will be asked to lead students to "uncover" the Essential Understanding)* |
|---|---|
| Sustainability impacts survival | In what ways does sustainability impact survival? |

| CONTENT KNOWLEDGE (What factual information will students learn in this lesson?) | PROCESS SKILLS (What will students be able to do as a result of this lesson?) |
|---|---|
| Students will learn:<br>• A drought is a prolonged period of abnormally low rainfall; a shortage of water resulting from this.<br>• Droughts can be caused by lack of rain or snow, low river levels, or even the use of | Students will be able to:<br>• Make generalizations and inferences about the content knowledge<br>• Analyze content to determine relevant information<br>• Make connections between water conservation, sustainability, and survival |

| | |
|---|---|
| too much water by people.<br>• That California recently experienced a 6 year drought<br>• The impacts of the California drought: agriculture suffers, energy usage (need to turn to other forms of energy-natural gas, etc.), increased danger of wildfires, wildlife reduction due to habitat changes, limits of water usage.<br>• A drought impacts the sustainability of an area because it limits the access to clean water sources. | • Compare and contrast the water sustainability issue in California and Tanzania |

| **GUIDING QUESTIONS**<br>***What questions will be asked to support instruction?***<br>***Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding*** | | |
|---|---|---|
| **Pre-Lesson Questions:** | **During Lesson Questions:** | **Post Lesson Questions:** |
| **Content**<br>What is a drought?<br><br>What factors lead to a drought?<br><br>What determines the availability of water to an area?<br>How long has California been experiencing a drought? How do you think this has impacted the people living there? What are some consequences of the drought?<br><br>**Concept**<br>Describe the relationship between a drought and sustainability. How are the two concepts connected?<br><br>How does where people live impact their sustainability? | **Content**<br>What areas of daily life have been affected by the drought? (farming, economy, jobs, etc.) In what ways have they been affected?<br><br>Who is impacted by the drought restrictions?<br>How do you think these people feel about the restrictions?<br><br>Who is not affected by the drought restrictions? What is your opinion of this? Why should certain people/businesses be allowed to use more water than others? What would justify this?<br><br>What connections could you make between the two articles, *California imposes first ever water restrictions* & *See how a historic drought has changed California's landscape*?<br><br>**Concept**<br>In what ways is the drought impacting the sustainability of California and the people who live there?<br><br>How would a decrease in farming impact sustainability? | **Content**<br>Based on the information you read, how do you feel about the actions of the Resnicks? What information would you use to support your view?<br><br>What is your opinion of the Resnicks? How is it ethical for them to use more water than everyone else? Explain.<br><br>Even though the drought is "over", why is it important for people to still conserve water? What could happen if people stop conserving water?<br><br>How would you assess the importance of access to water in terms of survival?<br><br>**Concept**<br>Based on what you know, how would you explain the impact of a drought on sustainability? What do people have to do differently in order to survive?<br><br>What role does geography play in determining sustainability of an area?<br><br>Compare and contrast the issue of sustainability in California and Tanzania. How are they different/similar to each other? |

**DIFFERENTIATION**

***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***

| Content | Process | Product | Learning Environment |
|---|---|---|---|
| **Students will read articles from news websites. These articles have advanced vocabulary and ideas.** | **Students will be provided with various higher order thinking questions. Students will have to use critical thinking skills to answer the questions.** | | |

**PLANNED LEARNING EXPERIENCES**

***(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)***

**Engage and Connect** - ***This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.***

As students enter, they will be given a weekly circular ad from a well-known store (Lowe's, Walmart, etc). Students should browse through the circular and circle items that would not need to be sold during a drought. After, discuss why the students chose those items and why they would not be needed during a drought.

Students will be shown the following picture:

As students are looking at the picture they will begin to create a word web for the word "drought". Students should list words that they associate with a "drought". Students may also list things and places that are impacted by a drought.
If students need more prompting, then ask the following questions:
What is a drought?
What factors lead to a drought?
What determines the availability of water to an area?

Since water accessibility in the US is not typically affected by economy, make sure to make connections to natural disasters, homelessness, oil spills. These should be brought up in discussion and mentioned as reasons for lack of water access in the US.

Students will then watch a video about the California Water Crisis. This video gives students some further background knowledge about what a drought is, how it is affecting the community, and what problems a drought causes in terms of sustainability.

*https://www.youtube.com/watch?v=q_zSaS5rRDU*

After watching the video, ask the students the following questions:
Describe the relationship between a drought and sustainability. How are the two concepts connected?
How does where people live impact their sustainability?
How long has California been experiencing a drought? How do you think this has impacted the people living there? What are some consequences of the drought?

**Explore** - ***In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.***

Just recently, the governor of California- Jerry Brown, announced that the drought in California was officially over. The drought lasted over 6 years. However, the drought has left California with some serious issues and problems to solve. The drought has drastically changed the landscape of California.

In small groups, students will read the following article, **See how a historic drought has changed California's landscape,**
**http://www.pbs.org/newshour/updates/how-californias-historic-drought-has-left-the-state-thirsty/ .**
Students will focus on the cause and effect relationships in the article by filling out a cause and effect graphic organizer while reading. Students should use close reading strategies.

After students have completed reading, ask the following questions and discuss:
In what ways is the drought impacting the sustainability of California?
What areas of daily life have been affected by the drought? (farming, economy, jobs, etc.) In what ways have they been affected?
How would a decrease in farming impact sustainability?

**Explain** - ***Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.***

Next, students will work with a different partner to read the following article: California imposes first ever water restrictions.
**https://www.nytimes.com/2015/04/02/us/california-imposes-first-ever-water-restrictions-to-deal-with-drought.html?_r=0** Students already learned about the cause and effects of the drought on the overall state. Now students will examine how the drought impacts individuals living in California. Students should use close reading strategies.

After students have completed reading, ask the following questions and discuss:
What areas of daily life have been affected by the drought? (farming, economy, jobs, etc.) In what ways have they been affected?

Who is impacted by the drought restrictions?
How do you think these people feel about the restrictions?

Who is not affected by the drought restrictions? What is your opinion of this? Should certain people/businesses be allowed to use more water than others? What would justify this?

What connections could you make between the two articles, California imposes first ever water restrictions & See how a historic drought has changed California's landscape?

**Elaborate** —***Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways***

Students will now read the following article independently: Meet the California Couple Who Uses More Water Than Every Home in Los Angeles Combined
**http://www.motherjones.com/environment/2016/08/lynda-stewart-resnick-california-water/**
Students should use close reading to take notes, create questions, and think critically about the text. Students should focus on the moral issues in this article.

After students have had time to read the article, discuss the following questions as a class:
Based on the information you read, how do you feel about the actions of the Resnicks? What information would you use to support your view?

What is your opinion of the Resnicks? How is it ethical for them to use more water than everyone else? Explain.

Even though the drought is "over", why is it important for people to still conserve water? What could happen if people stop conserving water?

How would you assess the importance of access to water in terms of survival?

**Students will also be given time today to finish working on their United Nations presentation. Today the students will be giving their oral presentation, which will be accompanied by a visual. Students will finish researching the country of their choice and the sustainability issues that the country is experiencing. Students will finish their presentations and begin to prepare for the oral presenation.**

**Evaluate:** ***This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.***

Students will end the lesson by answering the following questions in their journals:

Based on what you know, how would you explain the impact of a drought on sustainability? What do people have to do differently in order to survive?

What role does geography play in determining sustainability of an area?

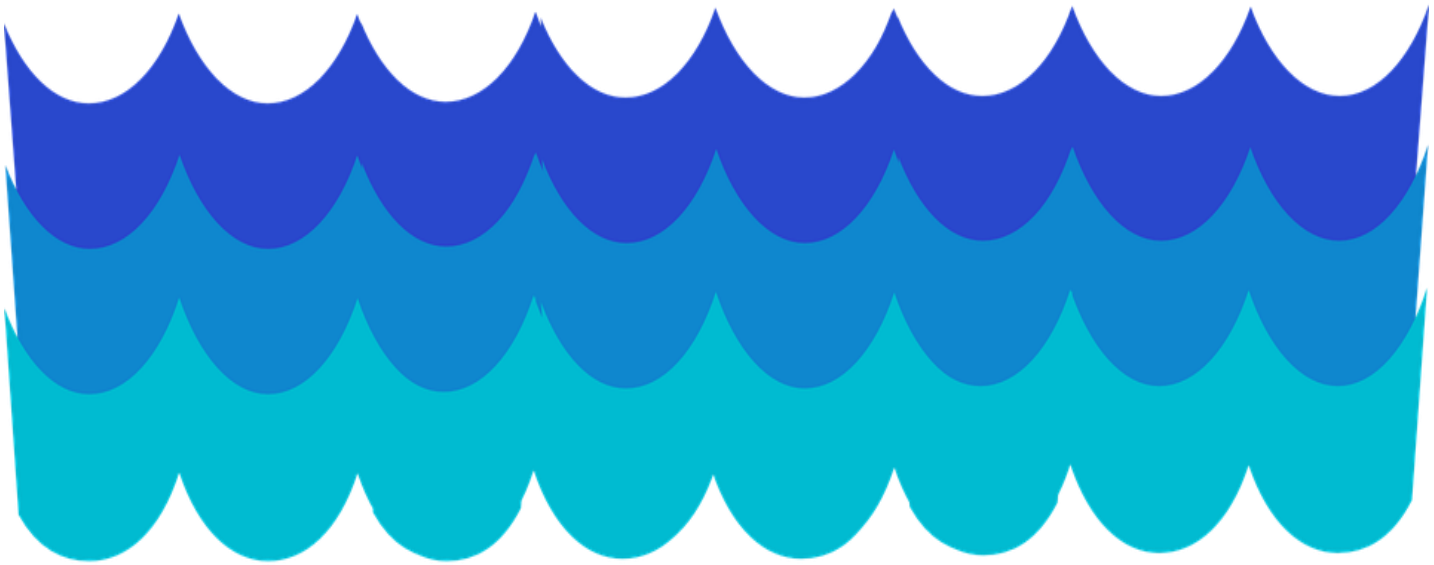
Compare and contrast the issue of sustainability in California and Tanzania. How are they different/similar to each other?

After students have had an appropriate amount of time to respond, have several students share out their answers to each questions. Use these responses to guide a closing discussion.

Students will end the class with one final discussion about the essential question: “In what ways does sustainability impact survival?” Students should use what they have learned today, as well as information from the past 3 lessons to shape their answers and provide justification.

**Students will also be presenting their United Nations performance task at the end of class today. Each group should be given 3-5 minutes to discuss the country they chose, the sustainability issues affecting it, and to demonstrate their working water filter.**

# Unit Resources



# Resources

Below you will find a list of various resources that could be used to supplement this unit. The resources have been divided into two sections depending on whether they are for teacher or student use. Next to each resource, you will find a brief description of what it includes.

## Teacher Use

HomeTeaching and Learning for a Sustainable Future. (n.d.). Retrieved July 31, 2017, from http://www.unesco.org/education/tlsf/

- At this website, you will find 27 modules on sustainable development education. The modules are broken up into four themes, Curriculum Rationale, Sustainable Development Across the Curriculum, Contemporary Issues, and Teaching and Learning Strategies. Each module contains objectives and several student activities based on sustainable development.

JOIN GEF NOW! (2017). Retrieved July 31, 2017, from http://www.greeneducationfoundation.org/institute/lesson-clearinghouse.html

- This is a forum created by the Green Education Foundation. On this forum, you will find sustainability lessons for grades K-12. The lessons are arranged by grade level and subject area. Teachers are welcome to submit lesson plans on the forum.

Project Wet Foundation. (2016). Teach and Learn. Retrieved July 31, 2017, from http://www.projectwet.org/teach-and-learn

- Project Wet Foundation has designed this website for educators. On this website you will find lesson plans, student activity books, publications, and even workshops that are available for teachers.

UNESCO. (2012). Education for Sustainable Development SOURCEBOOK. Retrieved July 31, 2017, from http://unesdoc.unesco.org/images/0021/002163/216383e.pdf

- This sourcebook was created by United Nations Educational, Scientific and Cultural Organization for teachers. It provides rationale behind teaching sustainable development, gives suggestions for how to fit it into a curriculum, and even provides several sample lessons plans and assessments.

# Student Use

Park & Co. (2017). Kids-water use it wisely. Retrieved July 31, 2017, from http://wateruseitwisely.com/kids/

- This website for students is all about how to use water wisely. Students can play games, look at a water saving tips, and even take on a water challenge of their own at home. It also has a link for teachers with educational materials.

Park, L. S. (2009). A long walk to water: based on a true story. New York: Clarion Books.

- This novel details the challenges of an 11 year old girl and boy in Sudan. The girl must travel to a pond two hours away, twice a day to get water for her family. *A Long Walk to Water* explains the challenges and dangers of having to complete a daily water walk.

Project Wet Foundation. (2016). Project WET Discover Water. Retrieved July 31, 2017, from http://www.discoverwater.org/

- This website allows students to explore more about water. It includes the water cycle, water sources, and sustainability. Students can watch interactive tutorials, videos, complete activities, and quiz themselves on what they have learned.

Water Education Foundation. (2016). Water Kids. Retrieved July 31, 2017, from http://www.watereducation.org/water-kids

- This resource has a variety of different articles for students to read. It covers topics such as water supply, water use, water conservation, and water quality. It also provides additional resources such as books and games that are available for purchase.